Title

Fighting in the Future Tense: Norm Collision and Imaginaries in the Emergence of Autonomous Weapons

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FIGHTING IN THE FUTURE TENSE: NORM COLLISION AND IMAGINARIES IN THE EMERGENCE OF AUTONOMOUS WEAPONS

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POLITICS

by

Jeffery Sherman

June 2022

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List of Abbreviations

Acronym	Definition
A2/AD	Anti-Access/Area Denial
ABM	Anti-Ballistic Missile
AFA	Air Force Association
AFRL	Air Force Research Laboratory
AI	Artificial Intelligence
ARPA	Advanced Research Projects Agency
AWS	Autonomous Weapons System
CCW	Convention on Certain Conventional Weapons
CIA	Central Intelligence Agency
CJCS	Chairman of the Joint Chiefs of Staff
CRS	Congressional Research Service
CW	Chemical Weapons
DAB	Defense Acquisition Board
DARPA	Defense Advanced Research Projects Agency
DAU	Defense Acquisition University
DDR&E	Director of defense research and engineering
DIB	Defense Innovation Board
DIU(x)	Defense Innovation Unit (Experimental)
DoD	Department of Defense
DSB	Defense Science Board
DT&E	Development testing and evaluation
FFRDC	Federally funded research and development center
GAO	Government Accountability Office, formerly General Accounting Office
GGE	Group of Government Experts
GPS	Global Positioning System
HASC	House Armed Services Committee
HRW	Human Rights Watch
ICBM	Intercontinental ballistic missile
ICRAC	International Committee for Robot Arms Control

Acronym	Definition
ICRC	International Committee of the Red Cross
IDA	Institute for Defense Analyses
IEEE	Institute of Electrical and Electronics Engineers
IHL	International Humanitarian Law
iPRAW	International Panel on the Regulation of Autonomous Weapons
ISR	Intelligence, Surveillance, and Reconnaissance
J-UCAS	Joint Unmanned Combat Aerial System
JAIC	Joint Artificial Intelligence Center
JCS	Joint Chiefs of Staff
JDAM	Joint Direct Attack Munition
LAR	Lethal Autonomous Robotics
LAWS	Lethal Autonomous Weapons System
LCAAT	Low-Cost Attributable Aircraft Technology
LoAC	Laws of Armed Combat
LOCAAS	Low-Cost Autonomous Attack System
MAD	Mutually Assured Destruction
NATO	North Atlantic Treaty Organization
NDAA	National Defense Authorization Act
NDS	National Defense Strategy
NGO	Non-Governmental Organization
NMS	National Military Strategy
NSCAI	National Security Commission on Artificial Intelligence
NSS	National Security Strategy
ONR	Office of Naval Research
OODA (loop)	Observe, Orient, Decide, and Act
OSD	Office of the Secretary of Defense
PGM	Precision Guided Munition
PME	Professional Military Education
PPBS	Planning, Programming, and Budgeting System
QDR	Quadrennial Defense Review

Acronym	Definition
R&D	Research and Development
RDT&E	Research, development, test, and evaluation
RoE	Rules of Engagement
RPA	Remotely Piloted Aircraft
SASC	Senate Armed Services Committee
SCO	Strategic Capabilities Office
SecDef	Secretary of Defense
SLBM	Submarine-launched ballistic missile
START	Strategic Arms Reduction Treaty
TAN	Transnational Advocacy Network
TRADOC	Army Training and Doctrine Command
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
UCAV	Unmanned Combat Aerial Vehicle
UCLASS	Unmanned Carrier-Launched Airborne Surveillance and Strike
UGV	Unmanned Ground Vehicle
UN	United Nations
UNDC	United Nations Disarmament Commission
UNGA	United Nations General Assembly
UNIDIR	United Nations Institute of Disarmament Research
UNODA	United Nations Office for Disarmament Affairs
UNSC	United Nations Security Council
USAF	United States Air Force
USD (A)	Undersecretary of defense for acquisition
USD (A&T)	Undersecretary of defense for acquisition and technology
USD (AT&L)	Undersecretary of defense for acquisition, technology, and logistics
USD (R&E)	Undersecretary of defense for research and engineering
USN	United States Navy
UUV	Unmanned Underwater Vehicle
WMD	Weapons of Mass Destruction

Abstract

Fighting in the Future Tense:
Norm Collision and Imaginaries in the Emergence of Autonomous Weapons
By Jeff Sherman

Within the current global security environment, several new military technologies hold the potential to fundamentally transform warfare and—by extension—how international actors use force towards political ends. In particular, autonomous weapon systems (AWS) emerged as a focal point of normative contestation at the global, domestic, and institutional levels. My research focuses on why U.S. as the pre-eminent military power is developing this weapons technology despite growing normative arguments against AWS at the international level. I draw on historical and discursive methods of analysis to argue that a collision between incompatible norm regimes, one within global governance structures and another across global security cultures account for this disjuncture. My research suggests that international politics, in a deeply constructivist sense, is embedded in the process of creating new military technologies like autonomous weapons via the logic of what I term the strategic imaginary.

Acknowledgements and Dedication

At times, this was a nearly impossible dissertation to complete. It is simply a miracle that it exists even in its present, albeit imperfect form. By all rights, it never should have seen the light of day. I am astounded daily by the amount of work that goes into writing a dissertation. It should be noted that the volume of effort that this project entailed is entirely a function of me not following the good advice of my mentors. I have made it more work than is reasonably necessary. But the only reason I completed this project is because of the support, sage guidance, and compellence of my dissertation committee. It may be a cliché but it is true: a dissertation is a team effort and not an individual achievement. Every astute observation I mustered or greater insight the reader might gain is entirely a product of their sage commentary and direction. It goes without saying that all errors and failings in this work are entirely my own.

First and foremost, I am deeply grateful to my advisors, Roger Schoenman and Sikina Jinnah. I owe an unfathomable debt to Roger. He took me on as an advisee and never gave up on me even when I did not believe in my own abilities. His persistent encouragement and calm counsel steered me away from rough academic waters. Professor Schoenman's clarifying, and ever constructive feedback kept this project in the range of feasible despite my many intellectual tangents. Roger and I share an ethos of humility about our professional achievements. I must register here how much I admire Roger's scholarly work and how much of an asset he is to UCSC. Similarly, I am continually overwhelmed with the breadth and depth of Sikina Jinnah's contributions in both academic and

concrete policy worlds. I can only hope that my own intellectual path leads me to a fraction of Professor Jinnah's accomplishments. It is difficult to convey how much I learned from her as her teaching assistant and how incredibly rewarding her open and collaborative approach to teaching impacted my own growth as an educator. As a mentor in teaching and research, she never let up on me, and the depth of my gratitude for her "tough love" is immeasurable. Without Sikina and Roger, I would simply have been lost.

My intellectual debts are numerous and also extend to the other members of my committee. I am eternally grateful for Dan Wirls' advice and insistence to write clearly in order to think clearly. Dan does not abide superficial intellectual trendiness and I appreciated his candor in weeding out my own academic flights of fancy. I want to thank him here for this vigilance and convey how much I deeply respect his perspective. His editorial acumen to hunt down the errant typo is a welcome skill I hope to fully develop someday. I was lucky enough to rope Dave Gordon into my orbit early on in his career at UCSC, and I benefited from these discussions at a time when my project was best described as meandering. As a recent Ph.D. graduate, Dr. Gordon's incisive questions about what I could and could not prove or even observe about the subject matter was an incisive comment, setting me on a path resembling success. I will always owe Dave for helping me to clarify what is at stake in my thinking and asking the difficult questions early on to transform vague notions into an actionable research project.

As a graduate student in the Politics Department, it has been a privilege to learn from the brilliant scholars who call our little department home. The nurturing but challenging intellectual environment in coursework that defies disciplinary boundaries was the characteristic that drew me to UC Santa Cruz in the first place. The graduate curriculum in the department and beyond delivered on those early impressions. The pleasure of working alongside faculty to teach undergraduates as a Teaching Assistant was incredibly rewarding. I truly believe that graduate students at UCSC learn more about the vocation of teaching simply by observing our talented faculty than in any other graduate program in the country. I will always be grateful to have learned from Ronnie Lipschutz, Vanita Seth, Eva Bertram, Kent Eaton, Deborah Gould, Jenny Reardon, Karen Barad, Marki Massoud, and Eleonora Pasotti. I want to thank extend a special thank you to faculty that have not only been a joy to learn from but who have gone above and beyond the call of duty serving in the Director of Graduate Studies position: Dean Mathiowetz, Megan Thomas, Benjamin Read, and Matt Sparke. Thank you all.

I want to offer a special thanks to Alex Dodd, a UCSC undergraduate student in Politics who contacted me out of the blue to offer research assistance late in the writing process. His assistance organizing my textual data and putting up with my idiosyncratic organizational habits is greatly appreciated. I am certain that despite the volume of my own work, I did not scare him away from his own bright future as a brilliant student of global politics.

The UCSC Politics staff are the lifeblood of the department and make a graduate student's life so much easier. All of my appreciation to Hollie Clausnitzer, Marianna Santana, Cindy Morris, Sarah Arantza Amador, Maya Woolfe, Lorato Anderson, and Nathalie Espinoza, who all supported me in innumerable ways.

Fellow UCSC graduate students have sustained me over the years in both cerebral and emotional terms. I treasure my friendships with Scott Newsome, Joe Lehnert, Mike Wilson Becerril, Alena Wolflink, Juan Diego Prieto Sanabria, Eric Crosbie, James Beneda, Martín Ordóñez, Ellie Frazier, Dominique De Wit, Aaron Augsburger, Zach Dove, Trina Barton, Daria Saprykina, Andrew Meyer, Covina Kwan, Alberto Ganis, Paige Lancourt, Jess Whatcott, Sam Cook, Logan Puck, James Beneda, Gabriel Filártiga, Shawn Nichols, Paige Lancourt, Mark Howard, Alyssa Ruth Mazer, Mizan Rahman, and Lucia Vitale. You have all made me a better academic and a better person.

I have benefited from an extended academic family through the International Studies Association and the ISA annual conference. Not only has this allowed me to see in person some of the most influential academics in the field, but it has also enriched my perspective by networking with fellow junior scholars working on similar questions around IR and technology. I owe a great intellectual debt to John Emory, Maaike Verbruggen, Tom Hobson, Emil Archambault, James Rogers, Andree-Anne Melancon, and Jack McDonald. Connecting with old friends like Silja Bára, Alynna Lyon, Chris Reardon, and Mary Malone at conferences also led to discussions that shaped my thinking. Above all, I want to thank Stacy

VanDeveer as a superlative mentor, always going out of his way to catch up, offer his advise, and hold me up with his unwavering support after encouraging me to pursue a Ph.D.

My career as a Ph.D. student at UCSC has been lengthy. While the Covid-19 pandemic certainly contributed to a certain amount of delay by upending everyone's plans, my own limitations, stubbornness, and hesitance to seek help are all factors leading to my completion well out of the normal timeframe. These factors are all my own inventions. It is a testament to the Politics Department faculty and their immense reservoir of patience as I dealt with my own anxiety, ADHD, bouts of writer's block, and self-imposed obstacles. Thank you all for being patient with me.

While the world of academia and graduate studies takes some getting used to, it is mystifying to many outside observers. For my family, these have been years of composed and sometimes perplexed tolerance of my academic pursuits. I would have collapsed figuratively and literally without their unending support. My parents, Leonard and Margory Sherman, have supported me in all of my endeavors, half-baked and otherwise. They gave me the world. While my sister Beth has faced enormous struggles in her own right, she has always stoically been there for me. I was lucky to gain another family with my marriage in 2005 and my mother-in-law, Ginger Watkins, is a rock whose encouragement is boundless. I also acquired a collection of other sisters. I am so thankful for the support of my sister Jenny Watkins who lent an ear and often helped me decompress. My other sister, Megan

Watkins and her husband Chris Abad, have sustained me and this endeavor to such a degree, that it is hard to convey my appreciation and just how much I owe them in emotional and material sustenance. That this impossible work ever saw the light of day is entirely due to their generosity and belief in me.

With all of my love and gratitude, this dissertation is dedicated to Kate Watkins. She has stood by me, supported me, put up with me, and never let me give up for a minute. Among the lengthy tally, hers is the greatest debt I owe.

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DISSERTATION PROJECT

Fighting in the Future Tense:
Norm Collision and Imaginaries in the Emergence of Autonomous Weapons

Within the current global security environment, several new military technologies hold the potential to fundamentally transform warfare and, by extension, how international actors use force towards political ends. In particular, autonomous weapons emerged as a focal point of normative contestation at the global, domestic, and institutional levels. My research focuses on how these technologies are created by the U.S. as the pre-eminent military power despite growing normative arguments against their development at the international level. I draw on historical and discursive methods of analysis to argue that incompatible norm regimes within global governance structures and global security cultures account for this disjuncture. My research suggests that international politics—in a deeply constructivist sense—is embedded in the process of creating new military technologies like autonomous weapons via the logic of what I call the strategic imaginary.

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Part I

Chapter 1 Introduction: Emerging Military Technologies, Norms, and the Global Security Order

The rapid pace of technological progress and the impact of that progress on everyday life on a global scale overwhelms any sense of control. Ever accelerating innovations race past the capacity for individuals, states, or the international community to regulate their effects. A litany of previous technological advances (e.g., the internal combustion engine, nuclear weapons, or the internet) had unintended consequences that significantly impacted global life and politics. Advances in biotechnology, gene-editing, artificial intelligence, nanotech, and social media all have the potential to empower or imperil human flourishing.

The impression that innovation is beyond the control of the very people it affects is especially pronounced in the case of cutting-edge military technology. Today's warfare consists of drone strikes on the other side of the globe, cyber warfare that can paralyze a country's power grid, and precision weapons that can kill the passenger of a vehicle while leaving the driver unscathed.[1] These are just a few examples that highlight the astonishing nature of military technology. On the

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[1] See: John Kaag and Sarah Kreps, *Drone Warfare*, 1 edition (Polity, 2014); John Arquilla, "Twenty Years of Cyberwar," *Journal of Military Ethics* 12, no. 1 (April 1, 2013): 80–87; Eric Schmitt, "U.S. Used Missile With Long Blades to Kill Qaeda Leader in Syria," *New York Times*, June 24, 2020, sec. World, https://www.nytimes.com/2020/06/24/world/middleeast/syria-qaeda-r9x-hellfire-missile.html; Warren P. Strobel and Gordon Lubold, "Secret U.S. Missile Aims to Kill Only Terrorists, Not Nearby Civilians," *WSJ*, May 9, 2019, sec. US, https://www.wsj.com/articles/secret-u-s-missile-aims-to-kill-only-terrorists-not-nearby-civilians-11557403411.

horizon are even more exotic weapons under development: hypersonic missiles, high-powered lasers, and railguns. It is easy to come away from such prospects with the sense that these advances take on a life of their own. In this context, we are quickly moving toward the reality where the world's leading militaries fight with weapons that select their own targets and kill without human intervention. In other words, a future where international actors build autonomous weapons and use them to fight their wars. While this prospect lends itself to the science-fiction nightmares of the Terminator, even a measured understanding of the weapons under development gives one reason for pause. The possibility of thoroughly dehumanized warfare is not one to wish for, even if it does not resemble the apocalyptic Hollywood version. Autonomous weapon systems (AWS) would have serious ramifications for how states and non-state actors use force. It is this emerging technology that is the focus of this study.[2] At the current moment, the international community and advanced military powers are presented with a choice: whether to develop killer robots to fight in wars of the future or to temper these innovations through international agreements to rein in such weapons.

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[2] I default to the working definition of autonomous weapons as described by the main subject of this study: the U.S. Department of Defense. In 2012 AWS were defined as "A weapon system that, once activated, can select and engage targets without further intervention by a human operator. This includes human-supervised autonomous weapon systems that are designed to allow human operators to override operation of the weapon system, but can select and engage targets without further human input after activation." See: Office of the Secretary of Defense, "Directive 3000.09 Autonomy in Weapon Systems" (US Department of Defense, November 2012), pp. 13-14.
https://www.esd.whs.mil/portals/54/documents/dd/issuances/dodd/300009p.pdf.

A first step toward understanding how the globe is at this crossroads and how these decisions are being made involves contemplating the path traveled so far. Put simply, most actors—including military practitioners—are hesitant about the creation of autonomous weapons. Transnational activist networks working through the international community have effectively translated this hesitation into an international norm: that these weapons ought to remain under meaningful human control. Since the mid-1990s, activists across global civil society have been successful in their campaigns to shape a series of multilateral arms control agreements and regulate various types of conventional weapons. Bans on antipersonnel landmines, cluster munitions, the start of the Arms Trade Treaty, and the nascent Treaty on the Prohibition of Nuclear Weapons are all markers of this successful humanitarian arms control approach.[3] However, activists have been stymied in the case of autonomous weapons: while the majority of international actors have coalesced around the norm of meaningful human control, there is no consensus on how to enforce the norm. Despite their reticence about AWS, military powers have continued their rush to develop these weapons. The U.S. is a particular case in this regard as the vanguard advanced military power with multiple lines of innovation moving ahead on this technology despite the fact that many of the

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[3] I borrow the label of "humanitarian arms control" here from the esteemed Neil Cooper. See: Neil Cooper, "Humanitarian Arms Control and Processes of Securitization: Moving Weapons along the Security Continuum," Contemporary Security Policy 32, no. 1 (April 1, 2011): 134–58.

highest military leaders and officers express deep reservations about these weapons congruent with the global norm.

The puzzle is how the U.S. continues to develop lethal autonomous robots in the face of a previously successful humanitarian arms control approach that has coalesced around an international norm. Is this a case of norm emergence, purely an example of norm contestation, or are the differences between the sides of the debate so significant because the norms and roles of the different actors are fundamentally incompatible?

I contend that this lack of normative progress is the result of the divergence between the norm regime within global governance structures on the one hand and the differing norm regime within global security cultures on the other. This is a case of norm collision over the specific military technology of autonomous weapons. The mechanics behind this disjuncture are located in the discourse of global security politics—in a social constructivist sense—that is deeply ingrained in the creation of new military technologies like AWS and how the future is envisioned within this discourse. Norm collision is rooted in the particular logic that I label the strategic imaginary. I define this concept as a collectively held, institutionally crafted, distributed, and operationalized vision of the future threat environment that is ultimately expressed in military-bureaucratic processes, doctrine and imbricated in weapons technologies produced to address anticipated challenges. This conceptualization is crucial because it encapsulates how norms within military organizations are translated into new weapons because of a unique strategic conundrum: the imperative to innovate today to meet future anticipated threats.

This dissertation starts from the premise that technology is created by societies for specific reasons. In other words, I reject the idea of technological determinism. The artifacts that people create do not determine political outcomes. Instead, those technologies are a product of social factors. In the area of global security, these social factors are overwhelmingly political and reflect collective ideas about what technology ought to be developed. Following from this assumption, tracing how collective ideas concerning the appropriateness of technological development involves interrogating norms. Norms are collectively shared standards of appropriate behavior for actors with a given identity.[4] These are shared ideas that develop through political discourse. Often norms are conflated with their concrete outcomes (either treaties or material, technological artifacts.) Thus, it is vital to keep in mind three characteristics of norms in order to avoid conceptual stretching: these ideas are based on some moral dimension of what ought to be, they pertain to specifically identified actors, and they specify a prescribed action—regardless if that action is taken or not.[5] Whether advanced

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[4] See: Martha Finnemore and Kathryn Sikkink, "International Norm Dynamics and Political Change," International Organization 52, no. 4 (ed 1998) pp. 891.

[5] Michelle Jurkovich, "What Isn't a Norm? Redefining the Conceptual Boundaries of 'Norms' in the Human Rights Literature," *International Studies Review* 22, no. 3 (September 1, 2020) pp. 694-696.

military powers create killer robots or choose to restrain themselves from making them will be determined by norms.

The trajectory of collectively held ideas about the appropriateness of autonomous weapons for responsible members of the international community has followed two parallel lines of effort. On the one side, an emerging norm to retain *meaningful human control* over autonomous weapons has emerged. On the other track, norms internal to the global security culture—with the U.S. military as the global leader in high-tech weaponry and the vanguard propagator of shared ideas about warfare—developed into a different notion about autonomous weapons. Here, an *innovation imperative* norm that insisted militaries ought to develop technologies in order to gain or retain military advantage pushed in the opposite direction. The overall result is a dynamic where two sets of key actors are engaged in two parallel lines of discussion about the same emerging technology, and when two sets of norms are produced by these twin discourses, the norms collide.

It is helpful to conceptualize this emerging norm as a translation or application of an overarching norm to a new weapons technology. In other words, a broad norm exists across the international community that undergirds the logic of arms control. That norm is that *law-abiding, civilized states ought to limit the creation, number, and use of weapons in warfare in the interests of protecting non-combatants from the horrors of war and managing conflict stability in the global security system.* When faced with the advent of a new weapons technology, the international community then engages in discourse over how to apply the foundational norm to the new type of weapon. Over the last eight years, diplomats have debated the prospects of autonomous weapons, presenting their views in a concerted effort at negotiated arms control over an emerging military technology. In these international forums, several stakeholders gave input: states, transnational activists, military experts, and the community of roboticists and artificial intelligence (AI) researchers. The majority of these stakeholders seek to curtail, if not completely ban, the development of killer robots. In addition to these actors, nearly every mention in the U.S. popular press about AWS expresses some level of alarm and opprobrium at the prospect of such weapons. Indeed, prominent elements within the U.S. military profess commitments against the rise of autonomous killing. In addition, while global public opinion diverges over drone strikes, there is broad opposition to creating weapons that kill independent of human intervention. [6] The norm developed via recent international negotiations is

[6] For polls conducted on drone strikes see: Richard Wike, Bruce Stokes, and Jacob Poushter, "Global Opposition to U.S. Surveillance and Drones, but Limited Harm to America's Image," Global Attitudes & Trends (Washington, D.C.: Pew Research Center, July 14, 2014), https://www.pewresearch.org/global/2014/07/14/global-opposition-to-u-s-surveillance-and-drones-but-limited-harm-to-americas-image/; and Alec Tyson, "Public Continues to Back U.S. Drone Attacks," U.S. Politics & Policy (Washington, D.C.: Pew Research Center, May 28, 2015), https://www.people-press.org/2015/05/28/public-continues-to-back-u-s-drone-attacks/. In the case of polling on autonomous weapons see: "The Campaign To Stop Killer Robots," November 13, 2019, https://www.stopkillerrobots.org/2019/11/new-european-poll-shows-73-favour-banning-killer-robots/; Chris Deeney, "Six in Ten (61%) Respondents Across 26 Countries Oppose the Use of Lethal Autonomous Weapons Systems" (New York, N.Y.: Ipsos, January 22, 2019), https://www.ipsos.com/en-us/news-polls/human-rights-watch-six-in-ten-oppose-autonomous-weapons; and Charli Carpenter, "How Do Americans Feel About Fully Autonomous Weapons?," Duck of Minerva (blog), June 19, 2013, https://www.duckofminerva.com/wp-content/uploads/2013/06/UMass-Survey_Public-Opinion-on-Autonomous-Weapons.pdf. Apart from the straightforward opinion surveys, there is a growing number of studies that utilize experimental methods with surveys to gauge public opinion today about speculative weapons innovations tomorrow. These surveys are focused on U.S. public opinion but provide a greater amount of nuance regarding the controversy. For example, see: Jacquelyn Schneider and Julia

proscriptive (negative or prohibitive of behavior) rather than prescriptive (establishing the correct method of behavior.) I characterize this emerging norm in these terms: *it is ethically impermissible for law-abiding, civilized states to develop or use autonomous weapons that exceed meaningful human control over lethal outcomes*. As a shorthand, I label this as the *meaningful human control* norm.

As suggested, there is an opposing norm that is somewhat submerged in its origins outside of the arena of intergovernmental organizations or on the floor of multilateral negotiations. While International Relations scholars tend to locate and examine global norms in settings like multilateral negotiations, I extend the concept of norms to a global security culture across the defense organizations of states. The norm is shared by advanced military powers and is an ethos that permeates global security cultures. I characterize this second norm in these terms: *national security professionals are ethically duty-bound by their role and identity to develop every technological advantage against possible future adversaries in order to maintain the sovereignty of their state and secure core national interests*. As the leading state across the contemporary global security culture, the United States occupies a key position in setting the parameters of this norm as it relates to AWS in particular. As it is applied to this technology, we can express the norm as: *security professionals*

Macdonald, "U.S. Public Support for Drone Strikes: When Do Americans Prefer Unmanned over Manned Platforms?" (Washington, D.C.: Center for a New American Security, September 20, 2016), https://www.cnas.org/publications/reports/u-s-public-support-for-drone-strikes/; James Igoe Walsh, "Political Accountability and Autonomous Weapons," Research & Politics 2, no. 4 (October 1, 2015); Michael C Horowitz, "Public Opinion and the Politics of the Killer Robots Debate," Research & Politics 3, no. 1 (January 1, 2016).

are duty-bound by their role to develop autonomous weapons in order to secure a wider technological advantage over potential adversaries in the future to secure national interests. As a shorthand, I label this as the *innovation imperative* norm.

These two norms normally coexist and balance against each other over the course of arms control negotiations and the implementation of international agreements. Not every new technology is leveraged in the interests of future national security, and not every potential military innovation raises objections even across humanitarian arms control activists. Security practitioners are certainly able to fulfill their roles and pursue military advantage through innovations without imperiling overarching arms control norms. Restrictions and taboos over the proliferation, invention and military use of certain technologies do not regularly interfere with strategic planning. In the case of autonomous weapons, the vehement opposition to their introduction and the political forces compelling U.S. defense practitioners in the other direction are unique. Ultimately, this is a case of norm collision because of the distinct strategic imaginary held by the dominant advanced military.

Plan of the Dissertation

This dissertation is organized into two parts. The first half is organized around the broader academic, theoretical, and methodological concerns. The second half applies the developed analysis to the empirical politics around AWS.

The Existing Literature

In chapter two, I interrogate the literature regarding the relationship between technology and International Relations (IR), consider their limits, and identify gaps within their analyses. I also extrapolate rival theories based on this literature that pose alternate explanations to the research question but that ultimately fall short in adequately accounting for the advent of autonomous weapons despite widespread objections.

Much of the academic study of the relationship between technology and global politics mirrors the causal logic in this contemporary debate over this specific class of weapons. In social science terms, this causal logic identifies technology as an independent or intervening variable and global politics as the dependent variable. However, treating technology as a primary driver of IR creates many conceptual problems. First, this casual chain fundamentally rests on an assumption of technological determinism. Suppose technology is the ultimate arbiter of political outcomes. In that case, political science would discount political agency both on the individual level and at the aggregate level of collective action and deny any role for shared ideas on the social level. In short, technology is destiny for political outcomes under this rubric. This relates to the second major conceptual challenge for a technological determinist logic: identifying the root source of technology, especially security technology. Put simply, where does this variable come from if it is entirely exogenous? Under a determinist model, technology evolves under its own devices independent of human intervention apart from a handful of technologists who are lucky enough to discover and harness the power of science.

While the interaction between technology and IR affects political economy and environmental politics, the impact of military technologies on the international order, in particular, is a central concern within the existing literature.[7] This tradition is driven by the advent of nuclear weapons and their impact on global security politics writ large in parallel to IR's maturation as a discipline within the Anglo-American sphere. Certainly, much of the research in the academic study of politics between states that references technology is found in the subfield of strategic studies and on the topic of military innovation. Here there are instances where researchers fall back on some form of technological determinism, but others

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[7] To preview the preoccupation with technology primarily in terms of security detailed in my literature review, let me highlight some of the most prominent scholars who reflect this assertion. Predating the establishment of International Relations, Mackinder and Mahan viewed either continental control of Eurasia or command of the seas as a key factor in determining global security. The grand strategic pronouncements of these two proto-IR theorists were only made possible by the advent of railroads and seam powered navies. See: H. J. Mackinder, "The Geographical Pivot of History," *The Geographical Journal* 23, no. 4 (1904): 421–37; and A. T. Mahan, *The Influence of Sea Power upon History, 1660-1783.*, Twelfth edition. (Boston: Little, Brown, 1918). Within IR, several prominent scholars focus on the impact of technology on the precipitation of wars, how it is conducted, and how the advent of nuclear weapons has reduced the utility of force in interstate conflict. See: Bernard Brodie, *War and Politics* (New York: Macmillan, 1973); John H. Herz, "Technology, Ethics, and International Relations," *Social Research* 43, no. 1 (1976): 98–113; Robert Jervis, "Cooperation Under the Security Dilemma," *World Politics* 30, no. 2 (1978): 167–214; Michael Mandelbaum, *The Nuclear Revolution: International Politics Before and after Hiroshima* (New York: Cambridge University Press, 1981); Barry Buzan, *An Introduction to Strategic Studies: Military Technology and International Relations* (New York: Palgrave Macmillan, 1987); Robert Jervis, *The Meaning of Nuclear Revolution: Statecraft and the Prospect of Armageddon*, Cornell Studies in Security Affairs (Ithaca: Cornell University Press, 1989); Barry Buzan and Richard Little, "The Idea of 'International System': Theory Meets History," *International Political Science Review* 15, no. 3 (1994): 231–56; Stephen Van Evera, "Offense, Defense, and the Causes of War," *International Security* 22, no. 4 (1998): 5–43; Daniel Deudney, *Bounding Power: Republican Security Theory from the Polis to the Global Village* (Princeton: Princeton University Press, 2007).

successfully break out of this logic's stranglehold. Instead, political, institutional, and cultural variables are considered key to new weapons innovations. However, these accounts narrowly focus on internal institutional cultures, inter-service rivalries, or the minutia of bureaucratic politics without taking into consideration the broader global context that often gives impetus to weapons development and innovation.[8]

My research contributes to the literature in two ways. First, I expand the application of a norm framework beyond the traditional environs of diplomatic conventions and plenaries into the halls of defense ministries, think tank panels, and service academy classrooms. This expansion contributes to a more robust constructivist understanding of how global politics is baked into technology. The second contribution is to the military innovation literature, pushing it beyond only micro or meso explanations of how new weapons are fostered.[9] In this project, I am concerned with a wider, global military culture where leading advanced military powers set norms that others follow, given the logic of international security politics

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[8] The well-developed literatures concerned with military technology and innovation within military institutions are especially prevalent within professional military education institutions (the universities run specifically for the education of the U.S. military officers.) It is within these institutions where we can see how ideas about innovation, technology, and IR are directly translated into the desired capabilities of emergent weapons.

[9] The incorporation of culture as a factor is a relatively recent development within the traditional military innovation literature. But this inclusion of culture is typically bounded to discreet institutions or countries. For example, using cultural factors to explain why the U.S. Air Force is more open to innovation than the U.S. Army because of its institutional culture or detailing a specific American way of war that is culturally more favorable to substituting technology for mass. Examples of these approaches included: Theo Farrell, *Weapons without a Cause: The Politics of Weapons Acquisition in the United States*, 1st ed. 1997 edition (New York: Palgrave Macmillan, 1997); and Peter R. Mansoor and Williamson Murray, eds., *The Culture of Military Organizations* (New York: Cambridge University Press, 2019).

in both competitive and cooperative terms. Framed in this way, the ubiquity of an innovation imperative across global military cultures is illuminated by the logic of appropriate behavior. Thus, advanced weapons are partially produced by security politics as practiced within global security cultures.

Theoretical Framework and Methods

I conclude Part one with a focus on theory and methods. In chapter three, I detail the theoretical scaffolding used to examine the phenomenon whereby the U.S. develops a controversial weapon technology. As previewed by the literature review in chapter two, the premise of my explanation rests on the contention that weapons technology is both constrained and driven by shared ideas about what ought to be done. Thus, I situate my approach given the evolution of norm theories in IR. A key part to understanding the mechanics of how military norms drive technological development is structured by a particular conundrum that military strategists face. In order to functionally perform its socially constructed role in assuring the security of the state, any given military institution must prepare against potential adversaries in an unknown future operating environment. This circumstance fosters the logic of appropriate behavior that demands planning for future contingencies. Those contingencies are further influenced by historical context and the overarching ontological security perspective of a particular state.[10]

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[10] In the formulation of how weapon technologies emerge, context matters. The concept of ontological security suggests that states engage in security seeking behavior not just in terms of rational or instrumental means but also with a sense of appropriateness to their own self-identity. While not central to my formulation, this concept is consonant with my explanation. In other

In light of this general problem for all militaries, one strategic option is to invest in developing weapons technology for these envisioned future challenges. As noted previously, there is no way for any person or organization to predict the future definitively. However, militaries allocate limited resources today in order to ensure security in the future by necessity. This strategic logic born of the function of the armed forces in society dictates that as an institution, the military must reasonably project into the future in order to fulfill its role as a guarantor of security. In other words, when the logic of state security is faced with a future that is fraught with contingency, it is forced to make educated guesses about future threats. If we accept the counterargument to the technological determinist model—that technology is created for some social purpose rather than as an independent variable or *deus ex machina* that dictates political outcomes—then a constructivist explanation must account for how emerging technologies are envisioned as part of the process of invention. Of course, this dynamic is tempered by global arms control norms, as noted above. A cursory study of nuclear weapons and the more exotic types of doomsday projects that have fallen by the wayside reinforces the fact that despite an unknowable future, not every technology is leveraged to the hilt for

words, any given advanced industrialized state does not suddenly decide one day to start producing killer robots. For instance, Switzerland may possess all of the means to produce their own lethal robotic weapons. However, it is highly unlikely that they will do so given their strategic history and that this type of weapon would be incongruent with the Swiss definition of security, what is to be secured, and self-identity as a neutral power. For more see: Brent J. Steele, *Ontological Security in International Relations: Self-Identity and the IR State*, 1 edition (New York: Routledge, 2008); and Jennifer Mitzen, “Ontological Security in World Politics: State Identity and the Security Dilemma,” *European Journal of International Relations*, July 24, 2016.

maximum military advantage.[11] Thus, the question becomes, when does the anticipated strategic edge from a potential weapon become so great as to override the norms that would curtail their development? Because of this conundrum unique to the norms of global military culture, I develop the concept of the strategic imaginary in chapter three in order to analyze the politics surrounding drones and AWS technology.

Chapter three also details the methods employed to interrogate the research question. The choice of methods used is determined by the nature of the political phenomenon under study, the type of data, and the orientation of political contention. In this case, I am observing the formation of shared ideas (norms) in two different settings. These operations take place between political actors in the form of communications in written and oral form. Thus, the data collected is text. While in social science parlance, this data is "unstructured" and does not lend itself well to statistical techniques, it is organized by the participants towards some end and constitutes a discourse. In terms of orientation, discussions both on the global stage and internal to the American defense establishment are preoccupied with the future. Because the analysis of norms in IR often locates their origins in multilateral negotiations, using discourse analysis methods was a straightforward exercise. What complicates my research is that this is a set of political contentions in the

[11] Here a short list of unrealized exotic weapons would include the "Dead Hand" system of guaranteed nuclear apocalypse contemplated by the Soviet Union that was satirized in *Dr. Strangelove,* projects like the nuclear-powered cruise missile investigated by both sides in the Cold War, or even the restraint placed on space-based weapons.

present about future technology under current development. This means that political actors must convince other actors about events set to take place in the future. The rhetoric involved in this type of contention over arms control must tell a convincing story about the future and consequentially has a certain narrative. With this in mind, I incorporate an overlay of narrative analysis on top of considerations of discourse.

Turning to norms outside of the typical parameters of IR analysis, I make two additional methodological moves that I detail in chapter three. Because I am applying a constructivist framework of norms to military culture, I must establish the context and background of the sources of those norms. This entails a technique of interrogating the internal historiography of this culture. In other words, an analysis of how the U.S. military tells its own history to itself, drawing upon primary sources. The second methodological step is to engage with a narrative-inflected discourse analysis that pays particular attention to the strategic imaginary of the contemporary U.S. defense community. Given the forecasting constraints placed on these actors to fulfill the innovation imperative norm, how they envision the desired future that maintains their national interest and what that future looks like in their collective estimation feeds directly into the new weapons they pursue.

Chapters four, five, and six constitute the empirical core of the dissertation in part two of the dissertation. These empirical chapters bring us back to the original puzzle that animates this study: the disjuncture between international norms regarding the prospect of AWS and the logic within the U.S. military that drives AWS development

The Global Politics of Autonomous Weapons

In order to fully develop this portion of the argument, chapter four considers the debate over AWS within the United Nations Convention on Certain Conventional Weapons (hereafter the CCW) from the inception of this debate in 2012 until 2019. In this instance, the CCW is the primary forum where rival ideas about AWS are contests and where norms emerge. While UAV weapons are a separate precursor to autonomous weapons, the political controversy around drone strikes gave impetus to concerns over killer robots. Thus, I first provide some technical context to what types of weapons are under development and the rival approaches to defining autonomy in weapon systems. Next, I consider the specific format of the convention format in international law and how the framework the CCW undertook in gathering international experts on this emerging technology structured the discourse. This analysis further delineates the types of actors involved in the diplomatic process, including NGO activist networks, academic researchers, industrial defense experts, diplomatic state representatives, UN personnel, and military experts. The resulting texts of this discourse over AWS norms are evident within formal statements from multiple countries, proclamations from activist organizations, the testimony of various experts, reports from UN organs, studies produced by think tanks for the CCW process, and pronouncements of the UN

Secretary-General. These texts give us a corpus or a representative database of the discourse. From them, I elucidate the structure, themes, matters of debate that change over time, blocs of international actors that coalesce around specific positions, and the differentiation between these blocs in terms of narrative arcs.

The analysis of this particular discourse gives us a rich illustration of the divide between the evolving norms on AWS on the one hand and the position taken within leading military powers despite these norms on the other. My analysis of the CCW discourse concludes that it did establish a shared norm in the form of an obligation for states to maintain meaningful human control over these weapons, but the breakdown in consensus over how to implement or enforce that norm is the crux of the political contention over AWS. Indeed, even within the U.S. national security community, there are several points of resistance against AWS that parallel arguments made within the global activist community. Nevertheless, as the leading technological and military power, the development of AWS by the United States national security enterprise continues apace. At the same time, the American diplomatic effort at the CCW has cumulated in resistance to any pre-emptive ban or restrictions of autonomous weapons technologies. This dynamic is the subject of the next two substantive chapters regarding the U.S. military.

The Internal History of U.S. Weapons Innovation

As alluded to previously, the expectations embedded in the U.S. strategic imaginary are based on a reading of historical experience propagated across military institutions. I take up this historical narrative in chapter five from the end of World War II until the beginning of the Third Offset Strategy. Given the theoretical framework outlined above and especially the fact that the data under analysis is textual, I employ a discourse analysis method. Key to understanding the U.S. push to develop AWS is the context of previous offset strategies focused on acquiring and employing new military technologies fielded against projected adversaries. The narrative arc of previous offset strategies suggests that technological overmatch is not only feasible but is the optimal strategy to pursue in any given instance. The historical narrative that reifies the offset notion informs the initiatives of military practitioners today.

In this chapter, I also trace the institutional changes within military R&D in the American case.[12] Historical change and continuity in the institutional arrangements geared towards military innovation exhibit patterns of vacillation between centralization and decentralization, innovation promoted internally within the DoD versus relying on external R&D via private contractors and associated civilian defense intellectuals. Evident in this analysis is how global politics shaped these institutional arrangements, historical discourses, and the conditions of possibility for emerging weapons technology. Notably, the two previous offset strategies engaged in this history are regarded as overwhelmingly successful, drove

[12] Here I take up the methodology suggested by Schmidt. See: Viven A. Schmidt, "Taking Ideas and Discourse Seriously: Explaining Change through Discursive Institutionalism as the Fourth 'New Institutionalism,'" *European Political Science Review* 2, no. 1 (2010): 1–25; and Vivien A. Schmidt, "Discursive Institutionalism: The Explanatory Power of Ideas and Discourse," *Annual Review of Political Science* 11, no. 1 (2008): 303–26.

technological advances, and contributed to institutional growth within the national security enterprise. Thus, the historical antecedents to the emergence of autonomous weapons have set the expectations of military technologists in terms of feasibility and the successful deployment of said technologies to overcome strategic threats. Indeed, such technological feats are often put forward as "game-changing," "transformative," "revolutionary," or "disruptive." In the context of this study, specific attention is paid to tracing the development of unmanned aerial systems within this historical discourse. The themes developed within this internal history, taking place over the course of America's ascension to superpower status, are enduring. Certainly, there are echoes of them in the discussions surrounding why America is compelled to pursue the capability of weapons that kill on their own.

The Innovation Imperative Applied to Autonomous Weapons

The shared narrative and intellectual pedigree that undergird the efforts of the American military to innovate its way out of strategic conundrums are extended in chapter six with a more detailed analysis of the contemporary strategic imaginary driving the U.S. development of autonomous weapons. In this chapter, I analyze the contemporary discourse within the U.S. national security community of military officers, civilian defense leadership, think tank advocates, and specialized defense press outlets tracing the evolution of this rationale. Methodologically, I switch gears back to discourse analysis of these texts with an emphasis on the narrative structure and occurrence of thematic tropes present in the contemporary national security discussion.[13] This empirical evidence displays the continuation of techno-military themes gleaned from the shared historical narrative outlined in the previous chapter and the evolution of the discourse about AWS.

The structure of this discourse shifted over three phases where a narrative became ever more focused on a primary global rival (China) while the subject of autonomous weapons was swamped by a shift in emphasis to artificial intelligence (AI), a more diffuse technology. As early innovations towards autonomous weapons were justified in amorphous terms during the tail end of the War on Terror, a distinct policy shift during the second Obama term pushed autonomy to the top of the priority list for R&D. This effort—termed the Third Offset strategy—was promoted by the consolidation of the narrative within the military around the possible advances by competitor nations. The theme of a "resurgence of geopolitics" or a "return to great power competition" between peer adversaries is prominent. While the effort was driven by policymakers from above, diffusion in both the threats identified and the lines of R&D to pursue was complicated by institutional proliferation and reoccurring questions about the ethics of autonomous weapons that thwarted partnerships with high-tech firms.

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[13] This approach is taken up under the rubrics suggested by: Kevin C. Dunn and Iver B. Neumann, *Undertaking Discourse Analysis for Social Research* (Ann Arbor: University of Michigan Press, 2016). For an excellent and influential example of this methodological approach within the IR literature see: Lene Hansen, *Security As Practice: Discourse Analysis and the Bosnian War*, Book, Whole (London; New York: Routledge, 2006).

As this narrative carries forward, the arms race dynamic was amplified by two factors. First, the new Trump administration focused on China as the primary strategic adversary projected into the future. Indeed, the Chinese government has proved to be a willing dance partner as the Peoples Liberation Army and the CCP have promoted their own efforts towards technological advance explicitly in the interests of China's national security. [14] Upon its ascension, the Trump administration also shifted the strategic focus within the DoD towards a Cold War-style arms race over investments in R&D and achievements in AI, a precursor technology to autonomous weapons. This broader technological focus allowed for the more mechanistic impulses of the new administration to cast a future struggle against China in economic, social, and ideological terms over and above the military-technical competition.

The emerging technology of AWS is a particularly evocative illustration of the strategic imaginary in the contemporary moment. Given the history of discursively shaped institutions outlined in chapter five, the functional role that institutions play within the U.S. military and how they serve the narrative of the strategic imaginary are encapsulated within this emerging military artifact. Thus,

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[14] James Acton et al., "Hearing on China's Advanced Weapons," § U.S.-China Economic and Security Review Commission (2017), https://www.uscc.gov/hearings/hearing-chinas-advanced-weapons-video; Elsa Kania, "China's Artificial Intelligence Revolution," The Diplomat, July 27, 2017, https://thediplomat.com/2017/07/chinas-artificial-intelligence-revolution/; Elsa Kania, "Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power" (Washington DC: Center for a New American Security, November 2017), https://www.cnas.org/publications/reports/battlefield-singularity-artificial-intelligence-military-revolution-and-chinas-future-military-power.

the organs of the DoD charged with strategic forecasting continuously update the rationale behind the need for AWS, citing projected future threat scenarios with China slated as the primary antagonist, all while shaping the desired capabilities of weapon systems currently in development. Following this web of institutional narratives, I trace how foundational ideas of international politics are transmitted across the constellation of institutions that make up the national security enterprise. I also trace how the norms of appropriate roles and behavior for national security practitioners are integrated into the strategic imaginary and how those ideas ultimately translate into requirements for the weapons of tomorrow.

Tools for Thinking About the Future of Warfare

In the concluding chapter, I consider the ramifications that my findings have on the study of technology in International Relations, their impact on the global killer robot debate, and how such an approach contributes to the study of future global security politics. By building a theoretical framework based on the contention that technology is a product of society—in this case, global security politics—this dissertation offers three contributions. In the first instance, this study supplements the growing academic literature within the field of International Relations that currently seeks to re-engage with the question about the relationship between technology and global politics. Recent research efforts have incorporated insights from the field of Science and Technology Studies to explicate this relationship. However, the burgeoning literature on technology in IR has predominantly emphasized the impact of technology on global politics and how material things make the "international" of international relations.[15] The direction of this move is a reaction to an emphasis on ideational sources in IR that have spread across the discipline since the 1980s, creating an eclectic landscape within the subfield.[16] While my broader research agenda is sympathetic to these new theoretical innovations, I seek to immunize these approaches against a slide into technological determinism by providing a counterpoint to an overemphasis on technology as a driver of politics. This position is taken not with the aim to deny the impact of technology out of hand but, rather, to support co-productive or coevolutionary

[15] The most emblematic of this new initiative in IR are the two volumes of *Making Things International* and the special issue of *Millennium* from the London School of Economics. See: Mark Salter, ed., *Making Things International 1* (Minneapolis: University of Minnesota Press, 2015); Mark Salter, ed., *Making Things International 2* (Minneapolis: University of Minnesota Press, 2016); and Nick Srnicek, Maria Fotou, and Edmund Arghand, "Introduction: Materialism and World Politics," *Millennium* 41, no. 3 (June 1, 2013): 397–397. For recent works that reflect the interest in the effect of specifically drone technology on global security politics see: Caroline Holmqvist, "Undoing War: War Ontologies and the Materiality of Drone Warfare," *Millennium* 41, no. 3 (May 1, 2013): 535–52; William Walters, "Drone Strikes, Dingpolitik and beyond: Furthering the Debate on Materiality and Security," *Security Dialogue* 45, no. 2 (2014): 101–18; Elke Schwarz, *Death Machines: The Ethics of Violent Technologies*, 1 edition (Manchester: Manchester University Press, 2019) and Jeffrey S. Lantis, *Arms and Influence: U.S. Technology Innovation and the Evolution of International Security Norms* (California: Stanford Security Studies, an imprint of Stanford University Press, 2016).

[16] While this is a sweeping statement may be suspect given the eclectic nature of the field with pockets that hew to primarily empirical research programs, while others gravitate towards traditional realist, institutionalist, or Marxist positions that emphasize structures, it is fair to say that the linguistic turn has made its mark on the field. Camps within IR that emphasize postmodernist, feminist, postcolonial, and constructivist research programs are well established. For a general overview of the current state of the field see two special issues: Tim Dunne, Lene Hansen, and Colin Wight, "The End of International Relations Theory?," European Journal of International Relations 19, no. 3 (2013): 405–25; and Christine Sylvester, "Whither the International at the End of IR1," Millennium - Journal of International Studies 35, no. 3 (2007): 551–73.

interventions through a buttressing of the social constructivist half of these interventions.

The second goal is to broaden the scope of the norm dynamics approach to arms control and, in so doing, incorporate the interactions of actors at various levels of analysis. This gives us a more comprehensive account of the phenomena of emerging military technologies and their political sources, arming norm theories with greater breadth and explanatory power. Norms are a central concept in the constructivist approach to IR, and several theories have been proffered about how they emerge, are sustained, vary in different cultural contexts, and are contested over. Here I add to the picture by illustrating how norms develop within global security cultures—akin to Hass' epistemic communities—and then how those norms interact with norms in the fora traditionally associated with international norms on the international stage.[17] Further, the framework suggested in this dissertation leads the norm perspective away from the confirmation bias that plagues earlier waves of constructivism to only analyze cases where progressive, liberal ideas are codified in international law and regarded as success stories. By expanding the remit of norms under consideration, I can more fully account for how the ideational half of the co-productive equation operates empirically.

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[17] See: Peter M. Haas, "Introduction: Epistemic Communities and International Policy Coordination," *International Organization* 46, no. 1 (1992): 1–35; and Peter M. Haas, "Introduction: Epistemic Communities and International Policy Coordination," *International Organization* 46, no. 1 (1992): 1–35.

Lastly, this dissertation seeks to equip both academic and policy communities with a framework that mitigates the uncertainty surrounding these emerging technologies and what they portend for the future of warfare. Discussion and analysis of AWS thus far have a nebulous character with one particular theme prevalent throughout the academic, activist, and military practitioner literatures: this technology—if allowed to go forward—will somehow fundamentally change warfare in ways that are antithetical to humanity. However, the intensity and character of this anticipated change is ill-defined and subject to hyperbole. The notion that autonomy and AI, more generally, portends a new revolution in warfare is widespread and illuminates the political salience of the debate over autonomous weapons. Certainly, the amorphous suggestion that AWS will "change everything" constitutes the foundational assumption of these debates.[18] What this "change everything" means in concrete terms is not clear even within the considerable amount of analysis performed so far on the subject. Armed with a more robust understanding of the political sources of technological innovations in the military sphere, I can better map the terrain of the debates over these emerging technologies. Reflecting on the findings from our analysis of the counter-discourses, I identify several disjunctures within the contemporary debates over lethal robotic weapons. In looking toward the future, the framework developed here allows us to clarify

[18] Richard Falk, "Why Drones Are More Dangerous than Nuclear Weapons," in *Drones and Targeted Killing: Legal, Moral, and Geopolitical Issues*, ed. Marjorie Cohn (Northampton MA: Olive Branch Press, 2014), 29–49.

how the arch of arms control regimes of past weapons foreshadows the future of this disruptive technology and points to a way forward in the impasse between colliding norms that pose vastly different visions of our collective future.

The Lingua Franca of Contesting the Future

From the start of my research into the weapons technologies of tomorrow, it was clear that there were distinct challenges to a study of this subject. The primary conundrum was how to label and refer to these technologies as doing so would signal bias towards one political perspective or another. For instance, the choice of referring to a weapon such as the MQ-9 as either a "drone" or the more belabored term "an Unmanned Aerial Vehicle" conveys specific political undertones. Drone is the more widespread moniker used among the public and activist networks. This term is sometimes favored not only for the sake of simplicity but also as shorthand for a new weapons technology that has specific chilling effects when evoked, especially when used in policy discussions concerning drone strikes. The objection to this language from a military perspective is that it is pejorative and wildly imprecise as a descriptor. Before their widespread use as a viable weapons platform, the term drone primarily referred to unmanned vehicles used for target practice. Thus, referencing drones or drone operators was derogatory to both the technology and the service members who fly them.

Additionally, the term drone is a catch-all term that, when applied to the defense realm, conflates equipment across the different service branches that vary in size from a large commercial aircraft (e.g., the Air Force's Global Hawk) to small, handheld UAVs (e.g., the U.S. Army's Raven.) Unmanned systems also vary widely in their operating environments (on the land, sea, or in the air) and mission functions. The objection to the inaccuracy of the drone nomenclature was so pronounced by the late 2000s that the U.S. Air Force decided to add to the cacophony and insisted on a switch from the label UAV to the descriptive title of Remotely Piloted Vehicles or RPAs in a concerted effort to emphasize that these weapons were controlled by personnel. Of course, objections that essentially argue for a more technical, apolitical naming convention for these weapons are undercut by the U.S. military's practice of designating their weapons by ghoulish names: the MQ-1 RPA, utilized in counterterrorism air strikes, goes by the title of Predator and the updated version of this aircraft (the MQ-9) goes by the name Reaper piloted the Hunters of the 432nd USAF Wing.

When considering the successor technology to UAVs, the controversy over naming conventions is more pronounced. Norm entrepreneurs within transnational civil society provocatively refer to these emerging weapons as "killer robots." Among national security practitioners, the term "autonomous weapon system" or AWS is the preferred nomenclature. Across the diplomatic landscape, the even more precise terminology of "lethal autonomous weapon systems" or (somewhat confusingly) LAWS is favored. Indeed, the clash within international forums and in the popular press between anti-killer robot activists and defenders of the new LAWS technology across military and state actors has been contentious over the last decade, reflected in the tensions over how to refer to these weapons.

For the researcher of these controversies, the conundrum of language and naming conventions is inescapable. Choosing from the outset the terms drone or killer robots cuts to the heart of the political controversy central to these technologies and readily serves to reach a wider audience not immersed in military terms. As evidenced by the lengthy list of acronyms in the front matter, the issue area of new military technology is rife with inscrutable jargon, and out of sympathy for the reader, one is inclined to use the most accessible language available. At times this necessitates the use of provocative languages like drone strikes or killer robots as these terms are technically descriptive of these weapons and the envisioned function of emerging technologies. However, this choice risks being construed as polemic. While many of my esteemed compatriots choose the role of activist academic in dealing with these controversies, I am motivated to explicate these controversies and their sources. I see my role as an analyst of the efforts by both transnational norm entrepreneurs and anitpreneures to influence the development and governance of these technologies.[19] From this perspective, simply defaulting to the use of military nomenclature--no matter how awkward and jargon-laden—would prove more technically precise and may inoculate the analysis to charges of a bias against the national security enterprise. On this count, I harbor a deep level of skepticism towards the sterile, disembodied prose encouraged by the

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[19] Alan Bloomfield, "Norm Anitpreneures and Theorizing Resistance to Normative Change," *Review of International Studies* 42, no. 2 (April 2016): 310–33; and Alan Bloomfield and Shirley V. Scott, eds., *Norm Anitpreneures and the Politics of Resistance to Global Normative Change*, 1 edition (New York, Routledge, 2016).

verbiage of the military establishment. Given my background in Critical Security Studies and particularly Carol Cohen's influential observations on the fundamentally political nature of technostrategic discourse couched in technical language, I am less inclined to limit my lexical choices to a grab bag of acronyms.[20] The anodyne euphemisms favored by U.S. military parlance inadequately convey the significance of handing over lethal decisions to an algorithm.

The competing terminology referring to these weapon systems is used widely for the purposes of analysis in this dissertation. I base this approach on the perspective that transnational activists, national security practitioners, representatives of states, journalists, and defense companies are all actors in this political discourse and are, therefore, all subjects of study. In this sense, the terms they choose to use, the motives behind those narrative choices, and the role of each actor that their language signals are as much the subject of study here as the weapons technologies themselves. Hence, the interchangeable use of terms such as UAV, drone, and RPA. I do make the distinction between drones and autonomous weapon systems (AWS). Of course, these emerging technologies also go by different names depending on the political outlook of various actors: AWS, killer robots, or lethal autonomous robots. Again, instead of favoring one set of terminology over the others, I use these naming conventions interchangeably to reflect the political contention. This approach is based not on a vague wish to split

[20] Carol Cohn, "Sex and Death in the Rational World of Defense Intellectuals," *Signs* 12, no. 4 (1987): 687–718.

the difference without taking a moral stand. Instead, using the full range of terminology to reference these weapons is an acknowledgment of the messy political discourse as it is. Faith is placed in the reader's sophisticated eye to appreciate the nuance when tracking the various ways of referring to these technologies.

One silver lining of this conundrum over nomenclature is that it puts to rest any qualms that these emerging technologies are bereft of politics. Indeed, the fact that referring to killer robots rather than autonomous weapon systems in a forum like the CCW signals a strong normative position indicates that what is typically a dry technical discussion over weapons capabilities is instead permeated by politics at the national and global levels. One notable aspect of AWS, in this sense, is the novelty of the debate. In stark terms, this is a contest over the future and the weapons used in that future rather than over how to deal with current arms and how they are used. Killer robots are not a fully mature technology. At the same time, these technologies are not science fiction either. Leading military powers are actively developing such weapons, and we can reasonably expect their deployment in a matter of years. Thus, the controversy and debate that surround these weapons technologies is clearly a contest over the shape of the future.

Contrasting Visions of the Global Future

Up to this point, I have laid out the components of my argument in relatively abstract terms. It is worth a foray into two specific examples how the two different visions of future warfare collided and gave the world two separate norms concerning autonomous weapons.

The first emblematic example of the disjuncture is the very public demonstration of the Perdix program in late 2016. The specific developer of the Perdix was the Strategic Capabilities Office (SCO), a unit within the Pentagon created under the auspices of the Third Offset strategy. Conceptually, this office was charged with developing strategic surprise to deter potential adversaries by retooling existing weapons technologies for new capabilities across the service branches. This specific prototype test consisted of over 100 small UAVs released at high altitude from a pair of jet fighters. The individual Perdix drones more closely resembled commercially available hobbyist drones than the more archetypal MQ-1 Predator UAV typically associated with the technology.

In an unusually public display of modern weapons testing, Will Roper (the Director of the SCO) invited the venerated CBS news broadcast *60 Minutes* to film the initial test.[21] Individually, each Perdix is not particularly impressive: each small, 3D printed drone carries a small computer, some limited communications hardware, a few sensors, and can fly for only a limited time. What was novel about this particular system is the fact that the “swarm” of 100 drones coordinated with each other to perform simulated missions (like reconnaissance, patrolling, and

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[21] With the election of the Trump administration, Dr. Roper has since moved from the Strategic Capabilities Office to the Air Force as Assistant Secretary of for Acquisition, Technology and Logistics. See: “DR. WILL ROPER > U.S. Air Force > Biography Display,” accessed July 30, 2018, *https://www.af.mil/About-Us/Biographies/Display/Article/1467795/dr-will-roper/*

tracking “terrorist” targets) independent of any direct human control.[22] Once released from two speeding fighter jets at high altitude, they gathered together and performed a set of actions of their own accord an as shared, almost hive mind across the swarm of UAVs.

The *60 Minutes* report—titled “The Coming Swarm”—also highlighted programs by the U.S. Marines for ground and UAV systems to coordinate using machine learning and facial recognition software in identifying targeted individuals. The veteran CBS News national security correspondent, David Martin, also highlights efforts by the Navy to field autonomous surface ships to hunt together for submarines on extended patrol in the open ocean or to protect manned naval vessels in autonomously coordinated swarming tactics. Given the high degree of access to military R&D program, this piece is filled with fascination for the prowess of high-tech weaponry development. The report ends with the following exchange between Director Roper and Mr. Martin:

> *Martin: “I’ve heard people say that autonomy is the biggest thing in military technology since nuclear weapons. Really?”*
>
> *Roper: “I think I might agree with that, David. I mean, if what we mean is biggest thing is something that’s going to change everything, I think autonomy is going to change everything.”*[23]

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[22] Strategic Capabilities Office, *Perdix Fact Sheet*, January 6, 2017, *https://www.defense.gov/Portals/1/Documents/pubs/Perdix%20Fact%20Sheet.pdf*

[23] David Martin, “The Coming Swarm,” *60 Minutes* (CBS, January 8, 2017), *https://www.cbsnews.com/video/the-coming-swarm-2/***.**

The global activist network that opposed the creation of AWS agreed with Dr. Roper that autonomy held the potential to change everything in the field of defense technology. A year after the Perdix test and in the run-up to the fourth year of UN meetings at the CCW, the Future of Life Institute produced the YouTube video pejoratively titled "Slaughterbots." [24] Prominent computer science researchers in academia and the private sector formed this organization in 2014 to warn against the hazards of the unfettered development of AI.[25] The video depicts a dystopian scenario in the near future where a swarm of autonomous UAVs, reminiscent of the Perdix drones. The first scene of this highly stylized video is a fictitious product launch modeled on a Silicon Valley product launch. A tech CEO in a blazer and t-shirt demonstrates a hand-held drone, extolling the amazing facial recognition software, ability to coordinate independently with other UAVs, and finally he sets the drone to hunting mode where it promptly recognizes an mannequin on stage, flies into it, and delivers a small shaped explosion to the skull as the tech titan declares how his product gives the U.S. military the capability to hunt our enemies. The video cuts to an imagined news report, where similar drones

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[24] See: Stewart Sugg, *Slaughterbots* (Space Digital, 2017), https://www.youtube.com/watch?v=9CO6M2HsoIA; 'As Much Death as You Want': UC Berkeley's Stuart Russell on 'Slaughterbots,'" *Bulletin of the Atomic Scientists* (blog), December 5, 2017, *https://thebulletin.org/2017/12/as-much-death-as-you-want-uc-berkeleys-stuart-russell-on-slaughterbots/*; Matt McFarland, "'Slaughterbots' Film Shows Potential Horrors of Killer Drones," CNNMoney, November 14, 2017, *https://money.cnn.com/2017/11/14/technology/autonomous-weapons-ban-ai/index.html*.

[25] The Future of Life Institute was launched by several technology luminaries such as Max Tegmark, Meia Chita-Tegmark, Victoria Krakovna, Anthony Aguirre, Jaan Tallinn. Nick Bostrom, Sandra Faber, Elon Musk, Stuur Russell, Francesca Rossi, and Stephen Hawking. See: *https://futureoflife.org/team/* and *https://futureoflife.org/lethal-autonomous-weapons-pledge/*

were unleashed on the U.S. Capitol building, killing senators “only on one side of the aisle” in an attack with little hope of attribution. In the final scene, a mother speaks with her son who is attending college overseas via video chat. She is perplexed by his interest in political activism on campus and his reticence to introduce her to his friends (the assumption being the younger generation is more wary of facial recognition.) Soon after, two swarthy men unleashed a swarm of killer drones upon the university out the back of a rented van. The swarm coordinates quickly to breach the protective barriers, zoom into a classroom and swoop down on specific, politically active students, assassinating each with a shaped explosive charge to the head, [26] Other prominent global activist organizations coordinated by the Campaign to Stop Killer Robots promoted the video within the media and highlighted its dark vision of the future amidst what they identified as faltering diplomatic momentum at the CCW.[27]

This grim vision of a plausible future—with AWS technology used to erode the everyday politics experienced in Western democracy—is distinctly incongruous with those lauded visions of the U.S. military, leveraging the innovation of Western society to defend that very same democratic system from future external threats. It is this juxtaposition between visions of the future, directly translated into different norm regimes that gives us today’s political contention over autonomous weapons.

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[26] Stewart Sugg, Slaughterbots (Space Digital and the Future of Life Institute, 2017), *https://www.youtube.com/watch?v=9CO6M2HsoIA*;

[27] Mary Wareham, “2017: A Lost Year for Diplomacy,” *Stop Killer Robots* (blog), December 22, 2017, https://www.stopkillerrobots.org/news/lostyear/.

Chapter 2 Emergent Military Technologies: A Literature Review of Technology and Transformation

Over the last three decades, proponents of humanitarian arms control hit upon a successful formula to regulate the development of weapon technologies.[28] During the Cold War, bilateral and multilateral arms control agreements driven by state actors focused mainly on weapons of mass destruction: limiting the numbers, spread, and production of nuclear, chemical, and biological weapons. In more recent history, non-state actors like NGOs and transnational civil society activists—assumed the role of norm entrepreneurs within arms control regimes. By the late 1990s, the target for transnational activist networks shifted to limiting conventional weapons, and they rapidly amassed several successes.[29] For instance, campaigns launched within the Convention on Certain Conventional Weapons (established in 1981) have successfully placed limits if not outright bans have come into force in the areas of munitions with non-detectable fragments, incendiary weapons, and the use of blinding lasers in combat. Beyond these specific, UN hosted talks, transnational activists have also scored remarkable achievements in the area of antipersonnel landmines via the Ottawa Process in 1997 and with a similar

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[28] Neil Cooper, "Humanitarian Arms Control and Processes of Securitization: Moving Weapons along the Security Continuum," *Contemporary Security Policy* 32, no. 1 (April 1, 2011): 134–58.

[29] Keith Krause suggest that this shift marks the delineation between *sovereign* sources of arms control towards arms control as a form of international *governance,* much more integrated within the domestic politics across states in the international community. See also Keith Krause, "Leashing the Dogs of War: Arms Control from Sovereignty to Governmentality*," *Contemporary Security Policy* 32, no. 1 (April 1, 2011): 20–39.

successful effort to ban cluster munitions in 2010. These grass-root successes are echoed in ongoing efforts in arms control in the form of the ongoing Arms Trade Treaty initiated in the late 1990s that came into force in 2014. This model of international governance driven by transnational activists appeared to be the wave of the future. Humanitarian arms control was on a roll. Indeed, focusing on the most destructive weapons on the planet, campaigns within global civil society later pushed for the broad Nuclear Weapon Ban Treaty negotiated in 2017 within the UN system. The agreement entered into force in early 2021 but with no ratification from any declared nuclear weapon state, the impact of this treaty is debatable.

In this context, leading activists within global civil society turned their attention in 2012 to the growing possibility that the world's leading militaries were actively developing weapons that could select targets on their own accord and then kill without human intervention. Pejoratively labeled "killer robots," computer scientists within academia raised the alarm about these emerging military technologies since 2004. The call for action in late 2011 when the president of the International Committee of the Red Cross (ICRC) and a collection of transnational NGOs contemplated a campaign towards an international norm against these weapons, following the Ottawa playbook once again.[30] Forming the Campaign to

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[30] Gary E. Marchant et al., "International Governance of Autonomous Military Robots" 12 (2011): 272–315; The International Committee for Robot Arms Control (ICRAC) was founded primarily by computer scientist in 2009 with a focus on the problem of autonomous weapons. See: https://www.icrac.net/statements/; and the explicit approach of the Campaign to Stop Killer Robots has followed the pattern of previous efforts in humanitarian arms control that map closely to the norm life cycle outlined by Keck and Sikkink, *Activists beyond Borders*. For an excellent account of how AWS evolved into an issue for norm entrepreneurs, see Charli Carpenter, *"Lost"*

Stop Killer Robots, some of the most well-known human rights organizations and activist leaders took up the cause. This time, the global public's awareness about the issue was even more significant, raised via the popular print and broadcast press. The Campaign was especially active via ubiquitous social media platforms. Prompted by a report submitted to the Human Rights Council, the international community's attention turned quickly within the UN General Assembly in early 2013. This particular document marks the shift from the global debate over remotely piloted U.S. drone strikes towards concern over autonomous weapons. Christof Heyns, the UN Special Rapporteur on Extrajudicial Killings and author of the report, forcefully suggested an international moratorium on developing autonomous weapons, so international law had time to catch up with the quickly growing reality.[31] With concern raised in the UN General Assembly's First Committee—a body focused on disarmament questions—the international community took the extraordinary step of carving out a separate track of the Convention on Conventional Weapons to take up the issue of autonomous weapons. Transnational advocacy actors, deeply involved from the start, were integral to the two-step process that emerged. In chapter four I engage with these negotiations more directly.

Causes: Agenda Vetting in Global Issue Networks and the Shaping of Human Security (Ithaca, New York: Cornell Univ. Press, 2014) 1-5, 88-121.

[31] Christof Heyns, "Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, Twenty-Third Session Agenda Item 3" (United Nations General Assembly, Human Rights Council, April 9, 2013), *https://www.ohchr.org/Documents/HRBodies/HRCouncil/RegularSession/Session23/A-HRC-23-47_en.pdf*.

By 2019, early optimistic aspirations on curtailing AWS and the string of successful arms control instruments ground to a halt in the face of intractable disagreement. While the CCW talks took place as planned, by 2019 no consensus was reached on a binding instrument to ban "killer robots" and there was even difficulty in defining what constituted an autonomous weapon. Even the new Secretary-General of the UN, Anónio Guterres, has vocalized the frustration and the increasing alarm at the prospects of algorithmic killing.[32] The Campaign to Stop Killer Robots openly questioned if the CCW was up to the task.[33] On top of this, the overall environment for disarmament and arms control also witnessed a series of stark setbacks. The U.S. withdrew from several arms control agreements during the Trump presidency representing the nadir of this dynamic. Parallel to the shortfalls in multilateral diplomacy, efforts to develop AWS gained speed with the

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[32] Indeed, Secretary-General Guterres has gone so far as to state "[A] new arms race, the cyberarms race, is already underway. The danger is that the next war will be triggered by a massive cyberattack. Tomorrow, killer robots could take the place of soldiers. We must ban all autonomous weapons. Machines that have the power and discretion to kill without human intervention are politically unacceptable and morally despicable. How is it imaginable that technological "progress" could lead to regression in human rights? We should instead be ensuring that artificial intelligence is used to guarantee that everyone can live in dignity, peace and prosperity. Dear friends, the world is breaking apart. The status quo is untenable." António Guterres, "Secretary-General's Remarks at the Paris Peace Forum" (Paris Peace Forum, Paris, November 11, 2019), *https://www.un.org/sg/en/content/sg/statement/2019-11-11/secretary-generals-remarks-the-paris-peace-forum-please-scroll-down-for-english-text*

[33] Mary Wareham, "Statement by the Campaign to Stop Killer Robots to the Convention on Conventional Weapons," Human Rights Watch, November 14, 2019, *https://www.hrw.org/news/2019/11/14/statement-campaign-stop-killer-robots-convention-conventional-weapons*. An excellent overview of how negotiations over regulating AWS has reached a lull is Neil C. Renic, "Death of Efforts to Regulate Autonomous Weapons Has Been Greatly Exaggerated," *Bulletin of the Atomic Scientists* (blog), December 18, 2019, *https://thebulletin.org/2019/12/death-of-efforts-to-regulate-autonomous-weapons-has-been-greatly-exaggerated/*.

U.S. in the lead. Indeed, the new dynamic of a great powers arms race to develop artificial intelligence for strategic advantage quickly emerged between the U.S., Russia, and China (the subject of chapter six.) In the face of these setbacks, the emerging norms concerning AWS appear to be deteriorating, leading to further instability in international security. How is it that these norms seem to fail precisely at the moment when they are most necessary?

Several explanations are available as to why the U.S. military continues to develop disruptive military technology, imperiling emerging international norms. These analyses run the gamut from suggestions that technological development runs on inertia beyond the control of global or localized governance to the recent literature on norm contestation.[34] Between these extremes are explanations that rely on rational instrumentalism, economic interests of vested elites, and competition within or across defense organizations. Each set of alternative explanations are rooted in the broader literature on technology in international relations, military innovation studies, and the role of norms in global politics. Thus, to understand the relative strengths and weaknesses of rival explanations and set the stage for my conceptual framework, a greater understanding of the foundational literature is needed. Again, my thesis suggests that emerging international norms

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[34] For these examples see: George Raudzens, "War-Winning Weapons: The Measurement of Technological Determinism in Military History," The Journal of Military History; Lexington, Va. 54, no. 4 (October 1, 1990): 403–433; Grégoire Chamayou, *A Theory of the Drone* (New York: The New Press, 2015); and Elvira Rosert, "Norm Emergence as Agenda Diffusion: Failure and Success in the Regulation of Cluster Munitions," European Journal of International Relations 25, no. 4 (April 2019): 1–29.

collide with an altogether different set of norms within the defense sphere. These shared ideas, principles, and notions of appropriate behavior for those that occupy the role of defense practitioners are established by the preeminent military power, the United States, and its particular envisioning of war in the future. To understand this dynamic, we must explore two related aspects: 1) how new military innovations are initiated, and 2) how norm dynamics work within arms control. These two strands of thought inform the literature surveyed here.

The plan of this chapter is as follows. First, I detail rival explanations to the puzzle of AWS development. Then, I will consider some attributes identified across texts to organize a typology of the literature. Digging into the scholarship, I briefly consider the traditional orientation of IR to technological innovation in general and the recent renaissance of technology in the study of global politics. Narrowing to this project's scope, the literature on military technologies is surveyed, including the debates over revolutions in military affairs, military innovation studies, and recent works on drone and autonomous weapon technologies. After turning to norms in arms control of emerging weapons technology, I conclude by examining the rival theories' weaknesses and situating my contribution across the literature.

Alternative Explanations: Why are Efforts to Curb Killer Robots Flagging?

Indeed, there are alternative explanations as to why the United States would develop AWS even in the face of international and domestic opprobrium. Based on the existing literature, one such rival theory would default to the adage of technological determinism: the inevitable progress of technology naturally dictates that weapons will advance and mature independent of political considerations. Such a hypothesis would generally comport with the causal logic that technology is an exogenous variable that develops beyond the confines of human interference or at least apolitically. From this perspective, neither state nor non-state actors can suppress the rise of autonomous weapons. It is merely the imperative for technology to dictate the pace of change and the contours of warfare, irrespective of any organized effort to rein in violence. The best that can be hoped for is to harness technological advances to render the use of force more precise and ethical.[35]

A second alternate explanation of why the U.S. is currently developing a weapons technology counter to the emerging norm against AWS is realist instrumentalism: states merely produce military technologies in light of their interests. Technology does not determine history.[36] Instead, great powers will naturally seek an advantage by creating ever more exquisite weapon systems to meet their self-identified national security goals. Thus, those actors with the means

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[35] Examples of works that defer to technological determinism: Amitai Etzioni and Oren Etzioni, "Pros and Cons of Autonomous Weapons Systems," *Military Review* 97, no. 3 (June 2017): 72–81; Robert Work and Eric Schmidt, "Interim Report" (Washington: National Security Commission on Artificial Intelligence, November 2019), *https://www.nscai.gov/reports*; Ronald C. Arkin, "The Case for Ethical Autonomy in Unmanned Systems," *Journal of Military Ethics* 9, no. 4 (December 1, 2010): 332–41; Ronald Arkin, *Governing Lethal Behavior in Autonomous Robots*, (Boca Raton: Chapman & Hall CRC, 2009); and John W. Brock II, "Why the United States Must Adopt Lethal Autonomous Weapon Systems" (Fort Leavenworth: School of Advanced Military Studies United States Army Command and General Staff College, 2017).

[36] I borrow this conceptualization from Columba Peoples, Justifying Ballistic Missile Defense: Technology, Security and Culture (Cambridge: Cambridge Univ. Press, 2009) pp. 77. The perspective that technological innovation is purely an instrumental outcome of national security policy has an apolitical and common-sense appeal that is prevalent among military practitioners.

at hand will create advanced weapons regardless of international norms.[37] This conceptualization is a variation on the Thucydidean theme that the strong do what they can and the weak suffer what they must. In other words, every great power will seek to maximize their military advantage in an anarchic competition with other armed states by fostering technological advances. Other political concerns about the harmful effects of such technologies (e.g., norms about IHL) are secondary to the primary goal of security via military strength.

A third avenue of explanation for our research puzzle locates the causal mechanism within a given state's political-economic defense interests or culture of militarism. This hypothesis would simply lay the explanation at the feet of militarism in two forms. The first type is the military-industrial complex, where key national security actors' economic interest spurs on new, ever more complex, and profitable weapon technologies to be adopted by the state. Here the drivers for military innovation—even in the face of normative resistance—are distilled down to sources beyond politics: avarice, capitalist greed. The more Marxist variant of this thesis would suggest that arms manufacturers have nearly captured the state in this arena. From this structure of social relations flows the pressure to transfer ever more tax dollars into the bank accounts of capitalists. Any lip service paid to broader societal values like national collective defense is merely window dressing

[37] For a specific application of this logic to the norms of arms control see: David W. Kearn Jr., *Great Power Security Cooperation: Arms Control and the Challenge of Technological Change* (Lexington Books, 2014).

that prays on the public's false consciousness.[38] Another variant on the military-industrial complex hypothesis shifts the focus towards the social impact of militarism expressed in feminist and social justice critiques: toxic masculine impulses towards violence (boys who love their toys) and a militaristic culture beget ever more repugnant technologies of death. From this perspective, a gendered militaristic culture fuels the U.S. military's quest for novel and ever more exotic weapons that sanitize organized violence.[39]

The fourth group of rival theories revolve around international norm dynamics and specifically those concerning arms control. Here the focus is on why norms fail to coalesce, emerge, or prevail vis-a-vis weapons technologies. This set of alternate explanations either locates a defect in the norming process or due to the weapons technology's intrinsic nature in question. Various norm explanations might suggest that this is a case of derailment via agenda-setting, successful "anitpreneures" who work against certain norms, that the norm is not yet "ripe" for

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[38] David Kinsella, "The Global Arms Trade and the Diffusion of Millitarism," in *Militarism and International Relations*, ed. Anna Stavrianakis and Jan Selby, 1st Edition (Routledge, 2014), 104–16; James McCartney and Molly Sinclair McCartney, *America's War Machine: Vested Interests, Endless Conflicts* (New York: Thomas Dunne Books, 2015); Thomas C. Lassman, "Putting the Military Back into the History of the Military-Industrial Complex: The Management of Technological Innovation in the U.S. Army, 1945–1960," *Isis* 106, no. 1 (2015): 94–120.

[39] Juliana Santos de Carvalho, "A Male Future: An Analysis on the Gendered Discourses Regarding Lethal Autonomous Weapons," *Amsterdam Law Forum* 10, no. 2 (2018): 41–61; E. Brunner, *Foreign Security Policy, Gender, and US Military Identity*, 2013 edition (Palgrave Macmillan, 2013); Emily Jones, Sara Kendall, and Yoriko Otomo, "Gender, War, and Technology: Peace and Armed Conflict in the Twenty-First Century," *Australian Feminist Law Journal* 44, no. 1 (January 2, 2018): 1–8; Ethan Blue, Michael Levine, and Dean Nieusma, *Engineering and War: Militarism, Ethics, Institutions, Alternatives*, 1 edition (Williston: Morgan & Claypool Publishers, 2013); and Marek Thee, "Militarism and Militarization in Contemporary International Relations," *Bulletin of Peace Proposals* 8, no. 4 (October 1, 1977): 296–309.

adoption, that powerful actors distort the moral core of the norm, or that autonomous weapons are simply a prosaic evolution of military technology that is not particularly evil in and of itself.[40] This set of explanations would suggest that killer robots are simply impervious to normative regulation. In summary, explanations from within the norm dynamics literature point to a breakdown in the norm process that prevents the norm's successful instantiation.

Again, each of these alternate theories flows from different perspectives on how technology and international relations interact. Here I present a deeper contextualization of these origins to identify the gaps in the literature that this dissertation serves to bridge.

Three Analytic Dimensions Across the Technology-IR Literature

While it would be disingenuous to suggest that the application of scientific discoveries has never factored into accounts of International Relations, technology was not originally conceptualized as a core concern within the field. Over time the role that technology plays in global politics—or vice versa—has varied widely within the literature. Specifically, some issue areas identify technology as playing

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[40] Charli Carpenter, "Vetting the Advocacy Agenda: Network Centrality and the Paradox of Weapons Norms," *International Organization* 65, no. 1 (2011): 69–102; Elvira Rosert, "Norm Emergence as Agenda Diffusion: Failure and Success in the Regulation of Cluster Munitions," *European Journal of International Relations* 25, no. 4 (April 2019): 1–29; Alan Bloomfield and Shirley V. Scott, eds., *Norm Antipreneurs and the Politics of Resistance to Global Normative Change* (New York: Routledge, 2016); Jeffrey S. Lantis, *Arms and Influence: U.S. Technology Innovation and the Evolution of International Security Norms* (Stanford, CA: Stanford Security Studies, an imprint of Stanford Univ. Press, 2016); Ingvild Bode and Hendrik Huelss, "Autonomous Weapons Systems and Changing Norms in International Relations," *Review of International Studies* 44, no. 03 (July 2018): 393–413; and Hendrik Huelss, "Norms Are What Machines Make of Them: Autonomous Weapons Systems and the Normative Implications of Human-Machine Interactions," *International Political Sociology* 0 (September 2019): 1–18.

a central role, while in others, it is a tangential concern. Interest in technology within global politics has also waxed and waned over the decades with its' resurgence in recent IR scholarship. This *ad hoc* and sporadic treatment of the subject presents difficulties in assessing how technology figures into IR as a discipline. In the interest of organizing these disparate approaches, I consider the literature across three different dimensions:

- Scope: The broad view of technology writ large to specific technological artifacts.
- Level of Analysis: If the causal mechanism or political phenomena occurs at the micro, meso, or macro level.
- Causal Direction: The introduction of a technology is considered an externally introduced independent variable versus the view that technology is a dependent variable, affected by political or economic factors

The first dimension or axis of differentiation across the literature is the breadth of technology under consideration in any given text. Studies are categorized along a sliding scale from those that encompass *technology* in its most comprehensive conceptual scope that includes all forms of applied science down to the very specific where a singular technological artifact is the study's subject. In between, there are categories and subdivisions of technology under consideration that I can identify and, thus, map out where any particular text fits into the broader literature. For example, several scholars consider the impact of multiple technologies on international relations across various categories (e.g., transportation, communication, media, military, and human health.) At the other end of the spectrum are specific studies that focus on a particular weapons system.

For example, one research project investigated the political and bureaucratic machinations that resulted in the cancelation of a particular British nuclear strike aircraft program in the 1960s.[41] This categorization of texts helps us understand how technology is conceptualized differently as a broader phenomenon in some cases or described by function in more narrowly tailored studies.[42] In the context of this dissertation, these technology categories are conceptualized as: general, military, nuclear weapons, conventional weapons, drone, and AWS, following from broadest to most specific. Other specific types of technology like ICT (information and communication technology), transportation, and environmental technologies, are beyond this dissertation's scope.

In a similar vein, texts in the literature are identified by the level of analysis designated by each study's subject and variables. This second dimension revolves around the question if the text is concerned with the interaction of technology and IR at the international system level, internally within the state, at an intermediate level within a specific institution, or the individual level of psychology or subjectivity. For our purposes, I collapse studies at the bureaucratic level (à la Allison) into the meso level of the state.[43] This distinction is well established in the

[41] John Law, *Aircraft Stories: Decentering the Object in Technoscience*, Science and Cultural Theory (Durham, NC: Duke Univ. Press, 2002).

[42] This mapping also bolsters our understanding of how especially military technologies are regarded as transformational and thus lead to periodization within the literature (e.g., the Nuclear Revolution or Network-centric Warfare.)

[43] Graham T. Allison, “Conceptual Models and the Cuban Missile Crisis,” The American Political Science Review 63, no. 3 (1969): 689–718, *https://doi.org/10.2307/1954423*; Graham Allison and

field of International Relations with the preponderant influence of Kenneth Waltz.[44] He determined the level of analysis of any given thesis about global politics by the source of change or where one located the independent variable. His insistence that the best, most parsimonious explanations for an international phenomenon like war, peace, or stability reside at the macro level of the international system bolstered the general impulse of IR scholars to distinguish their academic field as distinct from other political science subfields. The other levels of analysis identified by Waltz—characterizing different states by governmental type at the meso level and behavioralist accounts of human nature at the micro-level—were deemed reductive. Despite Waltz's pronouncements, the field of IR has proliferated a wide variety of analysis at the macro, meso, and micro levels that happily hold up under peer scrutiny and enrich our understanding of international phenomena.Ω [45] The literature on the relationship between technology and global politics is no different in this regard as there are various approaches at different levels of analysis.

Philip Zelikow, Essence of Decision: Explaining the Cuban Missile Crisis, 2nd edition (New York: Pearson, 1999).

[44] Kenneth Waltz, Man, the State, and War: A Theoretical Analysis, Topical Studies in International Relations., (New York: Columbia Univ. Press, 1959) and Kenneth Waltz, Theory of International Politics, Addison-Wesley Series in Political Science, (Reading, Mass.: Addison-Wesley Pub. Co., 1979).

[45] For the unsettled debate over levels of analysis see: J. David Singer, "The Level-of-Analysis Problem in International Relations," World Politics 14, no. 1 (October 1961): 77–92; Barry Buzan, "The Levels of Analysis Problem in International Relations Reconsidered," in International Relations Theory Today, ed. Ken Booth and Steve Smith (Penn State Press, 1995), 198–216. Here I defer to Owen Temby's suggestion that that one's ontological commitments do not necessarily hamstring the methods of analysis employed. See his "What Are Levels of Analysis and What Do They Contribute to International Relations Theory?" Cambridge Review of International Affairs 28, no. 4 (October 2, 2015): 721–42.

The third and final characteristic to identify across literatures is how technology is treated in terms of causal inference. This categorization entails noting if technology is treated as an independent or dependent variable and grouping arguments by the causal direction: whether technology has repercussions for international politics or if global politics drive technological innovation. The extremes of this continuum include technological determinism on one end versus the view that technology is purely socially constructed via discourse on the other. Given that individual texts consider technology to varying degrees (as a primary variable or an intervening variable along with others) and many texts make claims at a lower level of analysis with more narrow scope, this dimension is not diachronic. In other words, the vast majority of academics do not declare themselves dedicated to pure technological determinism or committed to amorphous postmodern explanations of ideas untethered from material factors. However, most analyses skew towards one tendency or the other. Some arguments even eschew positivist, causal arguments and fall within a middle category that suggests that technology and politics writ large co-evolve or coproduce each other. For my purposes, I map if any given text skews towards technological determinism, towards pure constructivism where ideas determine outcomes or falls within the category that splits the difference, labeling the relationship co-productive.

Technology and International Relations: The Wider Context

One can trace a tradition within International Relations that considers technology's relation to global politics. However, work in this register has not been a central concern to studying politics between and beyond nations. The question of how to adequately typify the relationship between technology and global politics has surfaced sporadically over the decades of IR scholarship. Here I will start by looking at works within this tradition that deal with technology in a general sense and at the macro-level of analysis.[46] In Anglo-American academia, the Cold War and its attendant scientific competition focused many academics on how to leverage technological expertise to benefit one side or the other in the bipolar divide. Early examples of this broad consideration of technology and its ramifications for relations between states include Ogburn and Haskins, who both surveyed scientific discoveries that impacted world affairs.z[47]

One notable scholar within this period is Eugene Skolnikoff, whose sustained engagement with the larger question of how technology writ large impacts relations between states outlasted many of his contemporary's fascination with the topic. Across his work, Skolnikoff considered the full panoply of technologies from transportation to mass communications, information technology,

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[46] One of the better overviews of technology in IR is Krishna-Hensel's contribution that decidedly skews towards a technological determinist model. See: Sai Felicia Krishna-Hensel, "Technology and International Relations," in Oxford Research Encyclopedia of International Studies (Oxford, UK: Oxford Univ. Press, March 1, 2010).

[47] William F Ogburn et al., Technology and International Relations, Norman Wait Harris Memorial Foundation (Chicago: Univ. of Chicago Press, 1949) and Caryl Parker Haskins, *The Scientific Revolution and World Politics* (New York, N.Y.: Harper & Row, 1964). Other early work in this vein includes Warner R. Schilling, "Science, Technology, and Foreign Policy," *Journal of International Affairs* 13, no. 1 (1959): 7–18; Jacques Ellul and Robert K. Merton, *The Technological Society*, trans. John Wilkinson (New York, NY: Vintage Books, 1964); William T. R. Fox, "Science, Technology and International Politics," *International Studies Quarterly* 12, no. 1 (1968): 1–15; and Franklin A. Long, "Some Revolutionary International Consequences of Science and Technology," *International Organization* 25, no. 4 (1971): 784–89.

industrialized technologies, and the national security implication of advanced weapons. Working at the macro level, his research program sought to achieve two aims. First, to distinguish between evolutionary and sudden revolutionary technological changes and how those modes drive international politics in different ways. Second, Skolnikoff emphasized through his work the challenges of global governance of technology given that advances in the scientific world habitually outpace the capacity for states (let alone international organizations) to react.[48] Subsequent scholarship on international politics, science, and technology broadly defined followed a similar logic at the macro level, emphasizing how technology determined global outcomes in various issue areas.[49]

Apart from this handful of IR scholars, technology in a general sense was not the primary focus for many within the discipline. As seen below, the one arena of international life—security studies—was preoccupied with technology with a narrow focus on nuclear weapons. However, significant power shifts on the world

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[48] Eugene B. Skolnikoff, "Science and Technology: The Implications for International Institutions," International Organization 25, no. 4 (1971): 759–75; Eugene B. Skolnikoff, The Elusive Transformation (Princeton, N.J: Princeton Univ. Press, 1993); Eugene B. Skolnikoff, The International Imperatives of Technology: Technological Development and the International Political System (Berkeley: Univ of California Intl, 1972). Also of note during Skolnikoff's era is one of the earliest calls for ethical considerations of technological impacts on international affairs from Kenneth A. Dahlberg, "The Technological Ethic and the Spirit of International Relations," International Studies Quarterly 17, no. 1 (1973): 55–88.

[49] Examples of this continued logic include: Franklin A. Long, "Some Revolutionary International Consequences of Science and Technology," International Organization 25, no. 4 (1971): 784–89; James P. Lester, "Technology, Politics, and World Order: Predicting Technology-Related International Outcomes," World Affairs 140, no. 2 (1977): 127–51; John V. Granger, Technology and International Relations (San Francisco: W. H. Freeman, 1979); Jonathan I. Charney, "Technology and International Negotiations," The American Journal of International Law 76, no. 1 (1982): 78–118; and Otto Hieronymi, Technology and International Relations (London: Palgrave Macmillan UK, 1987).

stage in the 1970s and 80s did focus the analysis on technology as a variable when other issue areas gained prominence.[50] For example, within IR theory, John Ruggie echoed Skolinkoff's observations about the difficulty for global governance of science and technology given the global shift in power relations along economic rather than military terms. Ruggie suggested that, despite the optimistic assumption of neofunctionalist like Ernst Haas, the governance of technology within the context of IGOs was fraught with political considerations.[51] Later, Ruggie concluded that technological innovations erode the geographic barriers that precipitate and solidify an international system of separate, sovereign nation-states. In other words, technology renders territory less critical to maintaining or increasing state power.[52] International relations theorists of the Realist and Neorealist varieties also took up this claim. Buzan and Little identified technology as a key intervening variable affecting states' interaction capacity to compete or

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[50] For an interesting foray into these shifts see: Lawrence S. Finkelstein, "International Organizations and Change: The Past as Prologue," International Studies Quarterly 18, no. 4 (1974): 485–520; and Ernst B. Haas, "Is There a Hole in the Whole? Knowledge, Technology, Interdependence, and the Construction of International Regimes," International Organization 29, no. 3 (ed 1975): 827–76.

[51] John Gerard Ruggie, "International Responses to Technology: Concepts and Trends," International Organization 29, no. 3 (1975): 557–83 and Ernst B. Haas, Beyond the Nation-State: Functionalism and International Organization, Revised ed. edition (Stanford, CA: Stanford Univ. Press, 1964). The neofuncional idea was that cooperation on apolitical, technical arenas of international life would foster wider forms of governance slowly evolving into more formal global government. See Ernst B. Haas, Beyond the Nation-State: Functionalism and International Organization, (Stanford, CA: Stanford Univ. Press, 1964) and also David Mitrany, "The Functional Approach to World Organization," International Affairs (Royal Institute of International Affairs) 24, no. 3 (1948): 350–363.

[52] John Gerard Ruggie, "Territoriality and Beyond: Problematizing Modernity in International Relations," Historical International Relations 4 (2015): 97–134.

cooperate in the anarchic international system. From this perspective, advances in military, communications, and transportation technologies overcome traditional geopolitical determinants of power distribution. Still, they do not go so far as to defang the underlying condition of anarchy.[53] In a similar vein, Deudney highlighted the role technology plays in overcoming geography in global politics while eschewing the Neorealist commitment to anarchy as an organizing principle. Instead, he emphasized that rising levels of interdependence over greater distances increases the density of transnational politics to the point where the principles of republicanism overtake fractious commitments to absolute sovereignty.[54]

Parallel to this stance, the literature on globalization generally considers the technological change in information communications technologies (ICT) and transportation as an antecedent to political transformation. Here the globalization scholars emphasized the realm of political economy rather than security.[55] With

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[53] This logic is even more central to Neorealist accounts of the nuclear revolution when our lens narrows to military technology below. Barry Buzan and Richard Little, "The Idea of 'International System': Theory Meets History," International Political Science Review 15, no. 3 (1994): 231–256.

[54] Daniel Deudney, Bounding Power: Republican Security Theory from the Polis to the Global Village (Princeton: Princeton Univ. Press, 2007).

[55] For the foundational discussions of globalization see Anthony Giddens, *The Consequences of Modernity*, 1 edition (Stanford, Calif: Stanford Univ. Press, 1991); Douglas Kellner, "Theorizing Globalization," *Sociological Theory* 20, no. 3 (2002): 285–305; Andrew Hurrell , *On Global Order : Power, Values, and the Constitution of International Society* (Oxford; New York: Oxford Univ. Press, 2007). Of note with in the discipline of IR on the topic of globalization are: Keohane, Robert O., ed., *Internationalization and Domestic Politics* (Cambridge England ; New York, NY, USA: Cambridge Univ. Press, 1996); and Robert Gilpin, *The Challenge of Global Capitalism: The World Economy In The 21St Century* (Princeton, NJ: Princeton Univ. Press, 2002). This conversation developed into a debate over the eclipse of the state due to globalizing factors. Again, the primary focus here was not on technology per se but it was treated as an intervening variable that accelerated the process of diffusion. See Peter Evans, "The Eclipse of the State: Reflections on Stateness in an Era of Globalization," *World Politics* 50, no. Journal Article (1997):

the collapse of the Bretton Woods international economic-political order, the world experienced a new wave of economic globalization and interdependence that IR scholars sought to explain. These new assessments depended on a shift in viewing power through a more diffused lens of economic and social influence than the traditional, narrow the scope of brute military strength. In this instance, Weiss suggests that ICTs like the internet and global mass media were the decisive factors in reordering international politics in a globalized era.[56] The debate over varieties of capitalism—enunciated by Hall and Sockice—also highlighted the role of technology in differentiated development and capabilities embedded within this wave of globalization.[57] Again, the causal mechanism identified is an introduction of new technology that shaped international political outcomes, a soft version of technological determinism. This is not to say that this literature was monolithic in equating technology with destiny. For example, one recent and influential contribution is Taylor's work that identifies the geopolitical divers of innovation

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62–87; and Linda Weiss, "Globalization and the Myth of the Powerless State," *New Left Review* I, no. 225 (1997).

[56] Charles Weiss, "How Do Science and Technology Affect International Affairs?" Minerva 53, no. 4 (2015): 411–30; Charles Weiss, "Science, Technology and International Relations," Technology in Society 27, no. 3 (August 1, 2005): 295–313. See also Young Ja Bae, "Information Technology and the Empowerment of New Actors in International Relations," Journal of International and Area Studies 10, no. 2 (2003): 79–92.

[57] Peter A. Hall and David Soskice, *Varieties Of Capitalism: The Institutional Foundations of Comparative Advantage*, 1 edition (Oxford England ; New York: Oxford Univ. Press, U.S.A., 2001); Peter Mcmahon, "Technology and Globalization: An Overview," *Prometheus* 19, no. 3 (September 1, 2001): 211–22; Derek Hrynyshyn, "Technology and Globalization," *Studies in Political Economy* 67, no. 1 (January 1, 2002): 83–106; and Jeffrey A. Hart, "Information Technologies and the Global Political Economy," Oxford Research Encyclopedia of International Studies, March 1, 2010.

within different countries. His research concludes that higher levels of innovation are achieved by states forced into external economic and military completion, turning the causal logic around.[58] For present purposes, it is essential to note that the literatures explicitly concerned with technology and IR fit with the analytic dimensions along these lines: the majority of works regarded technology as a driving factor that instigated political change; the lens of analysis is macro-level processes, and the broader view of technology later narrowed to a focus on primarily ICTs as the transmission belt of global transformations.[59]

Global Environmental Politics is one subfield of International Relations, where the treatment of technology is strikingly different at the macro level of analysis. Its genesis as an area of study is rooted in the degradation of the living environment on a global scale attributed to an industrialized society. Hence, the application of technology to daily life—especially in the transformation of fossil fuels into energy—is a primary source of transnational environmental challenges. Global Environmental Politics is also a subfield deeply integrated with the policy realm it studies, contributing actionable analysis in an open conversation with the subjects of study. These particular points were evident as international environmental concerns became more pronounced beginning in the 1970s and succinctly represented in *The Limits to Growth* report produced by MIT and the

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[58] Mark Zachary Taylor, The Politics of Innovation: Why Some Countries Are Better than Others at Science and Technology (New York, NY: Oxford Univ. Press, 2016).

[59] Peter Mcmahon. "Technology and Globalization: An Overview." Prometheus 19, no. 3 (September 1, 2001): 211–22.

Club of Rome.[60] Given the enormity of the problem and its potentially disruptive effects on all other aspects of international life, much of the subfield has concentrated on the issue of climate change due to anthropogenic emissions and the technologies associated with this problem. The global policy response to this overarching challenge has been extensive incorporation of highly technical climate models, measures of air pollutants, and the recognition that once could not divorce economic concerns among less-developed nations from environmental concerns. Since the 1990s call for sustainable development—defined as creating economic growth without ecological harm—policymakers have regarded technology as both a problem and a solution to climate change.[61] Thus, the subfield generally does not view technology as destiny but, instead, as a product of human choice. In this regard, Peter Haas is exemplary where the challenge to the global governance of greenhouse gas-emitting technologies is viewed as a problem of political will rather than a case of technological path dependence.[62] Another interesting example of the

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[60] See: Donella H. Meadows, Jorgen Randers, and Dennis L. Meadows, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (New York: Universe Books, 1972) and Donella H. Meadows, Jorgen Randers, and Dennis L. Meadows, *Limits to Growth: The 30-Year Update*, 3rd edition (White River Junction, Vt: Chelsea Green Publishing, 2004).

[61] Michael Redclift, Sustainable Development: Exploring the Contradictions (London: Routledge, 1987); T. R. Franks, "Managing Sustainable Development: Definitions, Paradigms, and Dimensions," Sustainable Development 4, no. 2 (1996): 53–60; Andrew Cheon and Johannes Urpelainen, "Oil Prices and Energy Technology Innovation: An Empirical Analysis," Global Environmental Change, Adding Insult to Injury: Climate Change, Social Stratification, and the Inequities of Intervention, 22, no. 2 (May 1, 2012): 407–17; Adam B. Jaffe, Richard G. Newell, and Robert N. Stavins, "Environmental Policy and Technological Change," Environmental and Resource Economics 22, no. 1 (June 1, 2002): 41–70.

[62] Peter M. Haas, "Addressing the Global Governance Deficit," Global Environmental Politics 4, no. 4 (November 1, 2004): 1–15.

subfields approach to technology is that of renewable energy innovations. The literature seeks to both actively foster its development and encourage its adoption via intergovernmental coordination.[63] Intending to mitigate the effects of climate change, the emerging technologies of geoengineering is a burgeoning topic that exhibits the strong links between IR scholarship, climate science, the relevant engineering fields, and the policy worlds of global environmental governance.[64] In terms of our typology, the global environmental literature evaluates technology at the macro-level and generally skews towards constructivism rather than what would be pessimistic determinism in this case. Indeed, these works within the subfield were on the cutting edge of incorporating Science and Technology Studies (STS) into their analysis of international phenomena.[65]

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[63] See Victor Galaz, Global Environmental Governance, Technology and Politics: The Anthropocene Gap (Edward Elgar Publishing, 2014); Robert Anex, "Stimulating Innovation in Green Technology: Policy Alternatives and Opportunities," American Behavioral Scientist 44, no. 2 (October 1, 2000): 188–212; Matthew Paterson, "Car Culture and Global Environmental Politics," Review of International Studies 26, no. 2 (April 2000): 253–70.

[64] Excellent examples on this topic include: Wil Burns and Simon Nicholson, "Governing Climate Engineering," in New Earth Politics: Essays from the Anthropocene, ed. Sikina Jinnah (Cambridge, MA: MIT Press, 2016), 343–58; Simon Nicholson, Sikina Jinnah, and Alexander Gillespie, "Solar Radiation Management: A Proposal for Immediate Polycentric Governance," Climate Policy 18, no. 3 (March 16, 2018): 322–34; David G. Victor, "On the Regulation of Geoengineering," Oxford Review of Economic Policy 24, no. 2 (July 1, 2008): 322–36; Mike Hulme, Can Science Fix Climate Change?: A Case Against Climate Engineering (John Wiley & Sons, 2014); and Scott Barrett, "Solar Geoengineering's Brave New World: Thoughts on the Governance of an Unprecedented Technology," Review of Environmental Economics and Policy 8, no. 2 (July 1, 2014): 249–69.

[65] Rolf Lidskog and Göran Sundqvist, "When Does Science Matter? International Relations Meets Science and Technology Studies," Global Environmental Politics 15, no. 1 (December 5, 2014): 1–20; Clark A. Miller and Paul N. Edwards, eds., Changing the Atmosphere: Expert Knowledge and Environmental Governance (Cambridge: The MIT Press, 2001).

Following the lead of Global Environmental Politics, the broader field of International Relations has recently reengaged with science and technology in several ways.[66] This rediscovery occurred under the banner of the "material turn" that newly has established a foothold within the discipline.[67] Whether influenced by the many variants of STS, inspired by the New Materialism approach of political theory, or the move towards post-humanism within the humanities, many IR scholars have looked to other disciplines to map the relationship between technology and global politics.[68] Again, this recent literature focuses on the macro-level of analysis and casts a wide net considering technology writ large. The distinction between this new crop of scholarship to earlier IR literature rests on the notion that a more comprehensive integration of technology into the global political analysis as a central concept is necessary. In grappling with this incorporation, much of this scholarship revolved around one of the analytic dimensions: the causal

[66] For two excellent overviews of this shift within the discipline of IR see: Maximilian Mayer, Mariana Carpes, and Ruth Knoblich, "The Global Politics of Science and Technology: An Introduction," in *The Global Politics of Science and Technology: Concepts from International Relations and Other Disciplines*, vol. 1, Global Power Shift (Heidelberg: Springer, 2014); and Daniel R. McCarthy, ed., *Technology and World Politics: An Introduction*, 1 edition (New York: Routledge, 2017). Interest in science and technology within the field cumulated in the establishment of the STAIR special interest section within the International Studies Association in late 2013. See: *https://www.isanet.org/ISA/Sections/STAIR/About-STAIR* and J. P. Singh et al., *Science, Technology, and Art in International Relations* (New York: Routledge, 2019).

[67] See: William E. Connolly, "The 'New Materialism' and the Fragility of Things," *Millennium - Journal of International Studies* 41, no. 3 (2013): 399–412; Daniel Deudney, "Turbo Change: Accelerating Technological Disruption, Planetary Geopolitics, and Architectonic Metaphors," *International Studies Review* 20, no. 2 (June 2018): 223–31; Roger Mac Ginty, "A Material Turn in International Relations: The 4x4, Intervention and Resistance," *Review of International Studies* 43, no. 5 (December 2017): 855–74.

[68] For instance: Stefan Fritsch, "Technology and Global Affairs," *International Studies Perspectives* 12, no. 1 (February 1, 2011): 27–45.

mechanism's direction. Depending on the external field that each scholar draws from, a greater role is found for social constructivism impacting the trajectory of technology or a modified version of technological determinism where objects portend political outcomes. Indeed, a third position is now prominent suggesting that the interaction between technology and global politics eludes a unidirectional description and is, instead, co-productive relationship.[69]

This brings us to the question of what exactly is Science and Technology Studies that many IR scholars are drawing upon. Starting in the 1960s, two interventions propelled the creation of STS as a field of study. The first was the intense controversy surrounding Thomas Kuhn's mediation on the philosophy of science and the historical structures of inquiry.[70] The second impetus for the foundation of STS was a series of Marxist interventions in political economy that revived the notion of technological determinism posed by Ellul and Heilbroner.[71] Inspired by an older tradition within the history of technology evidence by the thought of Lewis Mumford, the ensuing debate over the role of technology in

[69] It should be mentioned that there is also an intellectual reaction against the "turns" within the discipline. See: Stephane J. Baele and Gregorio Bettiza, "'Turning' Everywhere in IR: On the Sociological Underpinnings of the Field's Proliferating Turns," *International Theory*, June 15, 2020, 1–27

[70] Thomas S. Kuhn, The Structure of Scientific Revolutions, 50th Anniversary Edition (Chicago: University of Chicago Press, 2012).

[71] Jacques Ellul and Robert K. Merton, The Technological Society, trans. John Wilkinson, Extensive Underlining edition (New York, NY: Vintage Books, 1964); Robert L. Heilbroner, "Do Machines Make History?," Technology and Culture 8, no. 3 (July 1967): 335-345.; Robert L. Heilbroner, The Making of the Economic Society, 13 edition (Upper Saddle River: Pearson, 2011).

politics and society animated the organization of STS as a separate discipline.[72] The eventual resolution of this controversy drew STS towards a research program based on the social construction of science and technology, rejecting the inclinations towards determinism and a Eurocentric teleology. For instance, Pacey traces the trajectory of scientific and technological advance through time and across the traditional boundaries of the "West" and the "rest," challenging the tradition that located all appropriate scientific knowledge in the western tradition. In this sense, there has always been a world civilization where expertise and techniques have always permeated the boundaries of empires or states.[73]

While this history of science perspective is undoubtedly broader than some contemporary STS accounts, it tends to be a unidirectional story. Technology might develop in a specific society but quickly diffuses throughout world civilization. In other words, society begets technoscientific advances, and world civilization simply waits for the next innovation to come along. Thomas Hughes, another

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[72] See Lewis Mumford, Technics and Civilization (New York: Harcourt, Brace and Co., 1934) and Lewis Mumford, Pentagon Of Power: The Myth Of The Machine, Vol. II, First edition (New York: Harcourt, Brace and Co., 1974).

[73] For an overview of this debate see: Arnold Pacey, *Technology in World Civilization* (Cambridge, MA: The MIT Press, 1991) and Langdon Winner, Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought (Cambridge: MIT Press, 1977). Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought*, (Cambridge: MIT Press, 1977); Wiebe E. Bijker Hughes, Thomas Parke., Pinch,T.J., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge: MIT Press, 1987); Langdon Winner, *The Whale and the Reactor a Search for Limits in an Age of High Technology* (Chicago: Univ. of Chicago Press, 1989); Merritt Roe Smith , Leo Marx, *Does Technology Drive History?: The Dilemma of Technological Determinism*, (Cambridge: MIT Press, 1994); Sally Wyatt, "Technological Determinism Is Dead; Long Live Technological Determinism," in *The Handbook of Science and Technology Studies*, ed. Edward J. Hackett, Olga Armsterdamska, and Judy Wajcman, 3rd edition (Cambridge: The MIT Press, 2007).

historian of science, echoes the earlier work of Mumford. In his account, culture structures variations on technoscience, rejecting the reverse tendency of technology's influence over society.[74] Such socially constructed forms of thinking all favor society's power over technoscience rather than the other way around. Departments of Science and Technology Studies were established in the U.S., most notably at Cornell, MIT, and Harvard. Simultaneously, the discipline also spread within Europe at Cambridge, Oxford, LSE, and the University of Amsterdam.

Drawing from a wide array of other disciplines, STS has evolved into several variants. Remarkably, the disciplinary boundaries between the academic field and other areas of study within the humanities and social sciences proved especially permeable, marking STS as very interdisciplinary. A more theoretical group of works that deal with the epistemological ramifications of this constructivism for the philosophy of science overlay most STS research.[75] The empirical core of STS is concerned with the social construction of science and technology. Works in this register tend towards either single case study methods of particular technologies with the trajectory of their development within a specific society or comparative case studies of a specific technological artifact across

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[74] Thomas Hughes, *The Human-Built World: How to Think About Technology and Culture* (Chicago, IL: The University of Chicago Press, 2004)

[75] Ian Hacking, The Social Construction of What? (Cambridge: Harvard University Press, 1999); Bloor, Knowledge and Social Imagery, 2nd ed. (Chicago: University of Chicago Press, 1991); Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton: Princeton University Press, 2011).

different cultures.[76] As such, core STS subjects are typically specific technologies located at the meso-level of analysis, while these subjects are definitively treated as outcomes of social forces rather than technology as an independent variable.

A critical variant within the STS literature is Actor-Network Theory (typically referred to as ANT) that combined the insights from the philosophy of science and the more empirical observations of technoscience in action by incorporating anthropological methods. In a landmark work, Latour and Woolgar engaged in a participant observation study of the Salk Institute (a pre-eminent laboratory focused on cancer research), making the curious observations that scientific truth seemed to hinge on authoritative practices. Using the lens of an anthropologist, Latour observed rituals involving the calibration of instruments to fit pre-hypothesized outcomes, the authority that stemmed from publication, and the social facility to convince fellow experts concerning the efficacy of observed

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[76] Examples of empirical studies at the core of STS include Wiebe E. Bijker Hughes, Thomas Parke., Pinch,T.J., The Social Construction of Technological Systems : New Directions in the Sociology and History of Technology (Cambridge: MIT Press, 1987); Donald A. MacKenzie and Judy Wajcman, The Social Shaping of Technology: How the Refrigerator Got Its Hum (Philadelphia: Open University Press, 1985); Thomas Parke Hughes et al., eds., Technologies of Power: Essays in Honor of Thomas Parke Hughes and Agatha Chipley Hughes (Cambridge, Mass: MIT Press, 2001); Sheila Jasanoff, ed., States of Knowledge: The Co-Production of Science and Social Order, International Library of Sociology (London ; New York: Routledge, 2004); Sheila Jasanoff, The Ethics of Invention: Technology and the Human Future (New York: W. W. Norton & Company, 2016); Timothy Mitchell, Carbon Democracy: Political Power in the Age of Oil, 1 edition (London: Verso, 2013); Timothy Mitchell, Rule of Experts: Egypt, Techno-Politics, Modernity (Berkeley: University of California Press, 2002); Paul N. Edwards, The Closed World: Computers and the Politics of Discourse in Cold War America, Reprint edition (Cambridge, Mass. London: The MIT Press, 1997); Paul N. Edwards, A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming (Cambridge, Massachusetts London, England: MIT Press, 2013).

data.[77] Latour would go even further in developing ANT, making an influential suggestion that modernity is an anomaly: meaning the distinction between the social and the natural worlds was a prerequisite for the formation of Enlightenment reason is artifice. By this reading, the divide between subjects and objects serves as a necessary fiction buttressing scientific reasoning's authority and fueling the scientific revolutions that would follow but obfuscating the reality that all things (both social and natural) are hybrids containing elements of both.[78] This is the kernel of actor-network-theory (ANT) that seeks to interrogate the embeddedness of technoscience in society rigorously. What is frustrating with the schema presented in *We Have Never Been Modern* is Latour's vague precepts to avoid the charge of relativism made against most social constructivist accounts. One particular study to come out of the ANT tradition engaged with the subject of military technology: Law’s *Aircraft Stories* that sociologically traced the doomed path of the British TSR2 strike bomber that languished in development during the Cold War.[79]

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[77] Bruno Latour and Steven Woolgar, *Laboratory Life: The Construction of Scientific Fact* (Princeton, NJ: Princeton University Press, 1986).

[78] Bruno Latour, *We Have Never Been Modern* (Cambridge, MA: Harvard University Press, 1993). See also: John Law and John Hassard (eds.), *Actor Network Theory and After* (Malden, MA: Blackwell Publishing, 1999) and Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (New York, NY: Oxford Univ. Press, 2005).

[79] John Law, *Aircraft Stories: Decentering the Object in Technoscience*, Science and Cultural Theory (Durham: Duke Univ. Press, 2002); Donald A. MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge: MIT Press, 2001). This approach is echoed to two other influential works that approach international issues from an ANT inflected perspective. See: Paul N. Edwards, A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming (Cambridge, Massachusetts London, England: MIT Press, 2013) detailing how the global phenomenon of climate change is mediated through computer models and

The emphasis on the social construction of technoscientific knowledge and objects put forward by STS was not unproblematic. For one, hard scientists resented the implication that accepted scientific truth was simply a fabrication of cabal within their ranks.[80] The "science wars" that followed emphasized the issues with an STS endeavor that leaned heavily on social constructivism, pointing out the challenge of relativism's seemingly foundationless account for scientific change. Ultimately, these controversies enriched STS in the sense that ANT was revised by Latour, recasting his version of hybrid actants within assemblages that make up the world. In this register, Latour eschews sociological explanations in favor of a flattened ontology that traces the interactions between actants that are mediators creating the world and being created by each other.[81] In a similar vein, Jasanoff suggests an alternate understanding of how technoscience and society are co-produced. She proposes synthesizing elements of determinism and social constructivism, detailing how technoscience and societies co-produce each other in a feedback loop of overlapping and embedded processes that are non-linear rather than unidirectional. More specifically, Jasanoff offers that society does not cause science nor vice versa. Instead, with the lens of co-production, contingency and

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Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (London: Verso, 2013) that details the petrochemical foundations of Western liberal democracy.

[80] On the "science wars" see Paul Gross and Norman Levitt's Higher Superstition: The Academic Left and its Quarrel with Science (Baltimore: The John Hopkins University Press, 1994); Keith Ashman and Phillip Barringer, After the Science Wars: Science and the Study of Science (New York: Routledge, 2005); and Andrew Ross, Science Wars (Duke University Press, 1996).

[81] Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (New York, NY: Oxford University Press, 2005).

change impact these assemblages as they continually interact, circle back, and remake the work in both terms of structure and agency. Increasingly, the realities of human experience emerge as the joint achievements of scientific, technical, and social enterprise: science and society, in a word, are co-produced, each underwriting the other's existence.[82] I typify this approach as the more moderate social construction of technology school of thought. Within this wing of the discipline, several scholars have examined the sociopolitical sources of military technology from the perspective of STS. Perhaps the most exemplary work to come out of STS that engages with international politics and security issues focusing on a specific technoscientific artifact is MacKenzie's *Inventing Accuracy.* In this work, he charts the development of inertial guidance systems for nuclear-armed intercontinental ballistic missiles (ICBMs), increasing accuracy regardless of official nuclear doctrine and the sociopolitical factors that produced this particular technology. Indeed, the stated nuclear policy of mutually assured destruction was undercut by the accuracy developed in these weapons, giving them the capabilities that suggested a counterforce strategy (targeting an opponent's hardened nuclear sites rather than population centers).[83]

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[82] Sheila Jasanoff, "The Idiom of Co-Production," in States of Knowledge: The Co-Production of Science and Social Order, ed. Sheila Jasanoff (New York, NY: Routledge, 2004) pp. 1-12 and "Ordering Knowledge, Ordering Society," in States of Knowledge: The Co-Production of Science and Social Order, ed. Sheila Jasanoff (New York, NY: Routledge, 2004) pp. 13-43.

[83] Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: The MIT Press, 1990).

More recently, the subfield of Political Theory has drawn from STS insights (especially the revolutionary insights from ANT) to promulgate the concept of New Materialism. This literature seeks to bridge the gap between newer relativist social constructivism and older, determinist forms of materialism. This intervention's impetus has been the despoiling of the natural environment and the climate change crisis that marches forward unabated. Thus, this strain of political theory seeks to present the agency and importance of natural beings, objects, and ecologies, bringing them to the same political level as anthropocentric concerns.[84] Within the field, International Relations scholars have actively engaged with New Materialism quite widely.[85]

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[84] Jane Bennett, *Vibrant Matter: A Political Ecology of Things*, Book, Whole (Durham: Duke University Press, 2010); Diana H. Coole and Samantha Frost, eds., *New Materialisms Ontology, Agency, and Politics* (Durham: Duke University Press, 2010); Rick Dolphijn and Iris van der Tuin, *New Materialism: Interviews & Cartographies* (Ann Arbor: Open Humanities Press, 2012); William E. Connolly , *The Fragility of Things: Self-Organizing Processes, Neoliberal Fantasies, and Democratic Activism* (Durham: Duke University Press, 2013).

[85] William E. Connolly, "The 'New Materialism' and the Fragility of Things," *Millennium - Journal of International Studies* 41, no. 3 (2013): 399–412; Diana Coole, "Agentic Capacities and Capacious Historical Materialism: Thinking with New Materialisms in the Political Sciences," *Millennium* 41, no. 3 (March 19, 2013): 451–69; Nick Srnicek, Maria Fotou, and Edmund Arghand, "Introduction: Materialism and World Politics," *Millennium* 41, no. 3 (June 1, 2013): 397–397; Mike Bourne, "Invention and Uninvention in Nuclear Weapons Politics," *Critical Studies on Security* 4, no. 1 (January 2, 2016): 6–23; Jason Dittmer, *Diplomatic Material: Affect, Assemblage, and Foreign Policy* (Durham: Duke University Press Books, 2017); Roger Mac Ginty, "A Material Turn in International Relations: The 4x4, Intervention and Resistance," *Review of International Studies* 43, no. 5 (December 2017): 855–74; Benjamin Meiches, "Weapons, Desire, and the Making of War," *Critical Studies on Security* 5, no. 1 (January 2, 2017): 9–27; Jairus Victor Grove, *Savage Ecology: War and Geopolitics at the End of the World* (Durham: Duke University Press Books, 2019); Erika Cudworth and Stephen Hobden, *Posthuman International Relations: Complexity, Ecologism and Global Politics* (London; New York; New York: Zed Books, 2011); Erika Cudworth and Stephen Hobden, "Of Parts and Wholes: International Relations beyond the Human," *Millennium - Journal of International Studies* 41, no. 3 (2013): 430–50.; Simon Curtis and M. Acuto, eds., *Reassembling International Theory: Assemblage Thinking and International Relations* (New York, N.Y.: Palgrave Pivot, 2014).

Recent works by McCarthy, Herrera, and Salter are particularly emblematic of this re-engagement with technology as a central concern to IR. Each author also reflects different approaches to causal inference. For his part, McCarthy draws from the STS literature and especially the Marxist tradition, suggesting that IR re-embrace materialism along with an updated version of technological determinism.[86] Indeed, he considers this approach a viable social change theory drawing from early STS scholars like Mumford and Heilbroner.[87] Thus, technology serves as the impetus for global change, and it reflects the global hierarchy based on the uneven material distribution of innovation capabilities. For his part, Herrera takes a divergent view: technoscientific advance has social and political origins and social impacts. With this in mind, Herrera assesses the various theoretical traditions of Realism, Liberalism, Constructivism, and the English School to account for international systems change precipitated by what he terms sociotechnical systems. Leaning heavily on the concept of interaction capacity borrowed from Buzan,

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86 Geoffrey Lucas Herrera, *Technology and International Transformation: The Railroad, the Atom Bomb, and the Politics of Technological Change*, SUNY Series in Global Politics (Albany: State Univ. of New York Press, 2006); Daniel R. McCarthy, ed., *Technology and World Politics: An Introduction*, 1 edition (Abingdon, Oxon ; New York, NY: Routledge, 2017); Daniel R. McCarthy, "Technology and 'the International' or: How I Learned to Stop Worrying and Love Determinism," *Millennium - Journal of International Studies* 41, no. 3 (2013): 470–90.

87 Lewis Mumford, *Technics and Civilization* (New York [N.Y.: Harcourt, Brace and Co., 1934); Robert L. Heilbroner, "Do Machines Make History?," *Technology and Culture* 8, no. 3 (1967): 335–45. In fact, McCarthy declares technological determinism as good an explanation for international change as any other. Specifically, McCarthy discounts those coming out of STS insisting on social determinants of technology turning the equation back the other way around, pushing technology to the forefront explaining international outcomes. In this sense he reengineers the familiar Marxist trope of "uneven and combine development" into what he calls "uneven and combine determinism." See: McCarthy, "Technology and 'the International' or: How I Learned to Stop Worrying and Love Determinism."

Little, and Jones, the logic of Herrera's analysis skews towards the co-productive model of STS: in this argument, technological advance impacts the international system by modifying the modes and abilities of the constitutive units (e.g., states) to interact with each other, thereby shifting the international system as a whole. In turn, this shift creates incentives and opportunities for technological innovation. The result is an account that skews towards the middle position of our continuum between determinism and pure social construction. As a result, the technical and political inputs and outcomes are interlinked and run parallel to each other synchronously in Herrera's theoretical framework. It makes little sense to point to one or the other as a causal variable. In effect, technology and international politics influence each other but in a continual, circular pattern rather than an orderly, linear progression that lends itself to a unidirectional analysis.[88] Taking a different view, Salter enlists a wide variety of IR scholars to re-theorize the landscape of International Relations through the prism of New Materialism in two collected volumes.[89] Here the approach is decidedly philosophical, drawing from Latour's ANT to locate the agentic political influence of objects in global politics.

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[88] Herrera, *Technology and International Transformation*. The lion's share of his book is dedicated to the two case studies: 1) the creation and impact of railroad technology on German unification, industrialization and militarism and 2) the international impetus and impact on knowledge diffusion—via German Jewish émigrés to the US—to building of the atomic bomb

[89] Mark Salter, ed., *Making Things International 1: Circuits and Motion* (Minneapolis: Univ. of Minnesota Press, 2015 and Mark Salter, ed., *Making Things International 2: Catalysts and Reactions* (Minneapolis: Univ. of Minnesota Press, 2016).

The problem with the efforts outlined above to incorporate insights from STS or New Materialism into International Relations is fundamentally a question of agency. While many of these innovative attempts have born several compelling analyses, nearly all rely upon a form of determinism that either explicitly relinquishes political agency to technology or "things" or defaults to a soft determinism that, while promoting the ideal co-production, neglects to explore how international politics shape the technologies produced within this milieu.[90] The next section turns to this lacuna.

Technology and Warfare: Military Technology as a Driver of Global Politics

International Relations thinking tended to treat technological variables as determinative, in contrast to STS treatments of the subject. Embedded in much of the traditional IR scholarship considered above is the motif of geography versus technology. In other words, how changes in technology pose a challenge to the territorial state as a form of political organization for the better (in the case of idealism) or for the worse (in the view of realists.)[91] While technology played a role in these early discussions at the macro level, it was always an adjunct or

[90] See: Marijn Hoijtink and Matthias Leese, eds., *Technology and Agency in International Relations*, 1 edition (London: Routledge, 2019).

[91] For the former see Norman Angell, The Great Illusion; a Study of the Relation of Military Power to National Advantage (McClelland, Goodchild & Stewart, 1912) and Alfred Zimmern, "The Prospects of Democracy," Journal of the Royal Institute of International Affairs 7, no. 3 (1928): 153–91. In the case of the pessimists see Hans Joachim Morgenthau, Politics among Nations: The Struggle for Power and Peace (New York, NY: Alfred A. Knopf, 1948) and Edward H. Carr, Twenty Years' Crisis, 1919-1939 (Harper Collins, 1964).

intermediate variable in relation to war or peace. To frame the divergence between the two traditional IR theories as a question: would the technological feats of the industrial revolution ultimately promote pacifism by rendering conflict between territorial states futile, or would industrial technology simply make war more frequent and destructive?

A sharper focused debate took place within the "military sciences" of service academies over the ideas of geopolitics or the concept that geography served as destiny in both warfare and international politics. Adherents of Mackinder's heartland theory of military might suggest that sufficient manpower in order to hold the strategic resources necessary for industrial production favored large ground armies. On the other hand, the preeminent theorist of naval strategy—Mahan –prescribed large and advanced navies to secure sea power as this was the determinant of great power status and international hierarchy in his estimation.[92] Both martial theories heavily relied on military technologies to make their case. In modern Anglo-American academia, the theme of technology's triumph over geographic determinants of power distribution would surface habitually in the literature associated with the subfield of security studies that flourished during the Cold War. A substantial tradition that runs counter to either technological or geographic determinants of military outcomes flows from the venerated Prussian

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[92] Halford John Mackinder, "The Geographical Pivot of History" (Proceedings of the Royal Geographical Society, London: Royal Geographical Society, 1904), 421–37; and A. T. Mahan, The Influence of Sea Power upon History, 1660-1783., Twelfth edition. (Boston: Little, Brown, 1918).

scholar Clausewitz and his magnum opus *On War*. Regarded by many within military education and strategy as gospel, Clausewitz made the distinction between the *nature* of war and its *character*. Under this rubric, the nature warfare as a social phenomenon of violence utilized by collective actors towards political ends is considered eternal and unchanging. The character of warfare (in other words, *how* it is waged) is malleable and ever-evolving by his logic. Generally, Clausewitz, and those that honor his tradition, discounts the potential of new weapon technologies to sway the strategic balance one way or the other in warfare, emphasizing instead the quality of leadership and strategic vision. Indeed, where *On War* reflects on preparation for combat, the type of weapons or their functions are specifically discounted as a deciding factor.[93] While this seems to reflect an antiquated view informed by the Napoleonic context of Clausewitz's military experience, arguments over the nature versus the character of warfare echo to this day, especially in the debates over military technologies.

The confluence of two factors set the stage in the post-WW II academia for how military technology would factor into the study of global politics in the proceeding decades. First, the expansion of higher education in the U.S. undergirded the dominance of American voices in the field of IR as America assumed the status of a global superpower.[94] Second, the military might that

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[93] Carl von Clausewitz, *On War*, trans. Michael Eliot Howard and Peter Paret, Reprint Indexed edition (Princeton, N.J: Princeton University Press, 1989) pp. 6, 64, 85-86.

[94] The assertion that International Relations is deeply ingrained within the academic and political cultures of the UK and especially the US is well established by the historical sociology of the

underwrote this superpower status was most notably due to its early mastery of nuclear weapons. Indeed, the almost unimaginable destructive power of atomic weapons elicited two different responses. One widespread reaction was that these weapons compelled the world's states to form a world government to avoid an apocalyptic world war.[95] The other perspective, championed by one of the earliest and most influential thinkers on nuclear strategy, Bernard Brodie, equally regarded atomic weapons as transformational to global politics. However, in his estimation, the new technology only solidified the sovereignty of state power in the international arena while making general war between the great powers so monumentally destructive that a new way of thinking about military force—in a word, deterrence—was needed.[96] In the burgeoning world of civilian defense

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field. For example, see Stanley Hoffmann, "An American Social Science: International Relations," Daedalus 106, no. 3 (1977): 41–60; Robert M. A. Crawford and Darryl S. L. Jarvis, *International Relations--Still an American Social Science?: Toward Diversity in International Thought* (SUNY Press, 2001); and Ole Wæver, "The Sociology of a Not So International Discipline: American and European Developments in International Relations," International Organization 52, no. 4 (ed 1998): 687–727. In terms of American views dominating the composition of field see: Isaac A. Kamola, *Making the World Global: U.S. Universities and the Production of the Global Imaginary* (Durham: Duke Univ. Press Books, 2019).

[95] For example, Albert Einstein, "To the General Assembly of the United Nations," October 1947. Campbell Craig, "The Resurgent Idea of World Government," Ethics & International Affairs 22, no. 2 (2008): 133–42; Robert A. Strong, "The History of Nuclear Futures," Contemporary Security Policy 10, no. 1 (1989): 87–96; Ray Garrett, "A World Constitution: Analysis of the Draft by the Hutchins Committee," American Bar Association Journal 34, no. 7 (1948): 563–640; and the strategic theorist Sir Basil Liddell Hart, *The Revolution in Warfare* (New Haven: Yale Univ. Press, 1947).

[96] As one of the original nuclear strategists, Brodie would go on to an illustrious career with the RAND Corporation advising the U.S. Air Force and DoD. He is credited with the origination of nuclear deterrence with the famous dictum: "Thus far the chief purpose of our military establishment has been to win wars. From now on it chief purpose must be to avert them. It can have almost no other useful purpose." from Bernard Brodie et al., The Absolute Weapon: Atomic Power and World Order (New York: Harcourt, Brace and Company, 1946) 21. See also Bernard Brodie, Strategy in the Missile Age, First Princeton paperback edition, Princeton Legacy Library (Princeton, New Jersey: Princeton Univ. Press, 1965) and Barry Scott Zellen, State of Doom:

intellectuals that bloomed throughout the Cold War, the idea that changes in nuclear weapons technology determined the shape of defense planning to maintain strategic stability gained the status of gospel.[97]

What evolved from this stance was the Nuclear Revolution thesis heralded within IR by influential scholars like Barry Buzan and Robert Jervis. This thesis posited the nature of nuclear weapons rendered military victory between nuclear possessing powers impossible. Expanding on Brodie's original point, this thesis posits that the advent of nuclear technology irrevocably alters the relationship between military force and statecraft. Thus, strategic stability was the ultimate goal rather than compelling an adversary's will to one's national interests.[98] Under the umbrella of the Nuclear Revolution rubric four broad debates emerged. One outgrowth was the Offense/Defense theory that extended the thesis's logic into the past, suggesting that wars were caused when weapons technology shifted to favor offensive military force and waned when defensive technologies obtained.[99] Both

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Bernard Brodie, The Bomb, and the Birth of the Bipolar World (New York: Continuum International Publishing Group, 2012).

[97] For and excellent history detailing the rise of defense intellectuals see Fred M Kaplan, *The Wizards of Armageddon* (New York: Simon and Schuster, 1983).

[98] Barry Buzan, *An Introduction to Strategic Studies: Military Technology and International Relations* (New York: Palgrave Macmillan, 1987); Robert Jervis, *The Meaning of Nuclear Revolution: Statecraft and the Prospect of Armageddon*, Cornell Studies in Security Affairs (Ithaca: Cornell Univ. Press, 1989). Also see Michael Mandelbaum, *The Nuclear Revolution: International Politics Before and after Hiroshima* (New York: Cambridge Univ. Press, 1981).

[99] Robert Jervis, "Cooperation Under the Security Dilemma," *World Politics* 30, no. 2 (1978): 167–214; Stephen Van Evera, *Causes of War: Power and the Roots of Conflict* (Ithaca: Cornell Univ. Press, 2013); Stephen Van Evera, "The Cult of the Offensive and the Origins of the First World War," *International Security* 9, no. 1 (1984): 58–107; Stephen Biddle, "Rebuilding the Foundations of Offense-Defense Theory," *The Journal of Politics* 63, no. 3 (August 1, 2001): 741–74; Sean M. Lynn-Jones, "Offense-Defense Theory and Its Critics," *Security Studies* 4, no. 4

of the world wars served as prime examples in this sense: when changes in weapons favored either the defense (in the case of WWI) or the offense (as highlighted by blitzkrieg in WWII), it changed the military balance between states.

The second debate under the banner of the Nuclear Revolution centered around the number of nuclear weapons distributed between the two superpowers. One aspect of this debate was to figure out how many were enough to achieve strategic stability. The original model of deterrence theory initiated by Brodie would suggest that once a state acquired a second-strike capability (i.e., its nuclear forces could absorb a surprise attack and have enough to strike back), it had a credible threat that would deter any attack. Under this logic, once both sides reached a second-strike capability, there was little point in adding additional nuclear weapons to the arsenal.[100] Here, again the novel characteristics of nuclear weapons in their incredible capacity for destruction seemed to set them apart and undergird the assumptions of deterrence theory. As the Cold War competition continued, it appeared that the two antagonists were operating under an entirely different logic than the one espoused by Brodie, however. Nuclear arsenals climbed to ever greater levels, and security scholars took note. This arms race behavior was typified as the

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(June 1995): 660–91; Robert Gilpin, *War and Change in World Politics* (Cambridge ; Cambridge Univ. Press, 1981).

[100] Bernard Brodie, *Strategy in the Missile Age* (Princeton, New Jersey: Princeton Univ. Press, 1965); William W. Kaufmann, “The Requirements of Deterrence,” in *US Nuclear Strategy: A Reader*, ed. Philip Bobbitt, Lawrence Freedman, and Gregory F. Treverton (London: Palgrave Macmillan UK, 1989), 168–87; Thomas C. Schelling, *Arms and Influence*, Revised edition (New Haven, CT: Yale Univ. Press, 2008).

spiral model or a tit-for-tat action/reaction competition beyond either side's control. From this perspective, the nuclear weapons only fueled an arms race logic as much as any other military technology, ultimately rendering them as a destabilizing factor. The choice then was between out-of-control stockpiling of ever more destructive weapons or scaling back the qualitative completion via arms control agreements.[101]

Parallel to this question of the sufficient nuclear arsenal to maintain deterrence was a debate over the impact of these weapons' proliferation on other countries. On the one hand, in a bid to bolster his structural version of realism, Waltz suggested that the spread of nuclear weapons would result in a net positive, extending the strategic stability between the superpowers down to other states in the international system.[102] From this point of view, nuclear weapons were still categorically distinct from different types of warfighting technologies, given that they solidified the conditions for credible deterrence between state actors. While

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[101] Samuel P. Huntington, "Arms Races: Prerequisites and Results," *Public Policy* 8, no. 1 (1958): 41–86; Lewis F. Richardson, *Arms and Insecurity: A Mathematical Study of the Causes and Origins of War* (Boxwood Press, 1960); Thomas C. Schelling and Morton H. Halperin, *Strategy and Arms Control* (New York: Twentieth Century Fund, 1961); Hedley Bull, *The Control of the Arms Race: Disarmament and Arms Control in the Missile Age* (New York: Praeger, 1965); James D. Morrow, "Capabilities, Uncertainty, and Resolve: A Limited Information Model of Crisis Bargaining," *American Journal of Political Science* 33, no. 4 (1989): 941–72; Andrew Kydd, "Game Theory and the Spiral Model," *World Politics* 49, no. 3 (April 1997): 371–400; Barry Buzan and Eric Herring, *The Arms Dynamic in World Politics* (Boulder, CO: Lynne Rienner, 1998). For an excellent overview see: Charles L. Glaser, "The Causes and Consequences of Arms Races," *Annual Review of Political Science* 3, no. 1 (2000): 251–76.

[102] Kenneth N. Waltz, "The Spread of Nuclear Weapons: More May Be Better: Introduction," *The Adelphi Papers* 21, no. 171 (September 1, 1981): 1–32; Kenneth Waltz, *Theory of International Politics* (Reading: Addison-Wesley Pub. Co., 1979).

downplaying the prospects for inadvertent nuclear war, Waltz suggests that the proliferation of these weapons would produce a net good of stability. Leading the charge against this view, Sagan pointed out the brittle structure of the nuclear standoff and the plethora of safety measures put in place by the nuclear superpowers that still did not guarantee their accidental use.[103] In word and deed, anti-proliferation efforts recognized the incredibly destructive potential of nuclear weapons, and this characteristic demanded that states work in concert to limit their spread. While the non-proliferation regime that emerged within the international community was a far cry from the world government called for by the inventors of the atomic bomb at the beginning of the Cold War, this regime did represent an unprecedented level of global governance over this particular weapons technology.

The third strand of contention under the Nuclear Revolution thesis was normative. This unprecedented situation—where a global thermonuclear war between the Cold War rivals could conceivably result in the end of civilization—precipitated a moral crisis for those that took nuclear weapons seriously. This normative view echoed the sentiments present at the beginning of the atomic age with calls for a world government, as noted above. Several voices emerged that emphasized how this technology had changed warfare's moral and ethical

[103] Scott Sagan and Kenneth Waltz, *The Spread of Nuclear Weapons: A Debate* (New York: W.W. Norton, 1995); Scott Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (Princeton Univ. Press, 1995).

landscape, as highlighted by Herz, Niebuhr, Nitze, and others.[104] In the Cold War context, this normative line of thinking would continue within the nuclear disarmament and peace movements, suggesting that nuclear weapons technology was an unprecedented development and necessitated the renovation of global politics in line with cooperative if not wholly idealist principles.[105]

One close cousin to the Nuclear Revolution thesis was a more extensive deliberation christened the Military Revolution. Representing a general discussion over the relationship between weapons technologies and the sweep of global affairs and military history, the Military Revolution debate took on two forms.[106] One backward-looking dispute centered around historical precedent and a second, policy-oriented debate over the present and immediate future of technology and warfare within the U.S. context. Historians like Paker, Bean, and McNeill posited

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[104] Reinhold Niebuhr, "The Cold War and the Nuclear Dilemma," *Cross Currents* 9, no. 3 (1959): 212–24; Paul H. Nitze, "The Recovery of Ethics: Our Task Is to Discover a Framework That Commends Itself to the Modern Mind," *Worldview* 3, no. 2 (February 1960): 3–7; John H. Herz, "Technology, Ethics, and International Relations," *Social Research* 43, no. 1 (1976): 98–113.

[105] Grenville Clark and Louis B. Sohn, *World Peace Through World Law* (Cambridge: Harvard Univ. Press, 1958); Hidejiro Kotani, "International Morality in the Nuclear Age," *Journal of International Affairs* 12, no. 2 (1958): 216–21; Joseph C. McKenna, "Ethics and War: A Catholic View," *American Political Science Review* 54, no. 3 (September 1960): 647–58; Johan Galtung, "Violence, Peace, and Peace Research," *Journal of Peace Research* 6, no. 3 (September 1, 1969): 167–91; Robert Ehrlich, *Waging Nuclear Peace: The Technology and Politics of Nuclear Weapons* (SUNY Press, 1985); E. J. Woodhouse, "Is Large-Scale Military R&D Defensible Theoretically?," *Science, Technology, & Human Values* 15, no. 4 (1990): 442–60; Sanford Lakoff and W. Erik Bruvold, "Controlling the Qualitative Arms Race: The Primacy of Politics," *Science, Technology, & Human Values* 15, no. 4 (1990): 382–411; Patrick W. Hamlett, "Technology and the Arms Race," *Science, Technology, & Human Values* 15, no. 4 (1990): 461–73; James M. Acton, "Nuclear Power, Disarmament and Technological Restraint," *Survival* 51, no. 4 (September 1, 2009): 101–26.

[106] For a comprehensive and detailed overview see: Barton C. Hacker, "Military Institutions, Weapons, and Social Change: Toward a New History of Military Technology," *Technology and Culture* 35, no. 4 (1994): 768–834.

that military technologies shaped the past in dramatic ways, including determining the nation-state's political form in the early modern period. From this perspective, not only had the industrial revolution shaped warfare in the 20th century but earlier military innovations like gunpowder, for example, ultimately shaped political capabilities and allowed for the creation of the Westphalian state system.[107] To paraphrase Tilly's famous dictum, if war made the state and the state made war, then those martial technologies that changed the character of warfare ultimately shaped how international politics solidified into territorially based, sovereign units by transitive logic.[108] From this perspective, the West's political dominance and the course of colonialism are traced to the root of weapons innovations in early-modern Europe.[109] While the Military Revolution thesis was rooted within the discipline of

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[107] Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500-1800*, 2 edition (New York: Cambridge Univ. Press, 1996); Richard Bean, "War and the Birth of the Nation State," *The Journal of Economic History* 33, no. 01 (1973): 203–221 and William H. McNeill, *The Pursuit of Power: Technology, Armed Force, and Society since A.D. 1000*, 1 edition (Chicago: Univ. of Chicago Press, 1984). A precursor to this argument is found in John U. Nef, *War and Human Progress: An Essay on the Rise of Industrial Civilization* (New York, NY: W. W. Norton & Company, 1968). Notably Branch also regarded technology as the historical source of the state at this historical moment but located it within cartography rather than military innovations. See Jordan Branch, "Mapping the Sovereign State: Technology, Authority, and Systemic Change," *International Organization* 65, no. 1 (2011): 1–36.

[108] Charles Tilly, "War Making and State Making as Organized Crime," in *Bringing the State Back In*, ed. Peter Evans, Dietrich Rueschemeyer, and Theda Skocpol (New York: Cambridge Univ. Press, 1985). Other works that take up this formulation include Eugene F. Rice and Anthony Grafton, *The Foundations of Early Modern Europe, 1460-1559* (New York: WW Norton, 1994); Brian M. Downing, *The Military Revolution and Political Change: Origins of Democracy and Autocracy in Early Modern Europe* (Princeton: Princeton Univ. Press, 1992); and Richard Holmes, *The World Atlas of Warfare: Military Innovations That Changed the Course of History* (New York: Studio, 1988); Frank Tallett, *War and Society in Early Modern Europe: 1495-1715* (London: Routledge, 1997); Walter C. Opello Jr, *War, Armed Force, and the People: State Formation and Transformation in Historical Perspective* (Lanham: Rowman & Littlefield, 2016).

[109] Tarak Barkawi, *Globalization and War* (Lanham: Rowman & Littlefield, 2006); and Paul Hirst, *War and Power in the Twenty-First Century: The State, Military Power and the International System* (Oxford: Polity Press, 2014).

history, the most vociferous debate over its finding took place within the field of security studies. Both Boot and van Creveld emphasize the impact of technology on the course of warfare in the modern era following this logic.[110] Taking in the broader timescale, Levy and Thompson identify weapons technology as a decisive variable in the precipitation of war over the *longue durée.*[111]

The Military Revolution literature took on a different hue when national security practitioners took up the proposition of technological influence. Applying the logic that technological change shaped political outcomes via changes to warfare, American military thinkers posited that contemporary innovations in information technology would reshape the future of warfare.[112] Coming on the heels of American military dominance during the 1991 Gulf War, Pentagon luminaries like Cebrowski and Krepinevich anticipated that the U.S. could maintain

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[110] Martin van Creveld, *Technology and War: From 2000 B.C. to the Present* (New York: Free Press, 1989) and Max Boot, *War Made New: Technology, Warfare, and the Course of History, 1500 to Today* (New York: Gotham Books, 2006). Relatedly see: Robert Geoffrey Jensen and Andrew Wiest, *War in the Age of Technology: Myriad Faces of Modern Armed Conflict* (New York: NYU Press, 2001). See also: Trevor N. Dupuy, *The Evolution Of Weapons And Warfare* (New York: Da Capo Press, 1990).

[111] Jack S. Levy and William R. Thompson, *The Arc of War: Origins, Escalation, and Transformation* (Chicago: The Univ. of Chicago Press, 2011); Jack S. Levy and William R. Thompson, *Causes of War* (Hoboken: John Wiley & Sons, 2011). Followin this tradition is also Wayne E. Lee, *Waging War: Conflict, Culture, and Innovation in World History* (Oxford: Oxford Univ. Press, 2015). Many of the adjacent historians involved with the Military Revolution debate also found a sympathetic ear among national security practitioners in this extension of the thesis. For example, see: Martin Van Creveld, *Transformation of War* (New York: Simon and Schuster, 2009); Edward Luttwak, *Strategy: The Logic of War and Peace* (Cambridge: Belknap Press of Harvard Univ. Press, 2001)

[112] Andrew Latham, "Re-Imagining Warfare: The 'Revolution in Military Affairs,'" in *Contemporary Security and Strategy* (Palgrave, London, 1999), 210–235.

military supremacy by focusing on this new type of "network-centric" warfare.[113] This optimistic assessment was shared by many within IR, including Nye and Owen, who extended the notion of information dominance in the military sphere to the soft power spheres of economics and culture.[114] Knox and Murray intervened in this dialogue to distinguish between the past phenomena that had been the subject of debate among military historians and the emerging role of technology in modern warfare. In their estimation, historical Military Revolutions took place under social and political conditions that lead to a monumental change in international relations via war. They posited that what U.S. national security practitioners were actually dealing with was a less dramatic Revolution in Military Affairs: a smaller subset of changes where those militaries that adjusted doctrine and force structure to new weapon technologies would prevail on the battlefield.[115]

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[113] Much of the thinking within this community influenced military thinking and planning for a generation. Thus, these particular thinkers are part of the discussions in chapters 5 and 6 that follow and are treated as primary documents that make up the corpus of this particular discourse. See, Arthur K. Cebrowski and John Garstka, "Network-Centric Warfare: Its Origin and Future," *Proceedings of the U.S. Naval Institute* 124, no. 1 (1998): 28–35; Arthur K. Cebrowski and Thomas P.M. Barnett, "The American Way of War," *Proceedings of the U.S. Naval Institute* 129, no. 1 (2003): 42–43; Andrew F. Krepinevich Jr., "The Military-Technical Revolution: A Preliminary Assessment" (Washington DC: Center for Strategic and Budgetary Assessments, 2002).

[114] Joseph S. Nye and William A. Owens, "America's Information Edge," *Foreign Affairs* 75, no. 2 (1996): 20–36. On how the RMA would shape U.S. foreign relations overall see M. J. Williams, "The Coming Revolution in Foreign Affairs: Rethinking American National Security," *International Affairs* 84, no. 6 (November 1, 2008): 1109–1129.

[115] Williamson Murray, "Thinking About Revolutions in Military Affairs," *Joint Forces Quarterly* 16 (Summer 1997): 69–76; Andrew Latham, "Re-Imagining Warfare: The 'Revolution in Military Affairs,'" in *Contemporary Security and Strategy*, ed. Craig A. Snyder (London: Palgrave, 1999), 210–35; David Burbach, Brendan Rittenhouse Green, and Benjamin Friedman, "The Technology of the Revolution in Military Affairs," in *US Military Innovation since the Cold War: Creation Without Destruction*, ed. Harvey Sapolsky, Benjamin Friedman, and Brendan Green (Routledge, 2009), 1–13.

The debate over the “Revolution in Military Affairs” (RMA) would rage well into the new millennium. Indeed, the early campaign against the Taliban in Afghanistan by the U.S. led coalition in 2001 and the initial success in the Iraq invasion in 2003 displayed the prowess of the RMA approach.[116] In practice, the RMA's purported ramifications were that a technologically advanced force could dominate a numerically larger adversary through speed, maneuver, and precision. Secretary of Defense Rumsfeld took these lessons to heart during his tenure to overhaul the American military into a smaller, more agile fighting force.[117] As is common within the Department of Defense, the RMA's underlying premise inspired many variations on this theme across the services towards these ends. A short list of these variations on the theme among military practitioners includes: network-centric, fourth generation, maneuver, information, and effects-based warfare. While each of these iterations originated from different constituencies with different interests within military institutions, each version of the RMA was based on the shared logic that military technology demanded changes in tactics, strategy, doctrine, and institutional organization that warfare was fundamentally altered by technology.[118] However, the insurgency's growth in Iraq after the U.S. invasion

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[116] Keith L. Shimko, “The United States and the RMA: Revolutions Do Not Revolutionize Everything,” in *Reassessing the Revolution in Military Affairs: Transformation, Evolution and Lessons Learnt*, ed. Jeffrey Collins and Andrew Futter, Initiatives in Strategic Studies: Issues and Policies (London: Palgrave Macmillan UK, 2015), 16–32; Elinor C. Sloan, *Revolution in Military Affairs* (Montreal: McGill-Queen’s Press, 2002).

[117] Donald H. Rumsfeld, “Transforming the Military,” *Foreign Affairs* 81, no. 3 (2002): 20–32

[118] John Arquilla et al., eds., *In Athena’s Camp: Preparing for Conflict in the Information Age*, MR (Series), MR-880-OSD/RC (Santa Monica: Rand, 1997); John Arquilla and Douglas A.

marked the death-knell for the RMA as a substitute for more traditional military strategies in both intellectual and practical terms. In short, America quickly learned that there was no easy technological solution against a determined insurgency. This fact was certainly reflected in the later criticisms of the RMA within the literature.

The works detailed above exhibit many shared traits I can assess along our analytic dimensions. Nearly all these interventions are located at the macro-level of analysis, where the causal variables to political outcomes are situated between and across individual states. However, given the post-Cold War emphasis on U.S. primacy and intertwining of American foreign policy with the liberal international order, one could view the RMA debate as having macro-level inputs and outputs.[119]

Borer, eds., *Information Strategy and Warfare: A Guide to Theory and Practice*, 1 edition (Routledge, 2007); Edward Waltz, *Information Warfare Principles and Operations* (Boston: Artech, 1998); Tim Benbow, *Magic Bullets: Understanding the Revolution in Military Affairs* (London: Brasseys Uk Ltd, 2004); Arthur K. Cebrowski and John Garstka, "Network-Centric Warfare: Its Origin and Future," *Proceedings of the U.S. Naval Institute* 124, no. 1 (1998): 28–35; Andrew Latham, "Re-Imagining Warfare: The 'Revolution in Military Affairs,'" in *Contemporary Security and Strategy*, ed. Craig A. Snyder (London: Palgrave, 1999), 210–35; John T. Correll, "The Assault on EBO," *Air Force Magazine* 96, no. 1 (January 2013): 50–54; M. J. Williams, "The Coming Revolution in Foreign Affairs: Rethinking American National Security," *International Affairs* 84, no. 6 (November 1, 2008): 1109–29; John A. Warden, III, "The Enemy as a System," *Airpower Journal* 9, no. 1 (Spring 1995): 40–55; Rupert Smith, *The Utility of Force: The Art of War in the Modern World*, Reprint edition (New York: Vintage, 2008); William Lind, "Understanding Fourth Generation War," *Military Review* LXXXIV, no. 5 (October 2004); William S. Lind, *Maneuver Warfare Handbook*, 1 edition (Boulder: Routledge, 1985).

[119] Barry Buzan, "From International System to International Society: Structural Realism and Regime Theory Meet the English School," *International Organization* 47, no. 3 (ed 1993): 327–52; Michael Mastanduno, "Preserving the Unipolar Moment: Realist Theories and U.S. Grand Strategy after the Cold War," *International Security* 21, no. 4 (April 1, 1997): 49–88; Samuel P. Huntington, "Why International Primacy Matters," *International Security* 17, no. 4 (1993): 68; John M. Owen IV, "Transnational Liberalism and U.S. Primacy," *International Security* 26, no. 3 (2001): 117–152; Michael C. Webb and Stephen D. Krasner, "Hegemonic Stability Theory: An Empirical Assessment," *Review of International Studies* 15, no. 2 (April 1989): 183–98; Robert Keohane, "The Theory of Hegemonic Stability and Changes in International Economic Regimes, 1967–1977," in *Change In The International System*, ed. Ole R. Holsti (New York: Routledge, 2019), 131–62.

These accounts locate the causal variable in technological change, generally exogenous to political processes. Thus, much of this literature falls closer towards the technological determinist end of the spectrum. In this sense, technological change is a universal background condition, and the contingency of its unequal distribution accounts for much of the disparity between like units (much like the contingency of geographic factors that states happen to find themselves situated.) Significantly, nearly all of the arguments reflect some version of the realist school of thought in IR. Under the realist umbrella, the focus narrows to military technologies primarily as security, power politics, and competition between nation-states is considered the motivating factor *sin qua non* for the state actors under the realist rubric. In these formulations, technological change begets shifts in military power that directly translate into changes in relations between states as the primary actors. Thus, security is the transmission belt of the relationship between politics and technology.[120] With this in mind, this set of literature is grouped under the banner of technology as a driver of global politics at the macro level.

War and Technology: Social Impetus for Military Innovation

Turning attention to works that reverse the causal direction, one observes a different perspective on the relationship between technology and war. Several counterarguments to technological determinist models stake out a position that

[120] Representative of this line of thinking is Robert Gilpin, *War and Change in World Politics* (Cambridge; Cambridge Univ. Press, 1981).

instead emphasizes the preeminence of entrenched interests or the drive to gain relative power over rivals rather than technology as the deciding factor in IR. These sentiments are echoed in both the historical tradition and the policy-oriented literature concerned with military innovation.

One well established and critical perspective on the topic of arms technology stems from the peace studies literature. Coalescing around the stark fears of a global nuclear conflagration between the superpowers, the transnational peace movement among activists, and the peace research field within academia primarily focused on nuclear weapons technology.[121] These perspectives generally placed little faith in deterrence's status quo, given the unrestrained nuclear arms race between the U.S. and USSR. The logical end was Armageddon unless the world's public and their leaders intervened. Drawing from these sentiments, much of the arms control literature approaches military innovation because it is a force to be tamed by international political will to rein in nuclear technology.[122] A prominent branch of this school of thought was the military-industrial complex (MIC) thesis drawing from Eisenhower's famous farewell address. The crux of the

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[121] Frank Barnaby, "Peace Research: The Whys and the Wherefores," *Nature* 265, no. 5596 (February 1, 1977): 672–73; Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Cornell Univ. Press, 2002).

[122] Patrick W. Hamlett, "Technology and the Arms Race," *Science, Technology, & Human Values* 15, no. 4 (1990): 461–73; Sanford Lakoff and W. Erik Bruvold, "Controlling the Qualitative Arms Race: The Primacy of Politics," *Science, Technology, & Human Values* 15, no. 4 (1990): 382–411; E. J. Woodhouse, "Is Large-Scale Military R&D Defensible Theoretically?," *Science, Technology, & Human Values* 15, no. 4 (1990): 442–60; James M. Acton, "Nuclear Power, Disarmament and Technological Restraint," *Survival* 51, no. 4 (September 1, 2009): 101–26; and Johan Galtung, "Violence, Peace, and Peace Research," *Journal of Peace Research* 6, no. 3 (September 1, 1969): 167–91.

MIC thesis was that industrial and political interests aligned in the post-War era precipitated the Cold War arms race and expanded the national security state. The driving force in this analysis is not an inherent technological march towards ever more complex weapons. Instead, military innovations are foisted on the state due to the profit motive and the corporate interests of defense manufacturers that have captured the national security policy process.[123] This approach implies a historical materialist analysis that identifies economic interests as a causal variable resulting in technological outcomes.

Specific rebuttals to the determinist's models outlined in the previous section locate power competition as the foundational assumption and fit more

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[123] Marc Pilisuk and Thomas Hayden, "Is There a Military Industrial Complex Which Prevents Peace?: Consensus and Countervailing Power in Pluralistic Systems," *Journal of Social Issues* 21, no. 3 (July 1, 1965): 67–117; Walter Adams, "The Military-Industrial Complex and the New Industrial State," *The American Economic Review* 58, no. 2 (1968): 652–65; Ralph E. Lapp, *Arms Beyond Doubt: The Tyranny of Weapons Technology* (Silver Springs: Ground Zero Books, Ltd., 1970); Seymour Melman, *Pentagon Capitalism: The Political Economy of War* (New York: McGraw-Hill, 1970); Walter Adams and William James Adams, "The Military-Industrial Complex: A Market Structure Analysis," *The American Economic Review* 62, no. 1/2 (1972): 279–87; Lewis Mumford, *Pentagon Of Power: The Myth Of The Machine, Vol. II*, First edition (New York: Harcourt, Brace and Company, 1974); Barry S. Rundquist, "On Testing a Military Industrial Complex Theory," *American Politics Quarterly* 6, no. 1 (January 1, 1978): 29–53; Merritt Roe Smith, *Military Enterprise and Technological Change: Perspectives on the American Experience* (Cambridge: MIT Press, 1985); James M. Cypher, "Military Spending, Technical Change, and Economic Growth: A Disguised Form of Industrial Policy?," *Journal of Economic Issues* 21, no. 1 (1987): 33–59; Ted Greenwood, "Why Military Technology Is Difficult to Restrain," *Science, Technology, & Human Values* 15, no. 4 (1990): 412–29; Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford*, ACLS Humanities E-Book (New York: Columbia Univ. Press, 1993); Paul A. C. Koistinen, *State of War: The Political Economy of American Warfare, 1945-2011*, 1st edition (Lawrence: Univ. Press of Kansas, 2012); Rebecca U. Thorpe, *The American Warfare State: The Domestic Politics of Military Spending*, 1 edition (Chicago: Univ. of Chicago Press, 2014); Jonathan D. Caverley, *Democratic Militarism: Voting, Wealth, and War* (New York: Cambridge Univ. Press, 2014); Thomas C. Lassman, "Putting the Military Back into the History of the Military-Industrial Complex: The Management of Technological Innovation in the U.S. Army, 1945–1960," *Isis* 106, no. 1 (2015): 94–120.

comfortably in the realist camp, avoiding the peace research and MIC's normative foundations. For example, many arguments contra to the Nuclear Revolution thesis were formulated under neorealism's rubric, placing implicit boundaries on the counterarguments to technological determinism.[124] Mearsheimer and Grey are exemplary of this line of critique, discounting the novelty of nuclear weapons.[125] In this sense, a neorealist instrumentalist account drawn from this tradition suggests that the external impetus of the overarching competition between like units (e.g., states) drives military organizations to out-innovate each other without constraints.[126] The more granular debate over the Offense/Defense theory was also a family squabble within the realist school. In this instance, the objection to the idea that technology set the stage for military outcomes was based on an emphasis on national interests and states' power-seeking behavior regardless of dominant military technologies of the time. Critics of the Offense/Defense theory discounted the role of technology and instead emphasized a classic balance of power politics to explain the outbreak of wars.[127] Lieber's contribution is an exemplar of this line

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[124] For an excellent overview of how nuclear weapons impacted realist thought see: Rens van Munster and Casper Sylvest, *Nuclear Realism* (New York: Routledge, 2018).

[125] Colin S. Gray, *Geopolitics of the Nuclear Era: Heartland, Rimlands, and the Technological Revolution*, Reprint edition (New York: Crane Russak & Co, 1977); John J. Mearsheimer, *The Tragedy of Great Power Politics* (W. W. Norton & Company, 2001).

[126] This follows from the logic put forth by Waltz: "Contending states imitate the military innovations contrived by the country of greatest ingenuity." Here the only constraints on states in the system are their own differentiated material resources. Kenneth Waltz, *Theory of International Politics* (Reading: Addison-Wesley Pub. Co., 1979): pp. 127.

[127] Jack S. Levy, “The Offensive/Defensive Balance of Military Technology: A Theoretical and Historical Analysis,” *International Studies Quarterly* 28, no. 2 (June 1, 1984): 219–38; John J. Mearsheimer, *Conventional Deterrence*, Reprint edition (Ithaca: Cornell Univ. Press, 1985); James W. Davis et al., “Correspondence: Taking Offense at Offense-Defense Theory,”

of thinking, discounting the impact of weapons, and emphasizing the mechanism of power politics.[128] In the case of the proliferation discussion, Waltz's suggestion that more nuclear weapons spread across the world would be a desirable outcome did not necessarily fly in the face of technological determinism. However, this position did discount the original Nuclear Revolution thesis suggesting the balance of power logic would tame these immensely destructive weapons.[129]

There are two different sources of objection to the historical Military Revolutions thesis that emphasize factors other than technological determinism. One set of counterarguments follow macroeconomic accounts for the rise of the Westphalian state. North, Thomas, and Spruyt point to economic consolidation among elites as determinative in ending the feudal power structure and ultimately giving rise to the territorially-based, sovereign nation-state instead of military prowess through cutting edge technology of the time suggested by the Military Revolution thesis.[130] A second strand hews more closely to the traditional view of

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International Security 23, no. 3 (January 1, 1999): 179–206; Yoav Gortzak, Yoram Z. Haftel, and Kevin Sweeney, "Offense-Defense Theory: An Empirical Assessment," *Journal of Conflict Resolution* 49, no. 1 (February 1, 2005): 67–89; and Keir A. Lieber, "Grasping the Technological Peace: The Offense-Defense Balance and International Security," *International Security* 25, no. 1 (2000): 71–104. An excellent collection of accessible point of the debate are organized in James W. Davis et al., "Correspondence: Taking Offense at Offense-Defense Theory," *International Security* 23, no. 3 (January 1, 1999): 179–206.

[128] Keir A. Lieber, *War and the Engineers: The Primacy of Politics over Technology*, 1 edition (Ithaca; London: Cornell Univ. Press, 2008).

[129] Kenneth N. Waltz, "The Spread of Nuclear Weapons: More May Be Better: Introduction," *The Adelphi Papers* 21, no. 171 (September 1, 1981): 1–32; Kenneth N. Waltz, "Nuclear Myths and Political Realities," *The American Political Science Review* 84, no. 3 (1990): 731–45.

[130] See Douglass North and Robert Paul, Thomas, *The Rise of the Western World: A New Economic History* (Cambridge: Cambridge Univ. Press, 1973) and Hendrik Spruyt, *The Sovereign State and Its Competitors* (Princeton: Princeton Univ. Press, 1994).

history as contingent and multifaceted rather than a series of repetitions traceable to a singular or set of causal variables. In the case of Military Revolutions, the historians Black and Duffy represent this critique of technological path dependence. In their view, path dependence is nothing less than a simplified historical narrative organized around the RMA thesis.[131] The underlying assumption from this perspective is that politics and society influenced military technology—rather than the other way around—and this dynamic produces global political outcomes. Detractors to the policy-oriented Revolution in Military Affairs thesis draw from these historical accounts. But instead of relying on historical contingency, counterarguments to the RMA primarily rely on the Clausewitzian foundation that the nature of war is eternal. In other words, according to these critics, the fatal flaw made in the RMA thesis is conflating changes in the character of warfare (*how* wars are fought) with a shift in the fundamental nature of war—a transformation deemed impossible by followers of Clausewitz.[132] This stance does

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[131] Jeremy Black, 'Was There a Military Revolution in Early Modern Europe', History Today 58, 7 (July 2008): 34-41; Jeremy Black, *A Military Revolution?: Military Change and European Society 1550–1800*, 1991 edition (Basingstoke: Red Globe Press, 1991); Jeremy Black, *War and Technology* (Bloomington: Indiana Univ. Press, 2013); Michael Duffy, *The Military Revolution and the State 1500-1800* (Exeter: Univ. of Exeter Press, 1980). For an updated version of this critique see Frank Jacob and Gilmar Visoni-Alonzo, *The Military Revolution in Early Modern Europe: A Revision* (London: Palgrave Pivot, 2016), See also Andrew N. Liaropoulos, "Revolutions in Warfare: Theoretical Paradigms and Historical Evidence: The Napoleonic and First World War Revolutions in Military Affairs," *The Journal of Military History* 70, no. 2 (2006): 363–84; and George Raudzens, "War-Winning Weapons: The Measurement of Technological Determinism in Military History," *The Journal of Military History; Lexington, Va.* 54, no. 4 (October 1, 1990): 403–433.

[132] Colin S. Gray, *Weapons Don't Make War: Policy, Strategy, and Military Technology*, Modern War Studies (Lawrence, Kan: Univ. Press of Kansas, 1993); Colin S. Gray, *War, Peace and International Relations: An Introduction to Strategic History*, 2nd ed (Abingdon, UK: New York : Routledge, 2011); Eliot A. Cohen, "A Revolution in Warfare," *Foreign Affairs* 75, no. 2 (1996):

not take such an intransigent view of weapon innovations to suggest that military technology is not a factor at all. Rather, RMA criticism is directed at an attitude of technological optimism displayed by national security practitioners—particularly within the U.S. military—that equate transformation with a move beyond historical precedents.

A different branch of literature, Military Innovation Studies, drew from many of these historically oriented strands of thought surrounding the technology in warfare, but with a different research orientation. Instead of adjudicating between what constituted revolutionary military change or not, this scholarship was concerned with a related but altogether different set of questions. This body of inquiry sought to explain under what conditions successful innovation took place within military organizations that resulted in tactical or strategic overmatch.[133] Historically, some international actors successfully invent and field new military technologies while others do not? A subset of questions in this realm of study includes how some states are leaders in creating new technologies while others lag.

37–54; Eliot A. Cohen, "Change and Transformation in Military Affairs," *Journal of Strategic Studies* 27, no. 3 (September 2004): 395–407; Williamson Murray and Richard Hart Sinnreich, eds., *The Past as Prologue: The Importance of History to the Military Profession* (Cambridge ; New York: Cambridge Univ. Press, 2006); Williamson Murray, "Thinking About Revolutions in Military Affairs," *Joint Forces Quarterly* 16 (Summer 1997): 69–76. For a policy-oriented version of this stance see: Michael O'Hanlon, *Technological Change and the Future of Warfare* (Brookings Institution Press, 2011) and Michael E. O'Hanlon, *The Future of Land Warfare* (Washington: Brookings Institution Press, 2015).

[133] For two excellent analytic overviews see: Adam Grissom, "The Future of Military Innovation Studies," *Journal of Strategic Studies* 29, no. 5 (October 1, 2006): 905–34; and Stuart Griffin, "Military Innovation Studies: Multidisciplinary or Lacking Discipline?," *Journal of Strategic Studies* 40, no. 1–2 (January 2, 2017): 196–224.

Conversely, when many states have access to the same technologies, why some are more effective at integrating new weapons into their military organizations? This literature also investigates the mechanism by which new technologies spread across states and how those dynamics impact global security politics. Given this research program's clear policy orientation, much of military innovation studies in American academia are situated adjacent to national security practitioners. The view taken within this subfield is that innovation consists of two general elements: both the creation of new military technologies and the organizational frameworks needed to employ those new weapons in the field effectively. Within this framework, five different models for successful military innovation address many of these general research questions.

The first military innovation model is termed "operational adaptation," or changes made within military organizations during a conflict to employ new weapons. Within the subfield, Farrell and Terry make a distinction between *adaptation* (a change that takes place under duress over the course of war), *innovation* (modifications made within the military in preparation for a future conflict), and *emulation* (copying the innovations of other states).[134] In this sense, the operational adaptation approach is distinct and draws from reading for the military revolution literature that focuses on martial adjustments in the first half of the twentieth century and, echoing Clausewitz, emphasizes sage military leadership

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[134] Theo Farrell and Terry Terriff, *The Sources of Military Change: Culture, Politics, Technology* (Boulder, Colo.: Lynne Rienner Publishers, 2002).

responding to an adversary's weakness.[135] This school of thought emphasizes the action-reaction dynamic where adversaries counter each other with changes in military hardware, tactics, and doctrine. Because many modern warfare technologies were introduced during the First World War and matured throughout the Second World War, the interwar period is a historical focus. This particular period presents itself as a natural experiment of sorts, given that all of the major powers had equal access to emergent military technologies. Yet, some states wielded them much more successfully than others. The work of Murray and Millett predominates this approach to military innovation studies.[136] This example also mirrors a tendency within the military innovation literature to focus on the meso or the state level of analysis. This orientation is not surprising, given that a historical and policy-oriented lens lends itself to the comparative method.

Apart from the adaptation model, many scholars sought to explain changes in warfare from an internal perspective rather than as a response to external stimuli.

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[135] For examples of the operational adaptation school of thought see: James Russell, *Innovation, Transformation, and War: Counterinsurgency Operations in Anbar and Ninewa Provinces, Iraq, 2005-2007*, 1 edition (Stanford, Calif: Stanford Univ. Press, 2010); Michael Edward Brown, *Flying Blind: The Politics of the U.S. Strategic Bomber Program* (Cornell Univ. Press, 1992).

[136] Allan R. Millett and Williamson Murray, *The Second World War*, vol. 3, 3 vols., Military Effectiveness (New York: Cambridge Univ. Press, 2010); Allan R. Millett and Williamson Murray, *The First World War*, 2nd ed., vol. 1, 3 vols., Military Effectiveness (New York: Cambridge Univ. Press, 2010); Allan R. Millett and Williamson Murray, *The Interwar Period*, 2nd ed., vol. 2, 3 vols., Military Effectiveness (New York: Cambridge Univ. Press, 2010); Williamson Murray and Allan R. Millett, eds., *Military Innovation in the Interwar Period*, Revised ed. edition (Cambridge: Cambridge Univ. Press, 1998); Michael Edward Brown, *Flying Blind: The Politics of the U.S. Strategic Bomber Program* (Ithaca: Cornell Univ. Press, 1992); Timothy Moy, *War Machines: Transforming Technologies in the U.S. Military, 1920-1940* (College Station, TX: Texas A&M Univ. Press, 2001). For an engaging approach that follows this logic see Kimberly Marten Zisk, *Engaging the Enemy: Organization Theory and Soviet Military Innovation, 1955-1991* (Princeton Univ. Press, 1993).

These discussions focused on innovation in preparation for future conflicts and the mechanisms necessary for the successful creation of a novel mode of warfighting. For example, one school of thought focuses on "civil-military relations" and the need for an external push from elected civilian leaders for innovation and change. Posen is the primary figure promoting this approach that suggests military institutions' conservative nature renders them resistant to change. He posits a process of innovation whereby civilian actors instigate change in concert with "maverick" entrepreneurs within the military along technological and especially organizational lines.[137] While comparing the doctrine of rival great powers in the interwar period, the civil-military approach possesses more explanatory power over how certain emerging technologies gain favor over others and eventually prevail. The third school of thought that drills further down into bureaucratic politics is the "inter-service rivalry" thesis. Put forward most prominently by Sapolsky, this model attributes to the competition between the service branches and their interaction with the central actor of the DoD as the impetus for military innovation.

Given that the primary services of the Army, Navy, Air Force, and Marines famously regard each other as adversaries for limited defense budget dollars, this

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[137] Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars*, N/A edition (Ithaca: Cornell Univ. Press, 1986); Barry R. Posen, "Foreword: Military Doctrine and the Management of Uncertainty," *Journal of Strategic Studies* 39, no. 2 (February 23, 2016): 159–73. See also Edmund Beard, *Developing the ICBM: A Study in Bureaucratic Politics*, 1st edition (New York: Columbia Univ. Press, 1976). Also, Deborah D. Avant, *Political Institutions and Military Change: Lessons from Peripheral Wars* (Ithaca: Cornell Univ. Press, 1994). Oddly enough, Posen's model of successful military innovation corresponds to Keck and Sikkink's model of the norm life cycle.

view suggests military innovation is prominent only when branches are pitted against each other to fulfill a vital role in defending the nation.[138] Relying less on a competitive framework and more on the specific conditions that allowed for successful innovation, Rosen suggested an "intra-service" model that constitutes the fourth school of thought. In this framework, a particular set of prerequisites are needed for true innovation to take hold: the internal politics within each service, including the professional incentive structures for mid-level officers to take chances on new tactics and technology, have to align with a new "theory of victory" put forward by senior leadership within each branch.[139] While the background conditions of nearly unfettered military competition between states acting in their self-regarding interests would seem to place these approaches firmly within the realist IR tradition, many of the causal factors are identified with internal sources of change. This group of military innovation models—the civil-military approach, the inter-service rivalry, and the intra-service alignment—are more in line with IR's institutionalist or behavioralist theories. In this sense, they owe a debt to Allison's

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[138] See also Michael H. Armacost, *Politics of Weapons Innovation: The Thor-Jupiter Controversy* (New York: Columbia Univ. Press, 1969) and Frederic A. Bergerson, *The Army Gets an Air Force: Tactics of Insurgent Bureaucratic Politics*, 1st edition (Baltimore: The Johns Hopkins Univ. Press, 1980).

[139] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell Univ. Press, 1991). Other examples of this approach are Susan Marquis, *Unconventional Warfare: Rebuilding U.S. Special Operation Forces* (Washington, D.C: Brookings Institution Press, 1997); W. Blair Haworth, *The Bradley and How It Got That Way: Technology, Institutions, and the Problem of Mechanized Infantry in the United States Army* (Westport: Praeger, 1999); and Adam N. Stulberg, "Managing Military Transformations: Agency, Culture, and the U.S. Carrier Revolution," *Security Studies* 14, no. 3 (April 1, 2005): 489–528.

bureaucratic politics theory and organizational theory, emphasizing the principal-agent dilemma.[140]

The fifth and final approach within the Military Innovation literature is the "cultural" model that locates the origin of military innovation in shared ideas within states and the armed forces that defend them.[141] Encompassing a wide scope of approaches, this school of thought is alternately referred to as the constructivist or ideational model. Under this group of theories, ideas are given prominence as an explanatory variable.[142] Evangelista previewed the culturalist approach with his evaluation of how the United States and the Soviet Union differed in developing new weapons. In his estimation, the U.S. generated new military power from the bottom-up or via internal factors of a distinct and culturally diffused affinity for innovation. Simultaneously, the Soviets took a top-down approach that more readily reflected a neorealist, instrumentalist action-reaction model of innovation.[143] A wave of scholarship took up these more ideational determinants of military innovation from the bottom-up with prominent contributions from

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[140] Graham Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis*, 2 edition (New York: Pearson, 1999); Graham T. Allison, "Conceptual Models and the Cuban Missile Crisis," *The American Political Science Review* 63, no. 3 (1969): 689–718; and James G. March and Herbert A. Simon, *Organizations*, 2 edition (Cambridge: Wiley-Blackwell, 1993).

[141] For an introductory overview of the cultural approaches to security studies see: Michael C. Desch, "Culture Clash: Asesing the Imporance of Ideas in Security Studies," *International Security* 23, no. 1 (Summer 1998): 141–70.

[142] Theo Farrell, "Constructivist Security Studies: Portrait of a Research Program," *International Studies Review* 4, no. 1 (2002): 49–72.

[143] Matthew Evangelista, *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies* (Ithaca: Cornell Univ. Press, 1988).

Katzenstein, Kier, Adamsky, Legro, Farrell, and Terriff.[144] Under this broad tent, one subsection of the cultural model explicitly concerns itself with differences between states, regions, or within national armed forces either utilizing the comparative method or case studies detailing how strategic cultures foster or hinder innovation.[145] Applying the same cultural analysis, some scholars have further tapered their focus to individual service cultures and their propensity to either embrace or reject military change.[146] A large number of studies within military innovation studies were inspired by Weigley's highly regarded book, *The American Way of War,* wherein he suggests national characteristics of warfare unique to the

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[144] Peter J. Katzenstein, *The Culture of National Security: Norms and Identity in World Politics* (New York: Columbia Univ. Press, 1996); Elizabeth Kier, *Imagining War* (Princeton, N.J: Princeton Univ. Press, 1999); Dima Adamsky, *The Culture of Military Innovation: The Impact of Cultural Factors on the Revolution in Military Affairs in Russia, the US, and Israel.*, 1 edition (Stanford: Stanford Security Studies, 2010); Jeffrey W. Legro, "Military Culture and Inadvertent Escalation in World War II," *International Security* 18, no. 4 (1994): 108–42; Theo Farrell, *Weapons without a Cause: The Politics of Weapons Acquisition in the United States*, 1st ed. 1997 edition (New York: Palgrave Macmillan, 1997); Theo Farrell and Terry Terriff, *The Sources of Military Change: Culture, Politics, Technology* (Boulder: Lynne Rienner Publishers, 2002).

[145] Ken Booth and Russell Trood, eds., *Strategic Cultures in the Asia-Pacific Region*, 1999 edition (Houndmills: Palgrave Macmillan, 1999); Peter J. Katzenstein, *Cultural Norms and National Security: Police and Military in Postwar Japan* (Ithaca: Cornell Univ. Press, 1998); Alastair Iain Johnston, *Cultural Realism: Strategic Culture and Grand Strategy in Chinese History* (Princeton: Princeton Univ. Press, 1998); Ruth Benedict, *The Chrysanthemum and the Sword: Patterns of Japanese Culture,* First Mariners Books edition (Boston: Houghton Mifflin, 2005); Kier, *Imagining War*; Lawrence Sondhaus, *Strategic Culture and Ways of War* (New York: Routledge, 2006); Theo Farrell, Sten Rynning, and Terry Terriff, *Transforming Military Power since the Cold War: Britain, France, and the United States, 1991–2012* (Cambridge Univ. Press, 2013)

[146] Peter R. Mansoor and Williamson Murray, eds., *The Culture of Military Organizations* (New York: Cambridge Univ. Press, 2019); Terry Terriff, "Warriors and Innovators: Military Change and Organizational Culture in the US Marine Corps," *Defence Studies* 6, no. 2 (June 1, 2006): 215–47; Suzanne C. Nielsen, *An Army Transformed: The U.S. Army's Post-Vietnam Recovery and the Dynamics of Change in Military Organizations* (Carlisle: Strategic Studies Institute, 2010); Andrew Hill, "Military Innovation and Military Culture," *Parameters; Carlisle Barracks* 45, no. 1 (Spring 2015): 85–98; Timothy Moy, *War Machines: Transforming Technologies in the U.S. Military, 1920-1940* (College Station: Texas A&M Univ. Press, 2001).

U.S. in its martial history. Specifically, he posited a national propensity to wage war with the aims of securing unconditional surrender from the adversary via the use of overwhelming firepower (rather than manpower), resulting in a strategic style of attrition or annihilation with an aversion to limited wars with incremental policy goals.[147] A veritable academic cottage industry within the literature has presented variations of Weigley's themes with an emphasis on the American stamp on the Revolution in Military Affairs. The works within this subgenre most pertinent to this dissertation include contributions from Tomes, Mahnken, Evangelista, Shue, and Biddle that draw from the American Way of War tradition.[148]

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[147] Russell Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (Bloomington: Indiana Univ. Press, 1973).

[148] A short list of works that fit within this genre include: Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Johns Hopkins Univ. Press, 1989); Colin S. Gray, "National Style in Strategy: The American Example," *International Security* 6, no. 2 (1981): 21–47; Stephanie Carvin and Michael John Williams, *Law, Science, Liberalism and the American Way of Warfare: The Quest for Humanity in Conflict* (Cambridge: Cambridge Univ. Press, 2014); Burk, James. *How 9/11 Changed Our Ways of War*. Stanford, California: Stanford Univ. Press, 2013. Works within this subgenre more specific to the American use of technology in warfare include: Robert R Tomes, *U.S. Defense Strategy from Vietnam to Operation Iraqi Freedom: Military Innovation and the New American Way of War, 1973- 2003* (New York: Routledge, 2007); Harvey Sapolsky, Benjamin Friedman, and Brendan Green, *U.S. Military Innovation since the Cold War: Creation Without Destruction* (New York: Routledge, 2009); Thomas G. Mahnken, *Technology and the American Way of War* (New York: Columbia Univ. Press, 2008); Adrian R. Lewis, *The American Culture of War: A History of US Military Force from World War II to Operation Enduring Freedom* (Routledge, 2014); Antulio J. II Echevarria, *Reconsidering the American Way of War: US Military Practice from the Revolution to Afghanistan* (Washington: Georgetown Univ. Press, 2014); Barton C. Hacker and Margaret Vining, *American Military Technology: The Life Story of a Technology* (Westport: Greenwood Publishing Group, 2006); Ben Buley, *The New American Way of War: Military Culture and the Political Utility of Force* (New York: Routledge, 2007); Matthew Evangelista, Henry Shue, and Tami Davis Biddle, *The American Way of Bombing: Changing Ethical and Legal Norms, from Flying Fortresses to Drones* (Ithaca: Cornell Univ. Press, 2014).

Following Farrell and Terry's taxonomy, another set of works adjacent to the field of military innovation explores the emulation phenomenon. One branch of this literature is concerned with the mechanics behind the diffusion of military technologies across the state system. Horowitz, Goldman, and Eliason are prominent voices in this arena, explaining why established military technologies spread across states. These studies range from institutionalist accounts that emphasize the material adoption-capacity of states in their quest to field advanced weaponry to variants that suggest that certain cultural factors are necessary to integrate advanced weaponry successfully.[149] For example, Horowitz examines the relative advantages or disadvantages for states to invest in R&D and assume the role of "first mover" by inventing a new weapon system that will most likely diffuse to competitors eventually. Goldman's account of diffusion is more dependent on the political culture of military and elite attitudes towards change as a precursor for successful emulation or rejection of the new way of war.

Related to military innovation studies and the diffusion literature are works from security scholars that focus on the phenomena of military isomorphism across armed forces of different states. In other words, the research puzzle that animates these works stems from the propensity of states to mimic the leading military

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[149] Emily O. Goldman and Leslie C. Eliason, eds., *The Diffusion of Military Technology and Ideas* (Stanford: Stanford Univ. Press, 2003); Emily O. Goldman, "Cultural Foundations of Military Diffusion," *Review of International Studies* 32, no. 1 (2006): 69–91; Michael Horowitz, *The Diffusion of Military Power: Causes and Consequences for International Politics* (Princeton: Princeton Univ. Press, 2010); Andrea Gilli and Mauro Gilli, "The Spread of Military Innovations: Adoption Capacity Theory, Tactical Incentives, and the Case of Suicide Terrorism," *Security Studies* 23, no. 3 (July 3, 2014): 513–47.

powers through the acquisition of advanced weaponry, regardless of actual strategic need. Here the focus is less on the mechanics of diffusion of advanced weapons but, instead, on the rationale and motivations that drive diffusion. Early sociological oriented work by Suchman and Eyre explained the normative links made across national circumstances that equated the procurement of advanced weaponry with increased sovereignty and modernity.[150] The landmark edited volume by Katzenstein in 1996 definitively established this approach as central to constructivist accounts of military power in IR.[151] Following this tradition, Pretorius further located the source of these tendencies within cultural norms rather than rationalist and institutional precursors. She then analyzed this transnational phenomenon via the lens of what she calls the "security imaginary."[152] Bas and Coe extended this macro approach to the questions of arms proliferation and diffusion of conventional weapons. Ford also took up this strand later in his work on small arms.[153] Building on her ground-breaking work on *New Wars* from the human

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[150] Mark C. Suchman and Dana P. Eyre, "Military Procurement as Rational Myth: Notes on the Social Construction of Weapons Proliferation," *Sociological Forum* 7, no. 1 (1992): 137–161. See also: Lucy Suchman, Karolina Follis, and Jutta Weber, "Tracking and Targeting: Sociotechnologies of (In)Security," *Science, Technology, & Human Values* 42, no. 6 (November 1, 2017): 983–1002.

[151] See, *The Culture of National Security: Norms and Identity in World Politics*, ed. Peter J. Katzenstein (New York: Columbia Univ. Press, 1996).

[152] Joelien Pretorius, "The Security Imaginary: Explaining Military Isomorphism," *Security Dialogue* 39, no. 1 (2008): 99–120 and Joelien Pretorius, "The Technological Culture of War," *Bulletin of Science, Technology & Society* 28, no. 4 (August 1, 2008): 299–305.

[153] Muhammet A. Bas and Andrew J. Coe, "Arms Diffusion and War," *Journal of Conflict Resolution* 56, no. 4 (August 1, 2012): 651–74; Matthew Ford, *Weapon of Choice: Small Arms and the Culture of Military Innovation*, 1 edition (New York: Oxford Univ. Press, 2017).

security perspective, Mary Kaldor has expanded on this notion of transnational isomorphism and located its source in what she calls "global security cultures" (I will expand on this framing further in Chapter 3.)[154] The overarching thesis of this subgroup within the Military Innovation literature is that the logic of appropriateness drives individuals and institutions rather than a pure logic of consequence.

Closely related to accounts that emphasize culture, several influential works have sought to map the links between specifically American politics and technological advances in the military sphere. Much of this literature approaches the subject in a policy-oriented, mainstream fashion. For example, a number of accounts are primarily concerned with the political economy surrounding this relationship and find explanatory power in the logic of institutional interests. Case in point, Ruttan posits that if not for the expansive military investment post-WW II, the US would not have the significant technological advances of the 20th and 21st centuries. He also opines that U.S. economic expansion in mass production, commercial aviation, information technology, and space industry owes their size and breadth to the Cold War conflict. As his title suggests, war is necessary for

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[154] Mary Kaldor, "The Weapons Succession Process," *World Politics* 38, no. 4 (1986): 577–95; Mary Kaldor, *New and Old Wars: Organised Violence in a Global Era* (Malden: Polity Press, 2013). See especially Mary Kaldor, *Global Security Cultures*, 1 edition (Medford: Polity, 2018). It should be mentioned that Kaldor drew inspiration from Christopher Daase's concept of security culture. See Christopher Daase, "Wandel der Sicherheitskultur," *Aus Politik und Zeitgeschichte* 50 (December 13, 2010). For the related English conceptualization: Christopher Daase, "On Paradox and Pathologies: A Cultural Approach to Security," in *Transformations of Security Studies: Dialogues, Diversity and Discipline*, ed. Gabi Schlag, Julian Junk, and Christopher Daase (New York: Routledge, 2015).

economic growth, even if that war is cold.[155] But the question of impetus or why the US military took up such extreme measures (pouring billions of dollars into research and development) in the face of superpower competition is simply left unexplored. From a similar political-economic angle Dombrowski and Gholz evaluate the origins of network-centric-warfare. In their telling, Secretary of Defense Rumsfeld's quest to transform the U.S. military by incorporating IT innovations from the civilian commercial market. They diagnose the failure in implementing a sweeping transformation of military affairs as a casualty of the unrecognized political cost such an enterprise would entail. Transforming Pentagon institutions and upending established relationships in the defense industry required a level of political will and an initial investment of tax dollars that ultimately proved too high.[156] As an intervention into the varieties of capitalism literature, Weiss also considers the relationship between technoscience and security politics. She suggests that the US and its rise to economic prominence were not merely due to its liberal market economy. Instead, its variant of capitalism was more of a coordinated market economy with its competitive edge gained through military research and the development of dual-use technologies. The large and well-funded National Security State (here encompassing and somewhat redefining the military-industrial complex) precipitated technoscientific innovation leading to

[155] Vernon Ruttan, *Is War Necessary for Economic Growth? Military Procurement and Technological Development* (New York, NY: Oxford Univ. Press, 2006).

[156] Peter Dombrowski and Eugene Gholz, *Buying Military Transformation: Technological Innovation and the Defense Industry* (New York, NY: Columbia Univ. Press, 2006).

unprecedented economic growth. In her telling, this hybrid state, along with its hybrid capitalism, was induced by geopolitics (a rather simplistic version of global politics.) However, Weiss does little to explore these external dynamics.[157] In other words, in the story of how technoscientific advance was spurred on by national security state treats external, international factors that are treated as exogenous shocks rather than an integral logic of competition driving the process.

Taking an entirely different examination of the national security state, Der Derian includes media and entertainment in his survey of postmodern warfare. In *Virtuous War*, he considers the confluence of virtuous rationales for US military interventions at the end of the Cold War and the rise in virtual simulation technologies within the US military. He rechristens the familiar antagonist, the "military-industrial media entertainment network" or the MIME-NET for short. In a fascinating tour highlighting how both the military and Hollywood promote virtual reality and simulation technology, Der Derian considers the ramifications of this technological embrace for the actual waging of war. He eloquently demonstrates the power of the MIME-NET to structure how security is made real from virtual reality when simulations are relied upon for operational planning and training. Here, Virilio (echoing the pessimism surrounding globalization and the worry of Posthumanism) suggests a postmodernist virtual theory of IR that reads military preparations and simulation as text: US military force in the post-Cold War

[157] Linda Weiss, *America Inc.? Innovation and Enterprise in the National Security State* (Ithaca, NY: Cornell Univ. Press, 2014)

context is always virtuous and virtual through the lens of the MIME-NET. The technologies to simulate, prepare for and wage war through the RMA of network-centric warfare mediate the use of force. By this logic, technology structures security politics.[158] The weakest point of Der Derain's account is in his call for a virtual theory of war and peace that maintains a skeptical stance but stands for little else. A virtual theory of IR is a framework based on the observation that war and subsequently security is becoming further mediated through technology and virtually signified though no less lethal in its execution. However, little in this account points to the ultimate origin of military technoscience rather than the observation that global security politics is increasingly mediated by military innovations that tend towards acceleration. The technology here seems to arrive from elsewhere to mediate our understanding of international interactions.

Taking all of these accounts that stress the social sources of military technologies, one can identify several patterns within this scholarship. The first set of arguments pitted against technology-driven accounts locate their determinant variables at the macro level and rely on a singular, essential element to wrestle the analysis away from technological determinism. For instance, neorealist arguments against the Nuclear Revolution thesis or counterarguments to the Offense/Defense theory instead identify the generic impulse to gain power over one's rivals through

[158] James Der Derian, *Virtuous War: Mapping the Military-Industrial-Media-Entertainment Network* (Boulder, CO: Westview Press, 2001) and James Der Derian, "Virtuous War/Virtual Theory," *International Affairs* 76, no. 4 (Oct., 2000): pp. 771-788.

relative gains inherent in an anarchic system of states as the driver of conflict. In the case of the military-industrial complex thesis and historical arguments against the Military Revolution, the causal factors are timeless economic incentives. For Clausewitzian traditionalists arguing against the RMA's technophilic optimism, it is the immutable nature of war that provides the impetus for conflict.

It should be noted that the primary question for these accounts, contrary to the technological determinist model, is what drives conflict overall. As such, there is less of an exploration of what causes military innovation. These counterarguments' essentialism renders them less tenable to explain the emergence of any specific military technology like submarines, aircraft carriers, drones, or autonomous weapons. Considering the Military Innovation literature that obviously engages with the sources of military technology, there is a distinct shift from the macro level of analysis to the meso. Forgoing generalizability and parsimony in favor of specificity, these models locate the drivers of new military technologies in an instrumental account of politics. That is to say, states or institutions as subsidiaries of the state follow one of two logics: they are driven by either their distinct interests under the conditions of competition, or they follow their cultural proclivities to midwife new weapons. This truncates the horizon for a more comprehensive theory of why certain weapons are pursued instead of others and what effects international norms have on constraining or accelerating these developments.

Uninhabited Systems: From Drones to Lethal Autonomy

Narrowing the focus to the specific arms technologies that are the subjects of this dissertation, the collected literature on drones and autonomous weapons covers a broad spectrum of issues. While it is important to analyze how these two categories of military technologies are related both technically and in political discourse, the distinction between them is also imperative. As per the suggestion of Scharre, one can categorize both drones and AWS under the umbrella of *uninhabited* weapons rather than *unmanned,* considering that UAVs are piloted remotely. Thus, they are manned in some sense.[159] Therein lies the distinction between the two weapons technologies: drones are teleoperated by a pilot for critical portions of their sorties, while lethal robots are designed to operate with little to no human intervention throughout their missions. While it is essential to keep these differences in mind, this dissertation acknowledges that the development of drones and their use by the U.S. is directly linked to autonomous weapons in both political and technical terms. First, I will consider the literature on drones and then turn to autonomous weapons.

The advent of uninhabited drone warfare has captured the wider public's attention beyond both the academic and national security practitioner communities. Attest to by the volume of reports on the subject in both print and broadcast news,

[159] Again, the language surrounding these weapons are highly charged with political implications between military practitioners and civilian critics. Indeed, the use of the term unmanned has political implications between and within military institutions. See: Paul Scharre, *Army of None: Autonomous Weapons and the Future of War*, 1 edition (New York: W. W. Norton & Company, 2018).

the subject of autonomous weapons is a live issue lodged in the publics' mind.[160] In terms of the literature, many journalistic works that deal in-depth with drone warfare have enjoyed popularity in the mass market. The “Current Events” self of nearly any local bookstore will bear out the observation that the issue of drone strikes has captured an appreciable amount of attention among the general public. One work that stands out in this genre is Whittle’s insider account of how the U.S. military developed, armed, and ultimately used the iconic MQ-1 Predator UAV in the war on terror. Here he details the circuitous route taken by defense contractors, individual officers within the Air Force, and leadership in the CIA to first transform a relatively lackluster UAV program into a startling ISR (standing for Intelligence, Surveillance, and Reconnaissance) platform during the U.S. military air war in the Balkans and then to the crash course in arming the Predator drone for its now-infamous role as a strike aircraft against Al-Qaeda.[161] Some of the better works

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[160] News coverage of drone technology is quite expansive and somewhat beyond the scope of this project. But it does indicate the salience of the issue across the wider public and the importance of the issue politically. A quick search for the terms drone strike, military drone, killer robot, and variation on that theme (in order to exclude articles on the topic of domestic, hobby drones) on Lexis Uni from 2001 until the end of 2019 results in 2,200 print articles in major U.S. newspapers. Searching the Stanford Cable TV News Analyzer that scours the transcripts of broadcasts, the topic of drones take up 2,800 seconds over 517 individual segments on cable news from 2010 to 2020. For comparison, the subject of military fighter aircraft (or variants on that search term) resulted in 423 seconds in 440 segments over the same time frame. In other words, drone warfare was at least 6 times more prevalent in cable news discourse than mentions of the general issues concerning military aircraft. See: https://tvnews.stanford.edu/

[161] Richard Whittle, *Predator: The Secret Origins of the Drone Revolution*, Reprint edition (New York: Henry Holt and Co., 2015). For a deeper history see: Thomas P. Ehrhard, “Air Force UAVs: The Secret History” (Arlington: The Mitchell Institute for Airpower Studies, July 2010). See also: Konstantin Kakaes, “From Orville Wright to September 11: What the History of Drone Technology Says About Its Future,” in *Drone Wars: Transforming Conflict, Law, and Policy*, ed. Peter L. Bergen and Daniel Rothenberg (New York: Cambridge Univ. Press, 2014), 359–87.

beyond Whittle's inside history to survey the impact of this technology on warfare include Arkin, Woods, and Cockburn's works.[162] Notable books in this genre take an activist stance against drone strikes from a left-wing standpoint or take aim at the Obama administration, particularly from a right-wing perspective.[163] What is common across many of these journalistic accounts are two salient points. First, the use of UAV technology by the U.S. for military actions in Iraq, Afghanistan, and especially in counter-terrorism operations in Pakistan, Yemen, and Sudan marks a sea change in the conduct of warfighting. In this common assertion, a soft version

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[162] William M. Arkin, *Unmanned: Drones, Data, and the Illusion of Perfect Warfare* (New York: Little, Brown and Company, 2015); Chris Woods, *Sudden Justice: America's Secret Drone Wars* (New York: Oxford Univ. Press, 2015); Andrew Cockburn, *Kill Chain: The Rise of the High-Tech Assassins*, Reprint edition (New York: Picador, 2016). Other notable works in the journalistic genre that deal with drone warfare include Daniel Byman, "Why Drones Work: The Case for Washington's Weapon of Choice Essay," *Foreign Affairs* 92, no. 4 (2013): 32–43; Audrey Kurth Cronin, "Why Drones Fail: When Tactics Drive Strategy Essay," *Foreign Affairs* 92, no. 4 (2013): 44–54; Ann Rogers and John Hill, *Unmanned: Drone Warfare and Global Security* (Toronto: Pluto Press, 2014); Richard Whittle, *Predator: The Secret Origins of the Drone Revolution*, Reprint edition (New York: Henry Holt and Co., 2015); Benjamin Wittes and Gabriella Blum, *The Future of Violence: Robots and Germs, Hackers and Drones: Confronting a New Age of Threat* (New York: Basic Books, 2015); David E Sanger, "Cyber, Drones, and Secrecy," in *Understanding Cyber Conflict: Fourteen Analogies*, ed. George Perkovich and Ariel E. Levite (Washington: Georgetown Univ. Press, 2017), 19; Nicholas Grossman, *Drones and Terrorism: Asymmetric Warfare and the Threat to Global Security* (London ; New York: I.B. Tauris, 2018); The New York Times Editorial Staff, ed., *Drone Warfare*, 1st Edition (New York Times Educational Publishing, 2019).

[163] For example, see Medea Benjamin, *Drone Warfare: Killing by Remote Control*, Killing by Remote Control (London: Verso, 2013); Jeremy Scahill and Edward Snowden, *The Assassination Complex: Inside the US Government's Secret Drone Warfare Programme* (New York: Simon & Schuster, 2016); and Marjorie Cohn and Archbishop Desmond Tutu, *Drones and Targeted Killing: Legal, Moral, and Geopolitical Issues* (Northampton MA: Olive Branch Press, 2014) for leftist critiques. For other critical perspectives on the topic see: Daniel Klaidman, *Kill or Capture: The War on Terror and the Soul of the Obama Presidency*, 1st Edition (Mariner Books, 2012); Lloyd C. Gardner, *Killing Machine: The American Presidency in the Age of Drone Warfare* (New York: The New Press, 2013); Mark Moyar, *Strategic Failure: How President Obama's Drone Warfare, Defense Cuts, and Military Amateurism Have Imperiled America* (Threshold Editions, 2015); Scott Shane, *Objective Troy: A Terrorist, a President, and the Rise of the Drone* (New York: Tim Duggan Books, 2015).

of technological determinism is evident. Second, drone strikes posed ethical and legal quandaries that have not been sufficiently addressed by the U.S. state, according to the vast majority of authors writing in this space. Given that these are works focused on reportage, there is less emphasis on analyzing these questions than merely presenting them as matters of debate.

The level of interest in drone warfare within academia mirrored that across the broader public with an explosion in publications that examine this new military technology's political implications. Two surveys are regarded as definitive on the subject: Boyle’s 2013 article and the co-authored Kaag and Kreps book provide a sweeping survey of drone warfare issues.[164] Following the same organizational logic of the reportage above, we can detail how IR scholars applied fine-tuned analysis to these issues and disaggregate the sub-debates over military UAVs into two broad areas. The first set of debates are concerned with changes to warfare, while the second set revolves around drone strikes’ ethico-legal implications.

While there is a degree of crossover between these two facets of drone warfare, the potential military-institutional impacts of this new weapons technology are far-reaching. One of the better overviews of drone warfare from the military

[164] Michael J. Boyle, “The Costs and Consequences of Drone Warfare,” *International Affairs* 89, no. 1 (January 1, 2013): 1–29; John Kaag and Sarah Kreps, *Drone Warfare*, 1 edition (Polity, 2014). For another comprehensive overview see: Avery Plaw, Matthew S. Fricker, and Carlos Colon, *The Drone Debate: A Primer on the U.S. Use of Unmanned Aircraft Outside Conventional Battlefields* (New York: Rowman & Littlefield, 2015).

perspective is Kreuzer's sober and evenhanded work.[165] He points out that at the micro-level of analysis, there is the general concern that this type of remote warfare erodes the warrior ethos, challenging the culture of martial honor and what it means to be a warrior so far removed from the battlefield. Relatedly, there are many studies on the moral injury and surprisingly high level of PTSD among UAV pilots that experience the extreme juxtaposition remotely contributing to overseas battles including killing from above, but then returning to home life in the suburbs immediately after being on the station.[166] These observations highlight another aspect of drone warfare from the macro perspective, where this technology redefines what constitutes the battlefield itself, given the physical dislocation of combatants engaging in a counter-terrorism campaign that is literally on the other side of the world.[167] These two aspects highlight the difficulties that institutions within the military experience that Kreuzer details in terms of an institutional

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[165] Michael P. Kreuzer, *Drones and the Future of Air Warfare: The Evolution of Remotely Piloted Aircraft*, Cass Military Studies (New York: Routledge Taylor & Francis Group, 2016).

[166] Marouf Hasian, *Drone Warfare and Lawfare in a Post-Heroic Age* (Tuscaloosa: Univ. Alabama Press, 2016) and M. Shane Riza, *Killing without Heart: Limits on Robotic Warfare in an Age of Persistent Conflict*, 2013; Joseba Zulaika, *Hellfire from Paradise Ranch: On the Front Lines of Drone Warfare*, First edition (Oakland, California: Univ. of California Press, 2020) and Christian Enemark, "Drones, Risk, and Moral Injury," *Critical Military Studies* 5, no. 2 (April 3, 2019): 150–67; and Hugh Gusterson, "Toward an Anthropology of Drones: Remaking Space, Time, and Valor in Combat," in *The American Way of Bombing: Changing Ethical and Legal Norms, from Flying Fortresses to Drones*, ed. Matthew Evangelista and Henry Shue (Ithaca: Cornell Univ. Press, 2014), 191–206.

[167] Ian G. R. Shaw, *Predator Empire: Drone Warfare and Full Spectrum Dominance* (Minneapolis: Univ. of Minnesota Press, 2016); Peter Adey, Mark Whitehead, and Alison Williams, eds., *From above: War, Violence, and Verticality*, First edition, Critical War Studies Series (New York: Oxford Univ. Press, 2013); Robert Heinsch, "Modern Drone Warfare and the Geographical Scope of Application of IHL: Pushing the Limits of Territorial Boundaries?," in *Research Handbook on Remote Warfare*, ed. Jens David Ohlin (Northampton: Edward Elgar Publishing, 2017), 79–109.

culture that casts aspersions on drone pilots and the professional morass UAV crews face within the Air Force. Many pathbreaking studies have further explored this ambivalence within military institutions towards this weapons innovation by utilizing hypothetical scenarios and wargaming as an experimental method to explore attitudes towards drones within the military.[168]

Turning to the relationship between this new weapons technology and the policy field, there are several different strategic questions concerning drones. For example, there is a robust debate over the military effectiveness of drone strikes. Do UAV attacks in the service of counterterrorism significantly reduce the lethality of terrorist networks, or are they actually counterproductive because they radicalize the victims of drone strikes and push local communities into the arms of militant networks?[169] While statistical analysis suggests that these methods have degraded Al-Qaeda and other militant networks, the relative inaccessibility of these networks and the challenges of accurately surveying populations' political attitudes render this controversy unresolved. Another policy facet of drone warfare explored in the

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[168] Thomas G. Mahnken and James R. Fitzsimonds, "Revolutionary Ambivalence: Understanding Officer Attitudes toward Transformation," *International Security* 28, no. 2 (2003): 112–48; Julia Macdonald and Jacquelyn Schneider, "Battlefield Responses to New Technologies: Views from the Ground on Unmanned Aircraft," *Security Studies* 28, no. 2 (March 15, 2019): 216–49.

[169] Michael J. Boyle, "Is the US Drone War Effective?," *Current History* 112, no. 751 (April 1, 2014): 137–43; Patrick B. Johnston and Anoop K. Sarbahi, "The Impact of US Drone Strikes on Terrorism in Pakistan," *International Studies Quarterly* 60, no. 2 (June 1, 2016): 203–19; Megan Smith and James Igoe Walsh, "Do Drone Strikes Degrade Al Qaeda? Evidence from Propaganda Output," *Terrorism and Political Violence* 25, no. 2 (April 1, 2013): 311–27; Keith P. Feldman, "Empire's Verticality: The Af/Pak Frontier, Visual Culture, and Racialization from Above," *Comparative American Studies: An International Journal* 9, no. 4 (December 1, 2011): 325–41; and Christopher J. Coyne and Abigail R. Hall, "The Drone Paradox: Fighting Terrorism with Mechanized Terror," *The Independent Review* 23, no. 1 (2018): 51–67.

literature is the hypothesis that this new technology lowers the threshold for the use of force overall. In general, countries develop or acquire unmanned strike weapons to reduce the cost of precision airstrikes in both terms of blood and treasure. This argument supposes that once those costs are marginally negligible, then even democratically accountable leadership will revert to the use of force rather than seek more peaceful alternatives, thereby encouraging the use of force overall. While this hypothesis relies on a counterfactual logic of opportunity costs (the use of military power that would not have occurred if not for drone technology,) the increase in the use of UAVs for military attacks suggests that there is some grain of truth to this perspective. One can also anticipate this strategic logic playing a role in the use of drones by other state actors.[170] Related to this macro perspective, the literature has also taken up the issue of drone proliferation and what that portends for strategic stability in international security. The general concern over the proliferation of drone technology across countries and non-state actors is a cause for alarm among a number of academic observers, while some discount the novelty and strategic value of drones, *per se*, echoing previous skepticism over the RMA thesis.[171]

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[170] Geoffrey Corn, "Drone Warfare and the Erosion of Traditional Limits on War Powers," in *Research Handbook on Remote Warfare*, ed. Jens David Ohlin (Northampton: Edward Elgar Publishing, 2017), 247–72; Amy Zegart, "Cheap Fights, Credible Threats: The Future of Armed Drones and Coercion," *Journal of Strategic Studies* 43, no. 1 (January 2, 2020): 6–4; and James Igoe Walsh and Marcus Schulzke, *Drones and Support for the Use of Force* (Ann Arbor: Univ. of Michigan Press, 2018).

[171] Ulrike Esther Franke, "The Global Diffusion of Unmanned Aerial Vehicles (UAVs), or 'Drones,'" in *Precision Strike Warfare and International Intervention: Strategic, Ethico-Legal and Decisional Implications*, ed. Mike Aaronson et al. (Routledge, 2014), 52–72; Michael C.

While the academic work on the military and policy implications of drone technology is expansive, an even larger portion of the academic literature is dedicated to drone warfare's ethical and legal implications. Indeed, much of the critical work detailed above is underwritten by a general moral objection to the use of remotely piloted strikes. Notable in the particular vein are works by Shaw, Chamayou, and Gregory that decry the ethical shortfalls of the U.S. drone strike program.[172] One component of this moral objection is rooted in the micro-level of analysis where the use of UAVs from afar dehumanizes potential targets by essentially making combat a video game for drone operators, desensitizing pilots to the act of killing.[173] This is mirrored by the psychological effects for civilians on the ground living under the specter of drone strikes that seemingly come out of nowhere, creating the ethical dilemma that UAVs create the conditions of literal terror for non-combatants, especially children.[174]

Horowitz, Sarah E. Kreps, and Matthew *Fuhrmann*, "Separating Fact from Fiction in the Debate over Drone Proliferation," *International Security* 41, no. 2 (October 1, 2016): 7–42. The skepticism over UAV proliferation is born from a general disbelief that the technology is novel or game changing. For a succinct exposition of this position see Lawrence D. Freedman, "The Drone Revolution," *Foreign Affairs* 95, no. 6 (October 19, 2016): 153–58.

[172] Shaw, *Predator Empire*; Grégoire Chamayou, *A Theory of the Drone* (New York: The New Press, 2015); Derek Gregory, "The Everywhere War," *The Geographical Journal* 177, no. 3 (June 24, 2011): 238–50; and Derek Gregory, "From a View to a Kill: Drones and Late Modern War," *Theory, Culture & Society* 28, no. 7–8 (December 1, 2011): 188–215.

[173] Hugh Gusterson, Drone: Remote Control Warfare (Cambridge, Massachusetts: The MIT Press, 2016); Neil C. Renic, "A Gardener's Vision: UAVs and the Dehumanization of Violence," Survival 60, no. 6 (November 2, 2018): 57–72.

[174] James Cavallaro, Stephan Sonnenberg, and Sarah Knuckey, "Living Under Drones: Death, Injury, and Trauma to Civilians from US Drone Practices in Pakistan" (Stanford; New York: Stanford: International Human Rights and Conflict Resolution Clinic, Stanford Law School; New York: NYU School of Law, Global Justice Clinic, 2012), *https://law.stanford.edu/publications/living-under-drones-death-injury-and-trauma-to-civilians-*

These ethical considerations feed into the legal implications of drone strikes at the international level. The international laws of armed combat enshrined in treaties like the Geneva Conventions and rooted in customary law like that of the just war tradition certainly draw from ethical considerations outlined above. In the case of remotely operated, uninhabited weapons, several principles of international law already apply to these weapons.[175] One aspect that the literature has focused on in the last decade is the evolution of the taboo against assassination as an acceptable policy of states that has evolved into the broad argument in favor of "targeted killings" in counterterrorism operations now made more feasible by UAVs.[176] Carvin and Vogle aptly point out that legal objections to drone warfare conflate the objectionable policy choice (targeted killing) with the purportedly novel weapons

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*from-us-drone-practices-in-pakistan/***.** See also: Lisa Parks and Caren Kaplan, eds., *Life in the Age of Drone Warfare* (Durham: Duke Univ. Press Books, 2017).

[175] Allenby, Brad, "How to Manage Drones: Transformative Technologies, the Evolving Nature of Conflict, and the Inadequacy of Current System of Law," in *Drone Wars: Transforming Conflict, Law, and Policy*, ed. Peter L. Bergen and Daniel Rothenberg (New York, NY: Cambridge Univ. Press, 2014), 421–40; Bart Custers, *The Future of Drone Use: Opportunities and Threats from Ethical and Legal Perspectives* (Springer, 2016); James DeShaw Rae, *Analyzing the Drone Debates: Targeted Killing, Remote Warfare, and Military Technology* (Springer, 2014).

[176] B. Strawser et al., *Opposing Perspectives on the Drone Debate* (New York: Springer, 2014); Peter L. Bergen and Daniel Rothenberg, eds., *Drone Wars: Transforming Conflict, Law, and Policy* (New York: Cambridge Univ. Press, 2014); Marjorie Cohn and Archbishop Desmond Tutu, *Drones and Targeted Killing: Legal, Moral, and Geopolitical Issues* (Northampton MA: Olive Branch Press, 2014); Robert Heinsch, "Modern Drone Warfare and the Geographical Scope of Application of IHL: Pushing the Limits of Territorial Boundaries?," in *Research Handbook on Remote Warfare*, ed. Jens David Ohlin (Northampton: Edward Elgar Publishing, 2017), 79–109; Gabriella Blum and Philip Heymann, "Law and Policy of Targeted Killing," *Harvard National Security Journal* 1 (2010): 145–70; and Ian Hurd, "Targeted Killing in International Relations Theory: Recursive Politics of Technology, Law, and Practice," *Contemporary Security Policy* 38, no. 2 (May 4, 2017): 307–19.

technology resulting in confusion rather than moral clarity.[177] Others like Crawford have pointed out that this type of warfare from a distance still confounds the need for accountability in war under International Humanitarian Law (IHL.)[178] The details of these issues surrounding IHL hinge on the *jus in bello* principles of distinction and proportionality in the conduct of warfare. The principle of distinction imposes the responsibility upon armed forces to distinguish between combatants and non-combatant when using force. Both Gregory and Zehfuss point out how the use of this new technology has lowered the adherence to this standard while feigning legality via faith in precision.[179] While some amount of collateral damage to civilians in terms of deaths, injury, or material destruction is acceptable if the use of force serves a military necessity, it must be minimized according to international law. This is key to the further principle of proportionality that states must limit the destruction they visit on an enemy to be relatively equal to damage

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[177] Stephanie Carvin, "Getting Drones Wrong," The International Journal of Human Rights 19, no. 2 (February 17, 2015): 127–41; Ryan J. Vogel, "Droning On: Controversy Surrounding Drone Warfare Is Not Really About Drones," The Brown Journal of World Affairs 19, no. 2 (2013): 111–21. See also: P. W. Singer, "The Five Deadly Flaws of Talking About Emerging Military Technologies and the Need for New Approaches to Law, Ethics, and War," in *Drone Wars: Transforming Conflict, Law, and Policy*, ed. Peter L. Bergen and Daniel Rothenberg (New York: Cambridge Univ. Press, 2014), 215–29; and Charli Carpenter and Lina Shaikhouni, "Don't Fear the Reaper," Foreign Policy (blog), June 7, 2011, https://foreignpolicy.com/2011/06/07/dont-fear-the-reaper/

[178] Neta C. Crawford, "Accountability for Targeted Drone Strikes Against Terrorists?," *Ethics & International Affairs* 29, no. 1 (ed 2015): 39–49; David Cortright, Rachel Fairhurst, and Kristen Wall, eds., *Drones and the Future of Armed Conflict: Ethical, Legal, and Strategic Implications* (Chicago: Univ. of Chicago Press, 2015); Allen Buchanan and Robert O. Keohane, "Toward a Drone Accountability Regime," *Ethics & International Affairs* 29, no. 1 (ed 2015): 15–37.

[179] Thomas Gregory, "Targeted Killings: Drones, Noncombatant Immunity, and the Politics of Killing," *Contemporary Security Policy* 38, no. 2 (May 4, 2017): 212–36; Maja Zehfuss, "Targeting: Precision and the Production of Ethics," *European Journal of International Relations* 17, no. 3 (September 1, 2011): 543–66

incurred or anticipated from a foe on the battlefield. Critics charge that the use of drones exacerbates attempts to adhere to these principles, given that distinguishing between civilians and combatants is already tricky in counterterrorism operations and is relatively impossible from above and transmitted halfway around the world.[180] Pushback to these objections suggests that the precision of these new weapons technologies renders them more in line with IHL and is more ethical in that they spare U.S. service members' lives.[181]

However, the extensive use of drone strikes by the U.S., especially in countries that are not declared zones of conflict like Pakistan and Yemen, has caused a great deal of controversy over casualty counts and who is deemed a killed combatant versus a civilian. While undeclared as an instrument of state policy, drone strikes were one of the worst kept secrets in U.S. covert action history and

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[180] Daniel Brunstetter and Megan Braun, "The Implications of Drones on the Just War Tradition," *Ethics & International Affairs* 25, no. 3 (ed 2011): 337–58; Vik Kanwar, "Post-Humanitarian Law: The Was of War in the Age of Robotic Weapons," *Harvard National Security Journal* 2, no. Journal Article (2011): 616–28; Ezio Di Nucci and Filippo Santoni de Sio, eds., *Drones and Responsibility: Legal, Philosophical and Socio-Technical Perspectives on Remotely Controlled Weapons*, Emerging Technologies, Ethics and International Affairs (Burlington: Ashgate, 2016); Marcus Schulzke, *The Morality of Drone Warfare and the Politics of Regulation*, New Security Challenges (London: Palgrave Macmillan UK, 2016); Joseph Pugliese, "Prosthetics of Law and the Anomic Violence of Drones," *Griffith Law Review* 20, no. 4 (January 1, 2011): 931–61; Conway Waddington, "Drones: Degrading Moral Thresholds for the Use of Force and the Calculations of Proportionality," in *Precision Strike Warfare and International Intervention: Strategic, Ethico-Legal and Decisional Implications*, ed. Mike Aaronson et al. (London: Routledge, 2014), 114–32; and Margarita Petrova, "Proportionality and Restraint on the Use of Force: The Role of Nongovernmental Organizations," in *The American Way of Bombing: Changing Ethical and Legal Norms, from Flying Fortresses to Drones*, ed. Matthew Evangelista and Henry Shue (Ithaca: Cornell Univ. Press, 2014), 175–90.

[181] Bradley Jay Strawser, "Moral Predators: The Duty to Employ Uninhabited Aerial Vehicles," *Journal of Military Ethics* 9, no. 4 (December 1, 2010): 342–68.

were finally acknowledged as a policy tool by the Obama administration in 2013.[182] By that time, there had already been a concerted effort by journalists and NGOs to track UAV strikes in detail, with wildly divergent counts between official reports of collateral damage and independent tracking of extensive civilian casualties.[183] This controversy was highlighted by the move from targeted killings of specific, high-value targets within the Al-Qaeda hierarchy to what are called "signature strikes." In order to find, track, and eventually kill particular targets, U.S. counterterrorism forces collected an incredible amount of intelligence data in the form of video feeds, cell phone triangulation, geolocation data of specific houses, daily routines of suspected terrorists, and mapping the network of relationships between individuals surveilled. The drones utilized enabled this collection of data

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[182] "U.S. Government Releases Casualty Report, Executive Order, and Presidential Policy Guidance Related to Its Counterterrorism Strike Practices," *The American Journal of International Law* 110, no. 4 (2016): 814–26; Conor Friedersdorf, "Obama's Weak Defense of His Record on Drone Killings," *The Atlantic*, December 23, 2016, *https://www.theatlantic.com/politics/archive/2016/12/president-obamas-weak-defense-of-his-record-on-drone-strikes/511454/*; Jo Becker and Scott Shane, "Secret 'Kill List' Proves a Test of Obama's Principles and Will," *The New York Times*, May 29, 2012, sec. World, *https://www.nytimes.com/2012/05/29/world/obamas-leadership-in-war-on-al-qaeda.html*. Barak Obama, "Remarks by the President at the National Defense Univ." (Fort McNair, Washington DC, May 23, 2013), *https://obamawhitehouse.archives.gov/the-press-office/2013/05/23/remarks-president-national-defense-Univ.*.

[183] Abigail Fielding-Smith, Jessica Purkiss, and Payenda Sargand, "Drone Warfare," The Bureau of Investigative Journalism, September 4, 2020, *https://www.thebureauinvestigates.com/projects/drone-war*; Bill Roggio, "US Airstrikes in the Long War," Foundation for the Defense of Democracy: Long War Journal, September 4, 2020, *https://www.longwarjournal.org/us-airstrikes-in-the-long-war*; Peter L. Bergen, David Sterman, and Melissa Salyk-Virk, "America's Counterterrorism Wars," New America, March 30, 2020, *http://newamerica.org/international-security/reports/americas-counterterrorism-wars/*. See also: Peter L. Bergen and Rowland, Jennifer, "Decade of the Drone: Analyzing CIA Drone Attacks, Casualties, and Policy," in *Drone Wars: Transforming Conflict, Law, and Policy*, ed. Peter L. Bergen and Daniel Rothenberg (New York, NY: Cambridge Univ. Press, 2014), 12–41; Avery Plaw, Matthew S. Fricker, and Brian Glyn Williams, "Practice Makes Perfect?," *Perspectives on Terrorism* 5, no. 5–6 (December 2011): 51–69.

given the visual and electronic capabilities of these platforms, coupled with their ability to loiter over a target area for well over twelve hours at a time. Collating all of this information in real-time, national security practitioners built the central database known as the disposition matrix. This database enabled targeting officers to perform "pattern of life" analysis based on these observations, and drone strikes were increasingly based more on behavior observed in real-time rather than on verified identification of individual, pre-designated suspected terrorists. For instance, a truck leaving a house associated with a member of Al-Qaeda, with a phone on board identified as belonging to a member of the network, was automatically targeted. If there were multiple adult aged males in the back of the truck who were visually confirmed as carrying weapons, they were deemed viable combatants without any other corresponding information. Their deaths were counted as militants killed rather than civilians. Several academic critics of this practice have taken issues with these drone strikes from a variety of ethico-legal angles.[184]

Turning our attention to autonomous weapon systems, the academic literature follows a similar pattern with that of UAVs: there are a number of

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[184] Amitai Etzioni, "The 'Secret' Matrix," *The World Today* 66, no. 7 (July 2010): 11–14; Lauren Wilcox, "Embodying Algorithmic War: Gender, Race, and the Posthuman in Drone Warfare," *Security Dialogue* 48, no. 1 (February 1, 2017): 11–28; Keith P. Feldman, "Empire's Verticality: The Af/Pak Frontier, Visual Culture, and Racialization from Above," *Comparative American Studies: An International Journal* 9, no. 4 (December 1, 2011): 325–41; Peter Adey, Mark Whitehead, and Alison Williams, eds., *From above: War, Violence, and Verticality*, First edition, Critical War Studies Series (New York: Oxford Univ. Press, 2013); Matthew Crosston, "Pandora's Presumption: Drones and the Problematic Ethics of Techno-War," *Journal of Strategic Security* 7, no. 4 (2014): 1–24.

interventions that consider the impact on strategic-military affairs and an overabundance of commentary on the ethico-legal aspects of killer robots. As alluded to above, the development of AWS—especially in the form of aerial platforms—is inextricably linked to the use of drones. Each weapon technology has capabilities that appeal to military leaders on both tactical and strategic levels. Drones do not put pilots at risk, as they are less expensive, these weapons are more expendable, UAVs can remain over the target for much longer than manned options, and they allow for a certain amount of deniability. The iconic MQ-1 Predator was developed as an ISR asset that was later pressed into service as a strike platform with the remarkable additions of a satellite uplink and Hellfire missiles.[185] Use in uncontested air spaces allows for the impression that the U.S. has the capability to kill anyone, anywhere. However, the limitations of an RPA (control lag, datalink vulnerability, slow movement, relative lack of stealth) means that the current generation of UAVs is not capable enough for "high-end" combat directly with other armed forces. The Achilles' heel of UAVs—the datalinks with pilots—drive the logic for developing AWS to alleviate these weaknesses. In theory, machine intelligence will obviate the need for direct communication with the weapons platform and will increase maneuver speed well beyond that of manned

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[185] See Whittle, *Predator*. Interestingly, the AGM-114 Hellfire was also developed as an anti-tank missile for U.S. Army attack helicopters, a much different type of mission. Their technical development has had a very interesting arch as they have been retooled for the War on Terror. See Arthur Holland Michel, "Some Cautionary Notes on the New 'Knife Missile,'" Defense One, May 10, 2019, *https://www.defenseone.com/ideas/2019/05/some-cautionary-notes-new-knife-missile/156943/*.

jets. With autonomy, one does not have to fret over the satellite uplink, a pilot, poor visuals transmitted across the globe, or reaction time. This dynamic is well documented in two works that span nearly a decade, Singer's pathbreaking book on military robotics and Scharre's insightful update from the national security practitioner's point of view.[186]

In terms of anticipation of how autonomy in weapons will shape warfare, there are two primary threads in the literature. The first thrust echoes much of the similar concerns about drone warfare in that weapons that target and kill on their own completely dehumanize the conduct of war and pose even further challenges to military culture. On this point, many works highlight the difficulty of DoD institutions to wrestle with defining and efforts to maintain human control over this technology.[187] Indeed, one of the major impediments to this technology is the difficulty in creating a robust AI that can reliably adjust to the vagaries of combat

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[186] P. W. Singer, *Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century*, (New York, NY: Penguin Press, 2009); and Paul Scharre, *Army of None: Autonomous Weapons and the Future of War*, 1 edition (New York: W. W. Norton & Company, 2018). See also: Michael C. Horowitz, "Coming next in Military Tech," *Bulletin of the Atomic Scientists* 70, no. 1 (January 1, 2014): 54–62.

[187] Christopher Coker, *The Future of War: The Re-Enchantment of War in the Twenty-First Century*, Blackwell Manifestos (Malden: Blackwell Pub, 2004); Christopher Coker, "Still 'the Human Thing'? Technology, Human Agency and the Future of War," *International Relations* 32, no. 1 (March 1, 2018): 23–38; Erik Gartzke, "Blood and Robots: How Remotely Piloted Vehicles and Related Technologies Affect the Politics of Violence," *Journal of Strategic Studies*, October 3, 2019, 1–31; Valerie Morkevicius, "Tin Men: Ethics, Cybernetics and the Importance of Soul," *Journal of Military Ethics* 13, no. 1 (January 2, 2014): 3–19; and Anthony Swofford, "Why Clean War Is Bad War," *MIT Technology Review*, October 10, 2019, *https://www.technologyreview.com/s/614488/why-remote-war-is-bad-war/*.

without endangering ones' own troops or civilians.[188] The second thrust in the military policy vein is a growing concern over crisis escalation and strategic stability at machine speed. Considering that autonomous weapons are being designed for interstate conflict between nuclear powers (as seen in chapter 6), the maintenance of proper signaling and exercise of restraint in the use of force is a significant problem, even on the tactical level, when lethal decisions are handed over to autonomous systems.[189] As with drones before them, there is also a general worry over the proliferation of AWS across states and beyond to non-state actors.[190]

Again, mirroring the literature on UAV weapons technology, a large share of the academic literature on killer robots focuses on the ethics and international

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[188] Merel A. C. Ekelhof, "Lifting the Fog of War:: 'Autonomous Weapons' and Human Control through the Lens of Military Targeting," *Naval War College Review* 71, no. 3 (2018): 61–95; Merel Ekelhof, "Moving Beyond Semantics on Autonomous Weapons: Meaningful Human Control in Operation," *Global Policy* 10, no. 3 (2019): 343–48; and Anton Petrenko, "Beteeen Berserkgang and the Autonomous Weapons System," *Public Affairs Quarterly* 26, no. 2 (2012): 81–102.

[189] Jürgen Altmann and Frank Sauer, "Autonomous Weapon Systems and Strategic Stability," *Survival* 59, no. 5 (September 3, 2017): 117–42; Michael W. Meier, "The Strategic Implications of Lethal Autonomous Weapons," in *Research Handbook on Remote Warfare*, ed. Jens David Ohlin (Northampton: Edward Elgar Publishing, 2017), 443–78; Nathan Leys, "Autonomous Weapon Systems and International Crises," *Strategic Studies Quarterly* 12, no. 1 (2018): 48–73; Caitlin Talmadge, Todd S. Sechser, and Neil Narang, "Emerging Technology and Intra-War Escalation Risks: Evidence from the Cold War, Implications for Today," *Journal of Strategic Studies* 42, no. 6 (August 22, 2019): 864–87; Justin Haner and Denise Garcia, "The Artificial Intelligence Arms Race: Trends and World Leaders in Autonomous Weapons Development," *Global Policy* 10, no. 3 (2019): 331–37; Michael C. Horowitz, "When Speed Kills: Lethal Autonomous Weapon Systems, Deterrence and Stability," *Journal of Strategic Studies* 42, no. 6 (August 22, 2019): 764–88; James Johnson, "Artificial Intelligence & Future Warfare: Implications for International Security," *Defense & Security Analysis* 35, no. 2 (April 3, 2019): 147–69; Todd S. Sechser, Neil Narang, and Caitlin Talmadge, "Emerging Technologies and Strategic Stability in Peacetime, Crisis, and War," *Journal of Strategic Studies* 42, no. 6 (September 19, 2019): 727–35; James Johnson, "Artificial Intelligence, Drone Swarming and Escalation Risks in Future Warfare," *The RUSI Journal* 0, no. 0 (April 16, 2020): 1–11.

[190] Benjamin Wittes and Gabriella Blum, *The Future of Violence: Robots and Germs, Hackers and Drones: Confronting a New Age of Threat* (New York: Basic Books, 2015).

legal questions surrounding this emerging technology. Concerns expressed in this literature that focused on the practice of targeting killing with remotely piloted drones extends these qualms to possible targeted killing with autonomous platforms.[191] Thus, the links between the two technologies are pronounced, and the blurring of distinctions between ethical questions and legal questions is even more significant in the case of AWS. This is because of a very active discussion at the international level over possible arms control regulations of this technology are in their infancy. Interestingly, there is a great deal of concern over adherence to the laws of armed combat and IHL using these weapon technologies from within American military institutions.[192] In this sense, national security practitioners and the portion of security studies academics that specialize in the genre of policy prescriptions tend to focus on ethics, in particular on questions of how to keep the

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[191] Michael Carl Haas and Sophie-Charlotte Fischer, "The Evolution of Targeted Killing Practices: Autonomous Weapons, Future Conflict, and the International Order," *Contemporary Security Policy* 38, no. 2 (May 4, 2017): 281–306. For a rejoinder that discounts the link between the two technologies see: Werner J.A. Dahm, "'Drones' Now and What to Expect Over the Next Ten Years," in *Drone Wars: Transforming Conflict, Law, and Policy*, ed. Peter L. Bergen and Daniel Rothenberg (New York: Cambridge Univ. Press, 2014), 348–58.

[192] George R. Jr Lucas, "Postmodern War," *Journal of Military Ethics* 9, no. 4 (2010): 289–98; Benjamin R. Banta, "'The Sort of War They Deserve'? The Ethics of Emerging Air Power and the Debate over Warbots," *Journal of Military Ethics* 17, no. 2–3 (July 3, 2018): 156–71 and Jason Borenstein, "The Ethics of Autonomous Military Robots," *Studies in Ethics, Law, and Technology* 2, no. 1 (2008): 1–17; Daniel Statman, "Drones and Robots: On the Changing Practice of Warfare," in *The Oxford Handbook of Ethics of War*, ed. Seth Lazar and Helen Frowe (New York: Oxford Univ. Press, 2015); Langdon Ogburn, "Drones and War: The Impact of Advancement in Military Technology on Just War Theory and the International Law of Armed Conflict," *Ethics & International Affairs* (blog), September 17, 2020, *https://www.ethicsandinternationalaffairs.org/2020/drones-and-war-the-impact-of-advancement-in-military-technology-on-just-war-theory-and-the-international-law-of-armed-conflict/*.

"man in the loop" of lethal decisions.[193] These concerns follow the same logic of ethical concerns for drones, as mentioned above. For academics that follow the traditions of international law, the issue surrounding AWS technology fundamentally hinges on the question of if these systems can be engineered to adhere to the principles of distinction and proportionality or if that expectation is simply impossible. Many express deep suspicions that autonomous systems will ever meet this standard and, as such, fully autonomous systems will not pass muster under IHL.[194] This would render AWS as *mala in se* or inherently evil as weapons, given their dehumanization of warfare by definition.[195] The work of Amoroso and

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[193] Alex Leveringhaus and Tjerk de Greef, "Keeping the Human 'in-the-Loop': A Qualified Defence of Autonomous Weapons," in *Precision Strike Warfare and International Intervention: Strategic, Ethico-Legal and Decisional Implications*, ed. Mike Aaronson et al. (Routledge, 2014), 206–24; Alex. Leveringhaus, *Ethics and Autonomous Weapons* (London: Palgrave Macmillan UK, 2016); Noel Sharkey, "Staying in the Loop: Human Supervisory Control of Weapons," in *Autonomous Weapons Systems: Law, Ethics, Policy*, ed. Nehal Bhuta et al. (New York: Cambridge Univ. Press, 2016), 23–38; Michael N. Schmitt and Jeffrey S. Thurnher, "Out of the Loop: Autonomous Weapon Systems and the Law of Armed Conflict," *Harvard National Security Journal* 4, no. 2 (2013 2012): 231–81.

[194] Alan L Schuller, "At the Crossroads of Control: The Intersection of Artificial Intelligence in Autonomous Weapon Systems with International Humanitarian Law," *Harvard National Security Journal* 8, no. 2 (2017): 379–42; Emily Crawford, "The Principle of Distinction and Remote Warfare," in *Research Handbook on Remote Warfare*, ed. Jens David Ohlin (Northampton: Edward Elgar Publishing, 2017), 50–78; Dan Saxon, *International Humanitarian Law and the Changing Technology of War* (Martinus Nijhoff Publishers, 2013); Melisa Foster and Virgil Haden-Pawlowski, "Regulation Robocop: The Need for International Governance Innovation in Drone and LAWS Development and Use," *Sicherheit Und Frieden (S+F) / Security and Peace* 33, no. 2 (2015): 61–66; John Lewis, "The Case for Regulating Fully Autonomous Weapons," *The Yale Law Journal* 124, no. 4 (2015): 1309–25; Nehal Bhuta et al., eds., *Autonomous Weapons Systems: Law, Ethics, Policy* (New York: Cambridge Univ. Press, 2016); and Aiden Warren and Alek Hillas, "Lethal Autonomous Weapons Systems: Adapting to the Future of Unmanned Warfare and Unaccountable Robots," *Yale Journal of International Affairs* 12 (Spring 2017): 71–80.

[195] Noel Sharkey, "Saying 'No!' To Lethal Autonomous Targeting," *Journal of Military Ethics* 9, no. 4 (December 1, 2010): 369–83; Frank Sauer, "Stopping 'Killer Robots': Why Now Is the Time to Ban Autonomous Weapons Systems," *Arms Control Today* 46, no. 8 (2016): 8–13; Robert Sparrow, "Robots and Respect: Assessing the Case Against Autonomous Weapon Systems," *Ethics & International Affairs* 30, no. 1 (ed 2016): 93–116; Robert Sparrow, "Robots as 'Evil

Tamburrini encapsulates this IHL approach in their reviews of the literature, and Krishnan's book, in particular, is a touchstone for the legal approach towards killer robots.[196] Exhibiting the argument in the other extreme, Arkin and others that follow his logic suggest that robotic weapons would perform more ethically and adhere to IHL more closely than human soldiers currently do in combat. This position relies not only on an instrumentalist understanding of international law but also a faith in technology to deliver ever greater precision in warfare to negate the risks to civilians.[197]

Apart from these approaches based on the ethico-legal framework, other more philosophical perspectives on uninhabited weapons are prominent in the literature. Interventions by Schwarz and Sparrow both present arguments against autonomous weapons that illustrate how these systems would fundamentally

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Means'? A Rejoinder to Jenkins and Purves," *Ethics & International Affairs* 30, no. 3 (ed 2016): 401–3.

[196] Daniele Amoroso and Guglielmo Tamburrini, "The Ethical and Legal Case Against Autonomy in Weapons Systems," *Global Jurist* 18, no. 1 (2017); Daniele Amoroso, *Autonomous Weapons Systems and International Law: A Study on Human-Machine Interactions in Ethically and Legally Sensitive Domains* (Baden-Baden: Nomos Verlagsgesellschaft, 2020); Daniele Amoroso and Guglielmo Tamburrini, "Autonomous Weapons Systems and Meaningful Human Control: Ethical and Legal Issues," *Current Robotics Reports*, August 24, 2020. Armin Krishnan, *Killer Robots: The Legality and Ethicality of Autonomous Weapons*, (Burlington: Ashgate Press, 2009).

[197] Ronald Arkin, *Governing Lethal Behavior in Autonomous Robots*, (Boca Raton: Chapman & Hall CRC, 2009). Alex Leveringhaus and Tjerk de Greef, "Keeping the Human 'in-the-Loop': A Qualified Defense of Autonomous Weapons," in *Precision Strike Warfare and International Intervention: Strategic, Ethico-Legal and Decisional Implications*, ed. Mike Aaronson et al. (New York: Routledge, 2014), 206–24; Geoffrey S. Corn, "Autonomous Weapons Systems: Managing the Inevitability of 'Taking the Man out of the Loop,'" in *Autonomous Weapons Systems: Law, Ethics, Policy*, ed. Nehal Bhuta et al. (New York: Cambridge Univ. Press, 2016), 209–42; Alex Leveringhaus, "What's So Bad About Killer Robots?," Journal of Applied Philosophy 35, no. 2 (2018): 341–58; and Chris Jenks, "False Rubicons, Moral Panic, & Conceptual Cul-De-Sacs: Critiquing & Reframing the Call to Ban Lethal Autonomous Weapons," *Pepperdine Law Review* 44, no. 1 (January 30, 2017).

undermine the humanist foundations of law and responsibility.[198] Conflating the two types of weapons technologies, there are a number of critiques within the academy that have an ethical inflection but approach the issues of both drone warfare and the emergence of lethal autonomy from feminist and New Materialist perspectives. For instance, Clark, Roff, and Santos de Carvalho have all made important feminist contributions regarding drones and AWS, reflecting on how militarized masculinity expresses itself even in robotic warfare.[199] Wilcox's work within the tradition of feminist IR is especially strong in this regard, reflecting on the embodiment of technologically mediated state violence.[200] Drawing from posthumanism and New Materialism, many within the recent engagement with technology in global politics have focused on UAVs and lethal autonomy as illustrations of how artifacts are keenly important to international political

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[198] Elke Schwarz, *Death Machines: The Ethics of Violent Technologies*, 1st Edition (Manchester: Manchester Univ. Press, 2019); Robert Sparrow, "Robots and Respect: Assessing the Case Against Autonomous Weapon Systems," *Ethics & International Affairs* 30, no. 1 (2016): 93–116; and Robert Sparrow, "Killer Robots," *Journal of Applied Philosophy* 24, no. 1 (2007): 62–77. See also: Lucy Suchman and Jutta Weber, "Human-Machine Autonomies," in *Autonomous Weapons Systems: Law, Ethics, Policy*, ed. Nehal Bhuta et al. (New York: Cambridge Univ. Press, 2016), 75–102.

[199] Lindsay C. Clark, *Gender and Drone Warfare: A Hauntological Perspective* (New York: Routledge, 2019); Heather M. Roff, "Gendering a Warbot," *International Feminist Journal of Politics* 18, no. 1 (January 2, 2016): 1–18; Juliana Santos de Carvalho, "A Male Future: An Analysis on the Gendered Discourses Regarding Lethal Autonomous Weapons," *Amsterdam Law Forum* 10, no. 2 (2018): 41–61. See also: Lindsay C. Clark, "Grim Reapers: Ghostly Narratives of Masculinity and Killing in Drone Warfare," *International Feminist Journal of Politics* 20, no. 4 (October 2, 2018): 602–23; and Lorraine Bayard de Volo, "Unmanned? Gender Recalibrations and the Rise of Drone Warfare," *Politics & Gender* 12, no. 1 (March 2016): 50–77.

[200] Lauren Wilcox, *Bodies of Violence: Theorizing Embodied Subjects in International Relations*, 1 edition (New York: Oxford Univ. Press, 2015); Lauren Wilcox, "Embodying Algorithmic War: Gender, Race, and the Posthuman in Drone Warfare," *Security Dialogue* 48, no. 1 (February 1, 2017): 11–28.

outcomes.[201] What is notable about these more philosophically expansive treatments of uninhabited weapons is how their analysis is still undergirded by fundamental questions of ethics and how the introduction of this novel technology illustrates the impact of material objects on politics at the global level.

Considering the breadth of literature that focuses on uninhabited weapons, I can make the following observations about the state of the field. Naturally, as I have narrowed the examination down along the axis from most general studies of technology to the more fine-grained, this set of studies focus on drone and AWS technologies, often delving into specific weapons platforms. This narrowing of the technical scope lends itself to more descriptive approaches that lay out the history of the development of each innovation and, by and large, focuses on the U.S. as the primary innovator. The levels of analysis in question vary from the micro (in works that consider the changing character of warfare for the warriors and those targeted) to the meso (how American military institutions specifically integrate these technologies into warfighting), and also at the macro-level (what drone warfare and killer robots portend for the Laws of Armed Combat.) Less variable is the causal

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[201] Caroline Holmqvist, "Undoing War: War Ontologies and the Materiality of Drone Warfare," *Millennium* 41, no. 3 (May 1, 2013): 535–52; William Walters, "Drone Strikes, Dingpolitik and beyond: Furthering the Debate on Materiality and Security," *Security Dialogue* 45, no. 2 (2014): 101–18; Benjamin Meiches, "Weapons, Desire, and the Making of War," *Critical Studies on Security* 5, no. 1 (January 2, 2017): 9–27; Erika Cudworth and Steve Hobden, "The Posthuman Way of War," *Security Dialogue* 46, no. 6 (December 1, 2015): 513–29; Matthias Leese, "Configuring Warfare: Automation, Control, Agency," in *Technology and Agency in International Relations*, ed. Marijn Hoijtink and Matthias Leese, 1 edition (London: Routledge, 2019), 42–65; and Emily Jones, "A Posthuman-Xenofeminist Analysis of the Discourse on Autonomous Weapons Systems and Other Killing Machines," *Australian Feminist Law Journal* 44, no. 1 (January 2, 2018): 93–118.

direction for the vast majority of literature on drones and AWS: most of these contemporaneous accounts suggest that technological advance is driving the political processes. Even in the case that emphasizes ethics and adherence to international law or the more theory-oriented treatments, the impetus for change is located in the purported nature of the weapons technology itself.

Constraining Emerging Military Technology: Norms and Arms Control

With these observations about the literature on uninhabited weapons in mind, I now turn to works written in the tradition of social constructivism that engage with how ideas and norms operate to constrain military technologies through arms control. One should expect that this shift moves the discussion away from technological determinism. However, even under the rubric of norms determinist sentiments creep back in when autonomous weapons are the topic at hand. While I will delve further into theories on norm dynamics in the next chapter detailing the analytic framework taken in this dissertation, here is it is worth considering the orientation of the norm literature has taken recently towards drone and AWS technologies.

The literature on norms regulating the means of warfare is well established and has enjoyed a robust evolution well after the explosion of ideational approaches to IR in the 1990s.[202] Somewhat surprisingly, the subdiscipline of security studies—

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[202] Nicholas Onuf, *World Of Our Making*, 1 edition (London: Routledge, 2012); Alexander Wendt, *Social Theory of International Politics*, Cambridge Studies in International Relations (New York: Cambridge University Press, 1999).

long dominated by varieties of realist approaches—proved fertile ground for constructivist interventions, especially in the arena of arms control.[203] Research programs by two IR scholars are of particular note in this regard. Price's focus on chemical weapons and how norms about them shifted from early stigmatization at the cusp of their practical development at the Hague conference in 1899 to the widespread use of chemical weapons in WW I amid continued stigmatization, and then a return of a taboo to use these weapons with subsequent reaffirmations of their prohibition in the Geneva Protocols of 1929, their notable non-use in combat during WW II, and strengthening of the taboo with the establishment of the Chemical Weapons Convention in 1997. Here Price gives us a clear picture of the process whereby certain technologies are deemed *mala in se*.[204] In a similar vein, Tannenwald explores the norms surrounding nuclear weapons that fuel non-proliferation regimes, strategic arms control, and their non-use despite their variety and numbers. In this sense, she illustrates how nuclear weapons are rendered impractical as weapons except to deter other nuclear-armed states.[205] These two

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[203] Theo Farrell, "Constructivist Security Studies: Portrait of a Research Program," *International Studies Review* 4, no. 1 (2002): 49–72; Keith Krause, "Leashing the Dogs of War"; and Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Cornell Univ. Press, 2002).

[204] Richard Price, "A Genealogy of the Chemical Weapons Taboo," *International Organization* 49, no. 1 (1995): 73–103; Richard Price, "Reversing the Gun Sights: Transnational Civil Society Targets Land Mines," *International Organization* 52, no. 3 (1998): 613–44; Richard M. Price, *The Chemical Weapons Taboo* (Ithaca: Cornell Univ. Press, 2007).

[205] Nina Tannenwald, "The Nuclear Taboo: The United States and the Normative Basis of Nuclear Non-Use," *International Organization* 53, no. 3 (1999): 433–68; and Nina Tannenwald, *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons Since 1945* (Cambridge: Cambridge University Press, 2008).

accounts of especially politicized weapons categories are essential to later discussions in chapter 4 that consider current efforts by global civil society to build a taboo against autonomous weapons and enact a formal ban on their further development.

Today, other weapons are also subject to international constraints, and these prohibitions were marshaled under very different circumstances than the archetype of restraining weapons of mass destruction. The norm dynamic literature has recognized this shift towards "humanitarian arms control" driven primarily by transnational activist networks.[206] As noted above, these efforts are characterized as "humanitarian arms control," focusing on ridding the world of established weapons like landmines, napalm, and cluster munitions.[207] Again, the scholarship of Keck, Sikkink, and Finnemore looms large over this framing of arms control in humanitarian terms, as transnational activists have followed the norm life cycle and the analysis of boomerang effects explicitly in a role as norm entrepreneurs.[208] Thus, one explanation when these efforts fall short of limiting military technology is suggested by Bloomfield: while the role of norm entrepreneurs is well documented, less understood are those actors within norm contestation who act as

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[206] Harald Müller and Carmen Wunderlich, *Norm Dynamics in Multilateral Arms Control: Interests, Conflicts, and Justice* (Athens: University of Georgia Press, 2013).

[207] Neil Cooper, "Humanitarian Arms Control"; Ritu Mathur, "Practices of Legalization in Arms Control and Disarmament: The ICRC, CCW and Landmines," *Contemporary Security Policy* 33, no. 3 (December 1, 2012): 413–36; and Denise Garcia, "Humanitarian Security Regimes," *International Affairs* 91, no. 1 (2015): 55–75.

[208] Keck and Sikkink, *Activists beyond Borders*; and Finnemore and Sikkink, "International Norm Dynamics and Political Change."

spoilers or, in his terms, anitpreneures.[209] To extrapolate from this framing, efforts to constrain emerging military technologies falter in the face of international actors that obstruct the establishment of shared codes of conduct. Never the less, these recent cases of humanitarian arms control illustrate how norm entrepreneurs successfully mobilized public sentiment and reframed arms control issues around human rights and IHL rather than the security and strategic needs of state parties.[210] In particular, the power of ethical critique and the building up of technical knowledge to counter the trump card of military necessity have proven especially key to humanitarian arms control efforts. Yet still, in these accounts, the technological advance of weapons is treated as an exogenous factor, introduced to the norm dynamic originating somehow from outside of global politics.[211]

The example of drone strikes and the erosion of international norms surrounding targeting individuals for extrajudicial killings seemingly fly in the face of humanitarian arms control efforts. The literature on norm dynamics has not been mute on this point. Crawford, in particular, has made pointed critiques of targeting killing via UAVs on the one hand while the liberal way of warfare—especially in

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[209] Bloomfield, "Norm Antipreneurs and Theorizing Resistance to Normative Change"; Bloomfield and Scott, *Norm Antipreneurs and the Politics of Resistance to Global Normative Change*.

[210] Adam Bower, "Norms Without the Great Powers: International Law, Nested Social Structures, and the Ban on Antipersonnel Mines," *International Studies Review* 17, no. 3 (September 1, 2015): 347–73; Rosert, "Norm Emergence as Agenda Diffusion

[211] Margarita H. Petrova, "Weapons Prohibitions through Immanent Critique: NGOs as Emancipatory and (de)Securitising Actors in Security Governance," *Review of International Studies* 44, no. 4 (October 2018): 619–53; and Elvira Rosert et al., "Arms Control Norms and Technology," in *Norm Dynamics in Multilateral Arms Control: Interests, Conflicts, and Justice*, ed. Harald Müller and Carmen Wunderlich (Athens: University of Georgia Press, 2013), 109–40.

the context of a counterinsurgency effort in Iraq and Afghanistan—relies on protecting civilian populations rather than targeting them.[212] Many observers have attempted to square this circle of accounting for this problematic dichotomy through the lens of norms.[213] What is clear across these accounts is how the U.S. in particular and how (echoing the cultural ways of warfare thesis) techno-philia in the American military renders warfare immunized from critique as long as precision is demonstrated.[214] Again, conspicuous in this literature is how the novel drone technology is introduced externally and then subverts otherwise stable norms at the international level. In one of the more extensive studies of the norms surrounding UAVs, Lantis suggests that powerful actors lobby to substitute or revise established norms. With the example of drone strikes, he illustrates how the Bush and Obama administrations successfully built political legitimacy to change the international parameters surrounding the norm against targeted assassinations. In this

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[212] Neta C. Crawford, "Accountability for Targeted Drone Strikes Against Terrorists?," *Ethics & International Affairs* 29, no. 1 (ed 2015): 39–49; Neta Crawford, "Targeting Civilians and U.S. Strategic Bombing Norms: Plus Ça Change, plus c'est La Même Chose?," in *The American Way of Bombing: Changing Ethical and Legal Norms, from Flying Fortresses to Drones*, ed. Matthew Evangelista and Henry Shue, 2014, 64–86.

[213] Klem Ryan, "What's Wrong with Drones? The Battlefield in International Humanitarian Law," in *The American Way of Bombing: Changing Ethical and Legal Norms, from Flying Fortresses to Drones*, ed. Matthew Evangelista and Henry Shue (Ithaca: Cornell Univ. Press, 2014), 207–23; and Dennis R. Schmidt and Luca Trenta, "Changes in the Law of Self-Defence? Drones, Imminence, and International Norm Dynamics," *Journal on the Use of Force and International Law* 5, no. 2 (July 3, 2018): 201–45.

[214] See also: Carvin and Williams, *Law, Science, Liberalism and the American Way of Warfare;* Frank Sauer and Niklas Schörnig, "Killer Drones: The 'Silver Bullet' of Democratic Warfare?," *Security Dialogue* 43, no. 4 (August 1, 2012): 363–80.

formulation, drones are again treated as an intervening variable, introduced as an exogenous shock to the normal norm cycle.[215]

The treatment of autonomous weapon systems in the norm literature mirrors the prior studies of UAVs in warfare. Here the motif is still one where international norms and the laws that flow from them are valiantly racing to catch up with technological advances.[216] Unsurprisingly, there is significant overlap between research on norm dynamics, the ethics of new weapons, and the international law that regulates them. However, many academic observers are skeptical that transnational norm entrepreneurs will successfully shepherd the international community towards robust humanitarian arms control over these weapons. For example, Carpenter was prescient in 2011 that the constellation of NGOs that make up the transnational activist networks had excluded killer robots from their advocacy efforts.[217] Fearing that the topic was too speculative and traded upon Hollywood misperceptions of the actual issues at hand, arms control activist found it difficult to thread the needle of arguing that the issue of autonomous weapons was sufficiently ripe for norm contestation, but not so alarmist as to be discounted

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[215] Jeffrey S. Lantis, *Arms and Influence: U.S. Technology Innovation and the Evolution of International Security Norms* (Stanford: Stanford Security Studies, an imprint of Stanford Univ. Press, 2016);

[216] Denise Garcia, "Future Arms, Technologies, and International Law: Preventive Security Governance," *European Journal of International Security* 1, no. 1 (February 2016): 94–111. See also: Dustin A. Lewis, Gabriella Blum, and Naz Modirzadeh, "War-Algorithm Accountability," Research Briefing (Cambridge: Harvard Law School Program on International Law and Armed Conflict, August 2016), https://pilac.law.harvard.edu/waa.

[217] Charli Carpenter, "Vetting the Advocacy Agenda: Network Centrality and the Paradox of Weapons Norms," *International Organization* 65, no. 1 (2011): 69–102.

as science fiction fueled hysteria.[218] Soon after Carpenter's article, the network of international humanitarian arms control advocates did fully take up the cause of killer robots in 2012. Following up this research in her comprehensive monograph, Carpenter effectively traced how the intra-network links and interactions between advocacy elites successfully aligned so that the issue came to the fore as a matter of concern.[219]

The question then is, why have these efforts born so little fruit over the subsequent eight years? Rosert's research on the diffusion of norms against emerging weapons suggesting that they depend on the successful completion of each stage of that norm cycle. In this sense, norms must mature and complete each stage of her suggested model in order to reach adoption.[220] In the specific case of AWS, she joins with Sauer to suggest that the focus of mobilization around principles of distinctions and proportionality (thus turning attention towards avoiding civilian casualties) is an ill-advised strategy given that advocates for AWS could simply point to ever greater precision in targeting as a counter to these concerns. Instead, they suggest that a focus on the international principle of human

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[218] Charli Carpenter, "Rethinking the Political / -Science- / Fiction Nexus: Global Policy Making and the Campaign to Stop Killer Robots," *Perspectives on Politics* 14, no. 1 (March 2016): 53–69; Kevin L. Young and Charli Carpenter, "Does Science Fiction Affect Political Fact? Yes and No: A Survey Experiment on 'Killer Robots,'" International Studies Quarterly 62, no. 3 (September 1, 2018): 562–576.

[219] Charli Carpenter, "Lost" Causes: Agenda Vetting in Global Issue Networks and the Shaping of Human Security (Ithaca: Cornell Univ. Press, 2014).

[220] Elvira Rosert, "Salience and the Emergence of International Norms: Napalm and Cluster Munitions in the Inhumane Weapons Convention," *Review of International Studies* 45, no. 1 (January 2019) and Rosert, "Norm Emergence as Agenda Diffusion."

dignity as a useful, ethical framework would bear better results.[221] Soon after, Rosert and Sauer revise their critique to suggest that the playbook of humanitarian arms control is simply not tailored to tackle the issue of autonomous weapons.[222] This challenge is echoed by Maas, given that the scope of the debate has subsequently expanded beyond only autonomy and spilled into the arena of AI for military use.[223] Taking a wildly different tack, Bode and Huelss go further to suggest that autonomous weapons are intrinsically resistant to arms control, given that they influence norms by their very nature. They differentiate between norms that emerge via deliberation and those that are produced by practice. Under this framework, norms are actually shaped by weapons they notionally constrain.[224]

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[221] Elvira Rosert and Frank Sauer, "Prohibiting Autonomous Weapons: Put Human Dignity First," *Global Policy* 10, no. 3 (2019): 370–75. See also: Emily Crawford, "The Principle of Distinction and Remote Warfare," in *Research Handbook on Remote Warfare*, ed. Jens David Ohlin (Northampton: Edward Elgar Publishing, 2017), 50–78. Elvira Rosert and Frank Sauer, "Prohibiting Autonomous Weapons: Put Human Dignity First," *Global Policy* 10, no. 3 (2019): 370–75. See also: Emily Crawford, "The Principle of Distinction and Remote Warfare," in *Research Handbook on Remote Warfare*, ed. Jens David Ohlin (Northampton: Edward Elgar Publishing, 2017), 50–78.

[222] Elvira Rosert and Frank Sauer, "How (Not) to Stop the Killer Robots: A Comparative Analysis of Humanitarian Disarmament Campaign Strategies," *Contemporary Security Policy* 41, no. 4 (May 30, 2020): 1–26.

[223] Matthijs M. Maas, "How Viable Is International Arms Control for Military Artificial Intelligence? Three Lessons from Nuclear Weapons," *Contemporary Security Policy* 40, no. 3 (July 3, 2019): 285–311.

[224] Ingvild Bode and Hendrik Huelss, "Autonomous Weapons Systems and Changing Norms in International Relations," *Review of International Studies* 44, no. 03 (July 2018): 393–413. Huelss continues this logic even further in: Hendrik Huelss, "Deciding on Appropriate Use of Force: Human-Machine Interaction in Weapons Systems and Emerging Norms," *Global Policy* 10, no. 3 (2019): 354–58; and Hendrik Huelss, "Norms Are What Machines Make of Them: Autonomous Weapons Systems and the Normative Implications of Human-Machine Interactions," *International Political Sociology* 14, no. 2 (September 2019): 1–18.

Scholarship on the dynamics of arms control norms evolves in a fascinating manner as the focus on emerging weapons technologies narrows down to autonomous weapons. Definitively placed at the macro level, one would expect that an ideational theory of norms would identify the causal direction as politics or ideas dominate technological factors. This obtains in the historical cases of chemical and nuclear weapons. Even when the spotlight narrows to the more recent examples of antipersonnel landmines and cluster munitions, it seems that norm dynamics prevailed over the siren's call of military technology. However, this trend seems to reverse in the cases of military UAVs and particularly for autonomous weapons. Narrowing to these two military innovations, even normative accounts suggest that these particular technologies intrinsically have characteristics that immunize them from global governance. Indeed, by Huelss' logic, international norms are mutated by the specific qualities of autonomous weapons.[225]

Conclusion: Rival Theories and Contributions to the Literature

Clearly, from this review, it is evident that the question of how norms interact with emerging military technologies is a complicated query involving many strands across the discipline of IR. After navigating this wide range of scholarship, a number of patterns emerge that shape the intervention of this dissertation. First, it is clear that the dominant sentiment within international relations concerning the

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[225] To preview my own view, I believe this position is based on the shaky foundation of technological determinism. Instead, I assert that there are norms and ideas that drive these particular weapons developments that collide with the norms that inform arms control.

relationship between military innovations and global politics is one of technological determinism to varying degrees that treat technology as an independent, exogenous variable. From the earlier general treatments of technology in IR to the New Materialism of recent years, there is a propensity to analyze the *influence* or *impact* of technology on international affairs. This tendency is certainly more pronounced in the literature on the nuclear revolution, offense-defense theory, and revolutions in military affairs, where the introduction of military technology is explicitly referenced as the independent variable. The narrowly focused security studies literature on drones and autonomous weapons exhibits this bias towards technological determinism: the characteristics of these emerging technologies challenge established policies, norms, and social mores. Indeed, when IR scholars attempt to split the difference and suggest a co-productive relationship between technology and global politics—as is the case with much of the newer work drawing from Science and Technology Studies—there is a tendency to illustrate the agency of things as a novel intervention with less attention paid to the ideational half of the co-productive formula. Second, the minority position in the literature that deals with the ways politics shapes military technology (reversing the causal logic) only analyzes this dynamic at the mezzo or micro levels favoring rational actor models of bureaucratic politics. Where determinism is effectively challenged, positions are based on essentialist propositions, or the level of analysis is dialed down to the meso or micro-frame of reference, rendering these explanations idiosyncratic to American military policy or institutions in the case of the military innovation literature.

With these general observations in mind, let me turn to my own intellectual framework and the contribution to the literature this dissertation attempts to make. Hopefully, it is clear that I am committed to a non-essentialist, non-determinist explanation of the recent phenomenon of autonomous weapons despite deep and widespread reservations if not outright revulsion to their invention. In this sense, I share a kinship with the cultural explanations of military innovation and isomorphism. However, my analysis focuses on the macro level based on the empirical structure of international security politics with the U.S. as the pacesetting superpower whereas cultural explanations typically reside at the meso level of analysis. Primarily, this dissertation contributes to the scholarship on norm dynamics concerning emerging military technologies by expanding the remit of these studies beyond the bounds of international negotiations and recognizing the wider environment where norms are active. This research makes a secondary contribution to the burgeoning conversation on technology and international relations, where I hope to provide a counterbalance to accounts inspired by science and technology studies that neglect the politically constructed aspects of technological development.

My focus on autonomous weapons and drone technology as a precursor is not a unique feature among recent contributions to the field of security studies. In fact, there is a backlash against the research of military UAVs and lethal autonomy as a faddish preoccupation. A set of security studies scholars discount the novelty of these weapon technologies and they suggest the that the popular emphasis on yet another revolution in warfare is overblown. From this view, the focus on new weapons mistakes the weapons for the shifts in policy they are used for and overlook the deep continuities in warfare regardless of the means used to fight.[226] To these charges, I submit that these technologies are an especially politicized category of weapon empirically. Instead of adjudicating whether or not they will eventually prove revolutionary or not, my aims are to analyze the forming norms, shared ideas, and contentions that surround them in the here and now. The prospects for autonomous weapons have already gained attention on the world stage at the United Nations and the CCW as a separate track of negotiation. This phenomenon has taken place beyond the confines of academia within the machinery of global security politics. Even beyond these parameters, accounts in the popular press and across the global public, there is a growing concern over these weapons. My position is that there is political contention surrounding this technology, and the normative underpinnings of that contention is consequential.

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[226] Michael P. Kreuzer, *Drones and the Future of Air Warfare: The Evolution of Remotely Piloted Aircraft*, Cass Military Studies (New York: Routledge Taylor & Francis Group, 2016); Jack McDonald, *Enemies Known and Unknown: Targeted Killings in America's Transnational War* (Oxford: Oxford University Press, 2017); B. Strawser et al., *Opposing Perspectives on the Drone Debate* (New York: Springer, 2014); Lawrence Freedman, *The Future of War: A History* (New York, N.Y: Public Affairs, 2017); Colin S. Gray, *The Future of Strategy* (Cambridge, UK ; Malden, MA: Polity, 2015); and Williamson Murray, *America and the Future of War: The Past as Prologue* (Stanford, California: Hoover Institution Press, 2017).

With these points in mind, let us review the rival theories to the research question. Table 2.1 summarizes the alternative explanations, the primary thrust of each, their level of analysis, the causal direction of these rival theories, and the primary literatures from which they are sourced. On its face, the rival explanation based on technological determinism does not hold up to scrutiny if one simply consider a few previous innovations like GPS, nuclear weapons, or ICBMs. These technical achievements did not suddenly appear from a parallel, siloed world of science and engineering. In an environment of limited resources (in terms of time, money, materials, intellectual capital, or political will), certain avenues of research have to be prioritized and emphasized over others. Indeed, the proliferation of Research and Development (R&D) institutions within the post-WW II Department of Defense—as detailed in Chapter four—is a testament to the herculean efforts that have been undertaken to create previous military technologies. To paraphrase Robert Cox, emergent technologies are created *for* someone and *for* some political purpose.[227] Often that purpose is driven by national security concerns that depend on a particular narrative about warfare in the future. I will explore the historical sources of this narrative in the case of the U.S. in chapters 5 and 6. But it should be clear at this point explanations that fundamentally cede political agency to an idea of technology beyond human control are intellectually suspect due to their reductive logic and negation of human will and, thus, politics. Fundamentally, technology is

[227] Robert W. Cox, "Social Forces, States and World Orders: Beyond International Relations Theory," *Millennium* 10, no. 2 (June 1, 1981): 126–155.

developed towards human ends, and those ends are often political in nature. While I concede that new weapons technologies have a significant impact on the course of global security politics, they do so not as an independent force exogenous to those very same security politics.

Would explanations that rely on realist instrumentalism instead of technological imperatives then sufficiently answer the research question? Unfortunately, the view that technology is a neutral and value-free expression of rational political interests also falls short in explaining why the U.S. continues to pursue autonomous weapons despite deep reservations. While this explanation seems to appeal to a common-sense approach to technology, there are two fundamental flaws with this account of technology and international security in the face of international norm development. First, not all great powers employ a strategy of innovation to gain a strategic advantage. Instead, many leading military powers focus resources on less costly but reliable weapons in greater numbers. The quote attributed to either Stalin, Lenin, or Mao— that quantity has a quality all its own—typifies this strategic choice of overwhelming technologically elegant weapons with sheer numbers of rudimentary but proven weapon systems. Thus, realist instrumentalism explains neither the why nor under what conditions questions regarding the U.S. military's position on creating AWS. It also fails to explain the dog that should obviously bark in this instance: Japan. If the realist-instrumentalist rationale was correct, then one would expect that Japan—facing a strategic threat from an expansionist China, with a demographically aging population, a high-tech economy, and an advanced domestic robotics industry—would be at the forefront of developing autonomous weapons. Instead, there is general opposition to killer robots across the Japanese public and within its government. This is only one particular example among many that undercut the instrumentalist account.[228]

The second major flaw of the realist-instrumentalist thesis is that it denies any limits on military technology either in its development or employment, discounting any international norms that would constrain them. A long history of successful international arms control flies in the face of the supposed unfettered limits on military technology posited by a *realpolitik* hypothesis. Previous examples of weapons innovations that either did not take place (despite their feasibility) or instances where arms control of specific weapon technologies were successful belie this thesis. For example, the CCW has successfully instituted a ban on the use of lasers as blinding weapons for a number of years. Instances where international norms militated against the use or spread of nuclear or chemical weapons also undercut the instrumental argument of realist on this count.[229] A more illustrative case is that of enhanced radiation weapons, colloquially known as the

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[228] Amandeep Singh Gill, "Artificial Intelligence and International Security: The Long View," *Ethics & International Affairs* 33, no. 2 (ed 2019): 169–79; Daisuke Akimoto, "International Regulation of 'Lethal Autonomous Weapons Systems' (LAWS): Paradigms of Policy Debate in Japan," *Asian Journal of Peacebuilding* 7 (2019). See also Ruth Benedict, *The Chrysanthemum and the Sword: Patterns of Japanese Culture* (Boston: Mariner Books, 2006).

[229] John Ellis van Courtland Moon, "Chemical Weapons and Deterrence: The World War II Experience," *International Security* 8, no. 4 (1984): 3–35; Tannenwald, "The Nuclear Taboo".

neutron bomb. This weapon technology was feasible in the late 1950s but was not fully developed as a tactical weapon until the early 1980s. When the Reagan administration attempted to deploy enhanced radiation arms to Western Europe to replace existing tactical nuclear forces, the effort was successfully felled by political pressure from the anti-nuclear movement in those NATO member states. In short, neutron weapons, while technically feasible, were deemed unacceptable and have not been produced or deployed.[230] This would suggest that the realist view of weapons technology—that powerful states are entirely unfettered by norms—does not hold up to empirical evidence.

The two variations of the militarism theory locate state decisions about arms procurement in either vested economic interests or cultural factors like hypermasculinity. On the one hand, anti-militarism sentiments undergird many of the transnational activists' arguments against killer robots. On the other hand, theories of militarism have less to say about international norms apart from the vilification of defense establishments that seek to develop new weapons and the demand that international law should constrain unfettered armament. The militarism approach identifies social factors as independent variables that are the impetus of military innovations. However, the thesis derived from this family of

[230] Jorma K. Miettinen, "Enhanced Radiation Warfare," *Bulletin of the Atomic Scientists* 33, no. 7 (September 1977): 32–37; Kent F. Wisner, "Military Aspects of Enhanced Radiation Weapons," *Survival* 23, no. 6 (1981): 246–51; Milton Leitenberg, "The Neutron Bomb — Enhanced Radiation Warheads," *Journal of Strategic Studies* 5, no. 3 (September 1, 1982): 341–69; Matthew Evangelista, "Case Studies and Theories of the Arms Race," *Bulletin of Peace Proposals* 17, no. 2 (April 1, 1986): 197–206.

rival theories is more of an extrapolation rather than a direct rival to my own hypothesis. In the case of the more traditional variation, the military-industrial complex theory suggests that vested corporate interests in the form of the defense industrial base push the state to invest in ever more high-tech weaponry with high price tags but is much less specified about particular weapon technologies. While there is ample evidence of the pervasive intertwining of defense corporate interests with congress, military leadership, throughout the think tank industry, and across academia, it is less clear how the MIC thesis translates into military innovation that cuts against the normative grain beyond the generalized sense that all military matters are morally bankrupt. When anti-militarist scholarship does engage with military technology, it is primarily to point out the waste of billions of taxpayer dollars on research and development that could have been better used on civilian concerns to bolster domestic economic output. Empirically, the defense industry is trepidatious about investing in R&D for advanced military hardware that may not eventually result in a Pentagon contract and often languishes in development for lack of a military need. In other words, the return on investment for developing new capabilities is fraught with risk rather than lobbying the government to purchase already perfected systems in larger numbers. Indeed, the MIC rooted in a political economy reading of national security-specific to post-World War II America has little to say about specific military technologies like drones or killer robots beyond an essentialist argument that all individuals involved with the U.S. military are morally suspect by default. The alternate version of anti-militarist critique is based on cultural or gendered readings of security. Again, while this literature engages with a broad critique of wielding technology towards military ends, there is little in-depth engagement with specific military technologies and why they become viable. Critical feminist engagements with the gendered aspects of drone and autonomous technologies are the exception to this narrowing their focus on these particular technologies. However, these critiques hinge on either a meso level argument (the distinct economic structure of the U.S. defense establishment) or a micro-level argument more akin to human nature (the masculinized character of military organizations.) As a result, analyses that rely on militarism as the operating principle for defense innovation are overdetermined: locating the impetus for norm-breaking is difficult in an amorphous stew of elements that make up "militarism." In addition, these approaches offer little insight into the transnational creation of shared ideas and principles, instead of taking norms as an *a priori* given.

The more policy-oriented literature on military innovation offers another rival theory as to why AWS are seemingly inevitable despite emerging international norms against them. With an emphasis on the politics within and across military institutions, this flourishing subgenre of strategic studies is a source of inspiration for my own thesis. However, relying on an analysis that emphasizes competition between these institutions as the only catalyst for AWS development falls short of a comprehensive explanation of this phenomenon. These deficiencies stem from a few blind spots in the literature. Military innovation studies generally operate at the micro and meso levels of analysis: either the ambition of maverick leaders, the institutional configuration around specific parameters, or inculcation of a strategic culture results in the effective development and incorporation of new weapons technology. This hems in these explanations into one of two options; a competitive calculus that varies by the actor or discreet military cultures producing high-tech weaponry. The first family of theories relies on rational choice or historical analysis of institutional development. The second, cultural approach lends itself to historical-comparative methods to explain the higher propensity of a single state or military branch to seek high-tech weaponry. Both instances are oddly divorced from the underlying international factors of global security politics and are insular to particular states or military branches.

In the specific case of killer robots, the political calculus under a military innovation thesis is not entirely clear given the widespread resistance to these weapons. While this literature successfully avoids the pitfall of technological determinism, these explanations are mute regarding how the process of creating new weapons technologies interacts with and is constrained by the larger global context. This means that the military innovation literature misses the forest for the trees on this count. The logical supposition is that regardless of either the identity of international actors in the competition to field AWS or what the contours of warfare look like at the time, a specific technology of killer robots is ascendant because of a particular institutional configuration, individual personalities of military leaders, or because of American military culture. Competition between rival services over research and development funds does only partially explains this outcome, and a broader view under this rubric falls back on realist instrumentalism. In the case of military culture as the fount of AWS technology, multiple states are developing this class of weapon simultaneously, suggesting a broader culture of innovation. But both the institutional and cultural explanations elide any accounting for the fundamental motivation behind the creation of military technology: global military completion. Thus, the rationale for seeking ever more advanced methods of lethal military power is implicit, undergirded by an assumption of realist instrumentalism. This is not to say that instrumental or cultural account of weapons innovation are fundamentally incorrect. Instead, the implication is that they are incomplete without any incorporation of how the underlying concept of global security competition undergirds their logics. Again, my own explanation draws upon this literature, primarily from the cultural sources of innovation and especially the related research on military isomorphism. But this is undertaken with a view to the unique place the U.S. military occupies within the contemporary global security culture.

Another set of rival explanations—closer to my own—are found in the literature on international norm dynamics. Considered more in-depth within the theoretical framework of the next chapter, global norms play an important but often overlooked role in military innovation. Paradoxically, this blind spot is evident in literature that would locate the failure to regulate AWS thus far in a breakdown in arms control norms. The literature focused on the specific technologies considered in this dissertation and the norms that apply to them operate at the macro level of analysis, and hews towards social constructivism as the driver of political outcomes (with important exceptions seen below.) Recalling the norm life cycle, these shared codes of conduct emerge among international actors, reach a tipping point, cascade into widespread acceptance, and are then internalized by those actors (often codified into rules and law.)[231] A number of studies attribute the failure to institutionalize norms to either: the issue at hand lacking salience, skipping critical steps in the life cycle, the influence of antiprenures, or the introduction of weapons technology so novel that it alters the logic of appropriateness among key actors. In the case of AWS, none of these alternatives adequately explain the current dire straits of arms control norms regarding this technology. The deficiency in explanations emanating from the norm dynamics literature is that each only partially identifies the factors that hamstring efforts to govern AWS technology.

Let us consider each of these diagnoses in turn. The issue of autonomous weapons is markedly salient, at least since the issue was raised within the international community in 2012. If measured by awareness and concern across the general public, the issue has garnered extensive coverage in both print and electronic media globally. Measured by activity in the policy realm, there are a number of metrics that suggest the salience of the issue. First is the number of elites weighing in on AWS and the fact that it was necessary to start a wholly separate track of negotiation within the CCW. Second, several advanced militaries have

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[231] Finnemore and Sikkink, "International Norm Dynamics and Political Change." 898.

issued policy guidance specific to this emerging technology, all speak to the salience of the issue among policymakers. On the charge of faults in the norm life cycle, there is some merit to analyses suggesting that it is too soon to expect fully formed norms regarding emerging technology. One thinks of Price's work on the evolution of the chemical weapons taboo or Rosert's research on regulating cluster munitions as parallels to the global governance of autonomous weapons.[232] Rosert and Sauer build on this concept explicitly in the case of AWS, suggesting that this technology's intrinsic characteristics render it beyond the reach of humanitarian arms control as it is currently oriented.[233]

However, this conclusion gives us an incomplete picture of the dynamics at play. There are instances where arms technologies were curtailed even before widespread adoption, like blinding lasers or neutron weapons. First, this suggests that norm dynamics are more than capable of accelerating the life cycle timeline. In other words, there is no exact standard timeframe for norm diffusion. Second, it is unclear why some technologies would intrinsically lend themselves to regulation over others without any reference to military attitudes towards those technologies' projected utility. The role of antiprenures thwarting norm adoption and codification is a crucial aspect of the killer robot case. But there is little in Bloomfield's framework that illustrates the motivation for adopting the antiprenureal stance

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[232] Price, *The Chemical Weapons Taboo*; and Rosert, "Norm Emergence as Agenda Diffusion."
[233] Rosert and Sauer, "How (Not) to Stop the Killer Robots."

towards any potential norm or why some arms control norms are sabotaged while the very same antiprenureal actor fosters others. As alluded to above, those norm dynamic theories that attribute a breakdown in the norm life cycle to introducing new technology and how it changes actors' normative calculus are essentially ceding agency to technology. In Lantis's case, the introduction of a new weapons technology disrupts the status of established norms, and powerful actors fill the resulting void with norm substitution. In essence, this is a case of inadvertent and soft technological determinism. Huelss is more explicit in his version, suggesting that the new autonomous weapons set the procedural norms of military institutions (instead of the deliberative norms of international negotiations) are what prevail. This is an odd position to take from a social constructivist perspective and simply brings us back to the original sin of technological determinism. While my analysis is congruent with Huelss' incorporation of military institutions into norm analysis, I regard these institutions as social actors with their own set of motivations and internal discourses. These are the same institutions that foster the development of weapons technologies under their logic of appropriateness rather than automatons that simply incorporate technologies foisted on them into a procedural schema, as Huelss' argument suggests.

This dissertation contributes to several gaps in the literature and, through its findings, maps out both new scholarly directions to explore and policy-relevant suggestions. What is clear from the literature review above is that technological determinism has dominated the thinking of IR scholars previously and the recent re-engaging with questions of technology's role in global politics. While the more policy-oriented literature on military innovation bucks this trend, contributions in this tradition do so at the meso and micro levels. This dissertation argues for a constructivist position at the macro level of analysis concerning the specific military technology of autonomous weapons and their antecedents, drones. Specifically, my contribution is to expand the understanding of norms beyond the typical focus on diplomatic negotiations to the realm of military innovation and the macro level norms that drive them.

My findings speak primarily to two literatures: norms in arms control and military innovation studies. First, it speaks to scholarship on international arms control norms filling a gap in the understanding within this literature about why international actors undercut a shared logic of appropriate behavior. Here my academic contributions seek to broaden constructivist norm analysis beyond the purview of just international forums and into the realm of military institutions whose own norms then collide with efforts to govern military technology globally. In essence, the point is that militaries have norms too. From a policy-oriented perspective, this research implies that the normative discourse of great power competition motivates defense actors towards an arms race in autonomous weapons because of the assumptions embedded in a power projection strategy through technological overmatch. This approach is not an outright rejection of interest-based accounts but, rather, seeks to interrogate the ideational basis for those interests—the foundational norms that drive those interests.

This finding has repercussions for transnational activist and defense practitioners themselves in novel ways. Second, while the scholarship on military innovation correctly identifies sources of weapons technologies as cultural and political, my research augments this literature by locating the international sources motivating innovation. Indeed, by exploring the internal discourses that inform the DoD's innovation strategy, I illustrate how the narratives about the necessity for technological overmatch are infused with ideas about global politics and notions about the appropriate role of the U.S. military in international relations.

Table 2.1: Rival Theories

Designation	Alternate Proposition	Level of Analysis	Directionality (IV→ → DV)	Literatures
Technological Determinism	AWS are inevitable because tech development is independent of politics	Macro	Tech.→ → Politics	Nuclear Revolution; Military Revolutions; Drones/AWS as the Future of Warfare
Realist Instrumentalist	Dominant powers will inevitably create AWS as a tool for power-seeking behavior (due to anarchy) because security interests always trump norms	Macro	Politics → → Tech.	Traditional Security Studies; Neorealism; Counterarguments to NR/RMA
Militarism	The profit motive overrides any norm against weapons developments given the capture of state by capitalist/militarized interests/cultural militarism	Meso/ Micro	Econ.→ → Tech.	Military-Industrial Complex; Peace Research; Feminist Security Studies
Competitive Innovation	Competition between institutions spurred on by bureaucratic interests, maverick leaders, or the institutional culture of a specific service leads to new weapons regardless of norms	Meso/ Micro	Politics → → Tech.	Military Innovation Studies
Norm Contestation	Due to a flaw in the norm contestation process, arms control is sabotaged by: powerful actors (antiprenures); immaturity of the norm cycle; the introduction of new technology structures the norm cycle; or dominant procedural norms	Macro	Politics ← → Tech.	Norm Dynamics Theories

Chapter 3 Theoretical Framework and Research Design

The purpose of this chapter is to detail the theoretical framework informing this dissertation and detail the research design of this study. The methods used to investigate this query are informed both this framework and the nature of the subject of study. The lacuna in the current literature considered in the previous chapter informs this approach, seeking to contribute to both the academic and policy communities by addressing the issue of autonomous weapons to bridge the gap between understandings based on global norms and the socially constructed drivers for innovations in AWS. With these points in mind, the chapter progresses as follows. First, I will consider the framework of global norm dynamics in-depth to gain traction on how arms control norms are faltering. Second, I make a conceptual move to expand the lens of transnational norms to include the logic of appropriateness across military institutions and detail the unique position of the U.S. military within global security politics. Taking a step back at that point, I consider the subject of this study. With a keen awareness of the hypothesis offered in the introduction, I detail the methods necessary to explore the trajectory of this military technology.

This chapter is organized into three broad areas. My project's overall framework is constructivist, and the concept of norms is key to understanding the politics surrounding "killer robots" on the global stage. Thus, I consider norm dynamic theories generally and then detail how other scholars have applied norms to AWS. Following a typical pattern of norm emergence, a shared understanding about how responsible states ought to act regarding this new military technology took form through discussions on the world stage. A key component of my argument is the existence of another norm that reinforces a drive towards military innovation. Crucial to this second norm framework are the concepts of global security cultures, and strategic forecasting. These components of my theoretical framing are detailed in the second part of the chapter. Because the debates over how to allocate limited resources in the present to address projected military threats tomorrow, my analysis requires the conceptual tool of the strategic imaginary. This analytic framing means paying attention to collectively held operationalized vision of the future and the actions national security practitioners view as the appropriate response in order to shape that future towards desirable ends. In short, identifying the story the U.S. military tells itself about the future, the elements of that narrative, and the rationales produced by this projection that render the creation of new military technologies necessary.

In the third and final section of the chapter, I detail the research design and methods employed in this analysis. The methodological choices made are informed by this theoretical framework, the type of data available concerning these phenomena, and the inevitable constraints on accessing norms in the area of advanced weapons.

The Origins and Evolution of Norms in IR

The study of norms within international relations is a central element to the constructivist approach to global politics. The general thrust of social constructivism in IR is that ideas and identities are causal factors in international politics. This perspective served constructivism well during the monumental changes in global politics in the late 80s and early 90s with the end of the Cold War. As opposed to neorealism that suggested structured, material factors determined outcomes in international politics or the rival account by neoliberal theorists that institutional development (or a lack thereof) shaped global outcomes, constructivism could readily explain the mass global change. Constructivism could also incorporate the rising cadre of non-state actors that suddenly burst onto the international scene.

The constructivist perspective allows for an interrogation of international political contention in the form of discourse. As mentioned previously, because this is a case of global debate over weapons that are in the midst of their full development, this approach gives us the tools to engage in analysis of this phenomenon. Given that a major premise of my argument is that ideas about global politics shape weapon technologies even in the face of countervailing expectations, it behooves a discussion of norms. Thus, a concise overview of this perspective and how the concept of norms developed within this context is key to the theoretical framing.

Today the constructivist school of thought constitutes one of the three dominant mainstream approaches to the study of global politics. But in the late 1980s and early 1990, constructivism was a new challenger to the established IR perspectives of neorealism and neoliberal institutionalism. The tradition of realism located the determining factors of international political outcomes in the material factors—the disparity of raw power between otherwise equal actors in an anarchic system.[234] By the 1980s, neoliberal institutionalism was the primary alternative to realist perspectives. This school of thought conceded that states operated in an anarchic system. However, neoliberals contended that the rational pursuit of interest was the primary driver of global politics. When these pursuits were channeled into the proper institutional settings, cooperation rather than conflict was more probable.[235] Constructivism challenged both these views, suggesting that politics at the global level are constituted by shared ideas. In this formulation, intersubjective meaning-making is a phenomenon through which international actors define their interests, identities and influence their behaviors as they continually interact.[236] As an alternative perspective to neorealism and neoliberal institutionalism, constructivism was singled out as a rival to the disciplinary status

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[234] Kenneth N. Waltz, *Theory of International Politics*. 1st ed. Boston: McGraw-Hill, 1979; Robert Gilpin, *War and Change in World Politics*. Cambridge University Press, 1981; Joseph M. Grieco, "Anarchy and the Limits of Cooperation: A Realist Critique of the Newest Liberal Institutionalism." *International Organization* 42, no. 3 (1988): 485–507.

[235] Keohane, Robert O. *After Hegemony: Cooperation and Discord in the World Political Economy*. Princeton: Princeton University Press, 2005; Robert Keohane, and Joseph S Nye. *Power and Interdependence: World Politics in Transition*. Boston: Little, Brown, 1977; Robert Keohane, *Neorealism and Its Critics*. Columbia University Press, 1986; Stephen D. Krasner. "Structural Causes and Regime Consequences: Regimes as Intervening Variables." *International Organization* 36, no. 2, International Regimes (1982): 185–205.

[236] Friedrich V. Kratochwil, Rules, Norms, and Decisions: On the Conditions of Practical and Legal Reasoning in International Relations and Domestic Affairs (New York: Cambridge University Press, 1989); Onuf, Nicholas. *World of Our Making*. Columbia: University of South Carolina Press, 1989; Wendt, Alexander. "Anarchy Is What States Make of It: The Social Construction of Power Politics." *International Organization* 46, no. 2 (1992): 391–425; John Gerard Ruggie. "Territoriality and beyond: Problematizing Modernity in International Relations." *International Organization* 47, no. 1 (ed 1993): 139–74.

quo. In his presidential address to the International Studies Association in 1988, Keohane openly confronted constructivists accounts as “reflectivism” that were wedded to a post-positivist outlook diametrically opposed to a scientifically-based, rationalist epistemology, and he challenged them to demonstrate the analytic leverage of this approach in as an organized research program subject to external evaluation.[237]

In response, constructivist scholars embarked on several lines of inquiry to empirically demonstrate the efficacy of these perspectives without rejecting positivism outright.[238] Thus, the first wave of IR constructivists focused on refining their concepts to account for observed, historical outcomes in international politics in order to answer Keohane’s challenge. This meant demonstrating the ability of constructivism to account for both dynamism and stability at the international level. For wholesale shifts in international mores, it seemed that change was easily demonstrated whether one considered the shift away from global chattel slavery,

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[237] Robert Keohane, “International Institutions: Two Approaches.” *International Studies Quarterly* 32, no. 4 (December 1, 1988): 379–96.

[238] It should be noted here that this constituted a split between “mainstream” constructivism and alternate accounts of world politics that did seek to challenge the positivist basis of knowledge production within the field. Broadly speaking this alternate camp included: post-modernists, feminist, post-structuralist, and critical theories of IR. This split has methodological ramifications considered later in the chapter. See Annika Björkdahl, “Norms in International Relations: Some Conceptual and Methodological Reflections,” *Cambridge Review of International Affairs* 15, no. 1 (April 1, 2002): 9–23; and Matthew J. Hoffmann, “Norms and Social Constructivism in International Relations,” *Oxford Research Encyclopedia of International Studies*, March 1, 2010.

dueling, the shift to reject apartheid in South Africa across democratic states, or the massive social change that precipitated the fall of the Berlin Wall.[239]

The greater challenge implicit in Keohane's critique was for constructivism to empirically demonstrate stability within the international system without reliance on material factors or the standard account of perusing rational interests. Two concepts developed by constructivists stood out to meet this task: identity and shared norms. While a number of IR scholars worked on the separate track of collective identity formation, many concentrated on norms to demonstrate how the logic of appropriateness operated in the international realm.[240] In the interests of demonstrating the explanatory power of this perspective, the first-wave scholarship focused on the relative stability and spread of norms, developing illustrations of normative behaviors and concepts like conformance to a norm via socialization and how norms emerge within the international community.[241] The norms approach necessitated going beyond the typical cast of actors that was typically limited to

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[239] James Lee Ray, "The Abolition of Slavery and the End of International War," *International Organization* 43, no. 3 (ed 1989): 405–39; John Mueller, *Retreat from Doomsday*, (New York: Basic Books, 1989); Joseph M. Parent, "Dueling and the Abolition of War," *Cambridge Review of International Affairs* 22, no. 2 (June 1, 2009): 281–300.

[240] For the pioneering work that laid the groundwork for constructivist IR see: James March and Johan P. Olsen, "The New Institutionalism: Organizational Factors in Political Life," *American Behavioral Scientist* 73, no. 3 (1984): 734–49; and James G. March and Johan P. Olsen, "The Institutional Dynamics of International Political Orders," *International Organization* 52, no. 4 (ed 1998): 943–69.

[241] Examples of first-wave constructivism include: Albert S. Yee, "The Causal Effects of Ideas on Policies," *International Organization* 50, no. 1 (1996): 69–108; Martha Finnemore, *National Interests in International Society* (Ithaca: Cornell University Press, 1996); and Audie Klotz, *Norms in International Relations: The Struggle Against Apartheid* (Cornell University Press, 1999).

nation-states, the elites that executed the interests of their respective states, and perhaps functionaries within intergovernmental organizations. In this case, constructivism had an advantage in its flexibility to incorporate other voices: as an ideational perspective, constructivism was better positioned to account for the rise of non-state actors and detail the contemporary shift towards globalization in the 1990s and 2000s. And this flexibility made constructivism an appealing school of thought. Indeed, while it is typically assumed that the field of international relations is dominated by the paradigms of either realism and liberalism, 2011 survey research suggests that constructivism was as influential—if not more so—than these two schools of thought.[242]

The assent to mainstream status within IR came at an analytic cost for the constructivist research program. With an emphasis on demonstrating empirical relevance, first-wave constructivists developed the concept of norms and applied it to historical examples as an independent variable that affected identities, interests, and institutions. As such, the norms selected for study nearly always represented progressive values (e.g., human rights, successful arms control, or the development of the European Union) and were treated as stable, even static ideas. A growing chorus of constructivist was disillusioned with the treatment of norms as a stagnant,

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[242] See Maliniak, Daniel, Amy Oakes, Susan Peterson, and Michael J. Tierney. "International Relations in the US Academy." *International Studies Quarterly* 55, no. 2 (2011): 437–64; Maliniak, Daniel, Susan Peterson, Ryan Powers, and Michael J. Tierney. "TRIP 2017 Faculty Survey: Teaching, Research, and International Policy Project." Williamsburg: Global Research Institute, William & Mary, 2017. *https://trip.wm.edu/*.

unchanging concept and correctly pointed out that by building a research program on this analytic move, constructivism had ceded a great deal of its flexibility to explain a change in global politics in the service of addressing Keohane's challenge. Thus, second-wave constructivists trained their focus on researching the origin, relative spread, local resistance to, and non-compliance with norms.[243] Here much of the initial emphasis of the research was on how global norms emerge, evolve, disperse, and are incorporated through domestic actors. Drilling down into the domestic realm, this second-generation tended to focus on internal socialization towards norms, better modeling of the norm life-cycle, and accounting for non-compliance with norms. These moves have further inspired a more critical generation of norm scholars. Considered the third-wave of constructivists, this cohort emphasized the contested nature of norms and a contentious reintroduction of politics into norms research.[244] Notably, Wiener has led the charge that norms

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[243] For example, see: Amitav Acharya, "How Ideas Spread: Whose Norms Matter? Norm Localization and Institutional Change in Asian Regionalism," *International Organization* 58, no. 2 (April 2004): 239–75; Amitav Acharya, *Whose Ideas Matter?: Agency and Power in Asian Regionalism* (Ithaca: Cornell University Press, 2010); Alan Bloomfield and Shirley V. Scott, eds., *Norm Antipreneurs and the Politics of Resistance to Global Normative Change* (New York: Routledge, 2016); Andrew P. Cortell and James W. Davis, "How Do International Institutions Matter? The Domestic Impact of International Rules and Norms," *International Studies Quarterly* 40, no. 4 (1996): 451–78, *https://doi.org/10.2307/2600887*; Martha Finnemore, *National Interests in International Society* (Ithaca: Cornell University Press, 1996); Margaret E. Keck and Kathryn Sikkink, *Activists beyond Borders: Advocacy Networks in International Politics* (Ithaca: Cornell University Press, 2014); Jeffrey W. Legro, "The Transformation of Policy Ideas," *American Journal of Political Science* 44, no. 3 (July 2000): 419; Martha Finnemore and Kathryn Sikkink, "International Norm Dynamics and Political Change," *International Organization* 52, no. 4 (ed 1998): 887–917; and Thomas Risse-Kappen et al., *The Power of Human Rights: International Norms and Domestic Change* (Cambridge University Press, 1999).

[244] Examples include: Amitav Acharya, *Whose Ideas Matter?: Agency and Power in Asian Regionalism* (Ithaca: Cornell University Press, 2010); Andrew P. Cortell and James W. Davis, "When Norms Clash: International Norms, Domestic Practices, and Japan's Internalization of the

are fundamentally dynamic with contestation at all stages of emergence, establishment, and in the end stage of a norm fading from transnational life. Among this wave, a number of scholars also challenged the underlying assumptions of norms research, questioning its bias towards cases where the "norms" in question represent progressive, liberal achievements suggesting that negative norms were part of international life too.[245]

While this academic ferment across norm scholarship is welcome from an intellectual perspective, it does muddy the waters in the sense of clarifying what I refer to when I speak of norms. The confusion over norms is embedded in the inherent challenge of examining them as social facts. As previously noted, norms are not a directly observable phenomenon, so their existence, structure, and relative potency have to be measured by proxy in either discourse between actors or behavior. As a proxy, the behaviors surrounding the promulgation of international law is an ideal site of study because it is an explicit signal of an existing norm. Especially in positivist treaty law, an international agreement is clearly the product

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GATT/WTO," *Review of International Studies* 31, no. 1 (2005): 3–25; Neta C. Crawford, *Argument and Change in World Politics: Ethics, Decolonization, and Humanitarian Intervention* (Cambridge, UK ; New York: Cambridge University Press, 2002); Betcy Jose, *Norm Contestation: Insights into Non-Conformity with Armed Conflict Norms*, (Cham: Springer International Publishing, 2018), 21–46; Thomas Risse, "'Let's Argue!': Communicative Action in World Politics," *International Organization* 54, no. 1 (2000): 1–39; Wayne Sandholtz, "Dynamics of International Norm Change: Rules against Wartime Plunder," *European Journal of International Relations* 14, no. 1 (March 1, 2008): 101–131; and Alan Bloomfield and Shirley V. Scott, eds., *Norm Antipreneurs and the Politics of Resistance to Global Normative Change* (New York: Routledge, 2016).

245 Antje Wiener, *A Theory of Contestation*, 2014 edition (New York: Springer, 2014). Again, for an excellent overview of this evolution, see: Hoffmann, "Norms and Social Constructivism in International Relations."

of a number of global actors, typically preceded by a delineated negotiation, and the resulting legal instrument sets out clearly understood expectations of behavior. The problem is that, more often than not, norms are only considered widely-held or bonified if they are codified via treaty agreements among states.[246] This leads to one of two analytic outcomes that are problematic. The first is erroneously equating norms with their formal instantiation into international law. When norms are expressed via transnational discourse—but for whatever political reason do not result in formal law—students of norm dynamics regard them as failed norms. Third-wave constructivist scholars more attuned to norm contestation have gone to great lengths to develop a multitude of reasons why norms falter.[247] One prominent

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[246] For discussions on the challenges of norm observation see: Martha Finnemore and Kathryn Sikkink, "International Norm Dynamics and Political Change."; Crawford, *Argument and Change in World Politics*. pp. 87-98; and Amir Lupovici, "Constructivist Methods: A Plea and Manifesto for Pluralism," *Review of International Studies* 35, no. 1 (January 2009): pp. 200.

[247] To summarize, as part of the normal life-cycle, norm contestation is considered an intrinsic part of normative development. Instead of thinking in a linear way, formal rules are not the end in and of themselves but rather just one point in a habitual cycle of contestation. See: Sandholtz, "Dynamics of International Norm Change"; Wiener and Puetter, "The Quality of Norms Is What Actors Make of It"; and Wiener, *A Theory of Contestation*. Contestation serves as the umbrella category under which many academics have posited different explanations of why norms fail to translate into international treaties. For example, norm subsidiarity is suggested as the process whereby local actors develop new rules, offer new understandings of global rules or reaffirm global rules in a different, regional context. See: Acharya, "Norm Subsidiarity and Regional Orders." Norm substitution is outlined as process where state elites persuade their peers in multilateral venues that a new norm frame is legitimate rather than the original established norm framing. See: Lantis, *Arms and Influence*. Rosert differs suggesting in in cases where the norm-setting process fails, the culprit is typically low salience where the amount of attention granted to an issue and reflected in agendas is too low to sustain wider acceptance. See: Rosert, "Salience and the Emergence of International Norms"; and Rosert, "Norm Emergence as Agenda Diffusion." Pratt offers three different ways that norms are unsuccessful: norm death where a prohibition has disappeared, either because the historical circumstances that established and reinforced it no longer obtain, or because it has been eroded by the deliberate efforts of pro-assassination "norm entrepreneurs"; norm dissociation where a norm did not actually exist, except perhaps as an unenforced formality, or (more plausibly) that powerful states simply violated the norm from the start. Instead, Pratt hypothesizes that powerful actors within the international system are able to instigate norm transformation driven by changes in technology and bureaucratic imperatives

method of explaining why norms fail (e.g., why they are not converted into international law in every instance) is to subdivide norms into a typology. For instance, Wiener separates out *fundamental* norm from *organizing principles* as different categories and further delineates *standardized procedures* as a different type entirely.[248] While this approach allows for the analytic specificity to explain the difficulty in operationalizing fundamental norms, it has also led many to focus on practice instead of discourse or international law. In this case, the critique within third-wave scholarship is that dialogue between actors does not actually indicate the true nature of transnational norms. In this view, the unwritten, unspoken foundations for norms across actors due to unconscious motivations, bias, and habitual standard operating procedure. In this view, only practice—the actions of actors—constitutes the core indicator of norms.[249] With this analytic move, we are in a very strange place from where constructivism started: namely, the proposal that shared ideas matter in international relations.

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where they successfully redefine the substance of an existing norm. See: Pratt, "Norm Transformation and the Institutionalization of Targeted Killing in the US."

[248] Weiner, "Enacting Meaning-in-Use," pp. 183-185. Here *fundamental* norms are considered the core constitutional ideas (e.g., sovereignty, human rights, and the rule of law) while *organizing principles* are conceptualized as common policy principles used to operationalize fundamental norms (e.g., proportionality, responsibility, and mutual recognition), and *standardized procedures* describe how these principles are enacted (e.g., proportional representation, qualified majority voting, or unanimous decision making.)

[249] Ted Hopf, "The Logic of Habit in International Relations," *European Journal of International Relations* 16, no. 4 (December 1, 2010): 539–61; Vincent Pouliot, "The Logic of Practicality: A Theory of Practice of Security Communities," *International Organization* 62, no. 2 (2008): 257–88; Wayne Sandholtz, "Dynamics of International Norm Change: Rules against Wartime Plunder," *European Journal of International Relations* 14, no. 1 (March 1, 2008): 101–31.

This latter approach that equates norms with observed practice creates further analytic problems conflating repetitive activity with norms. Indeed, a recent intervention by Jurkovich suggests that the concept is currently suffering from the sin of conceptual stretching.[250] Given the expansive treatments outlined above, international norms are conflated with a number of other concepts like behavior, practice, ingrained bias, international customary law, moral principles, normative thought, ethical precepts, accepted common sense, ideology, organizational psychology, or simply discourse writ large. The challenge now in adopting the lens of norms to account for the politics surrounding emerging military technologies is how to avoid repeating the same missteps. I agree with Jurkovich's assessment of the need to clarify what norms are from what they are not, and I think her observations about the three specific characteristics of norms are helpful to narrow down an effective conceptual framework. First, norms are based on a moral dimension of what ought to be. In this sense, norms are prescriptive. Second, a transnational norm involves a defined actor of a specific identity. Third, behavior or action is specified (rather than an empty pontification without prescribed action.) Through identification of these characteristics, Jurkovich seeks to weed out norm

[250] Michelle Jurkovich. "What Isn't a Norm? Redefining the Conceptual Boundaries of 'Norms' in the Human Rights Literature." *International Studies Review* 22, no. 3 (September 1, 2020): 693–711. For the original sin, see Giovanni Sartori, "Concept Misformation in Comparative Politics," *The American Political Science Review* 64, no. 4 (1970): 1033–53.

claims that are actually based on moral opprobrium, formal law, or standards that go above and beyond shared expectations of behavior.[251]

While this triangulation is helpful to distinguish transnational norms, there are two further important points to make. The first concerns the relationship between widespread ideas and collective action. In an important example, Crawford effectively deals with this problem of conceptual stretching in norm dynamics. Sharing in the frustration over the blurring between global norms and other political phenomena, she simplifies the distinction. In her typology, there are *normative beliefs* that suggest appropriate roles on the one hand and *behavioral norms* that represent a tradition of action for a given role on the other.[252] Instead of favoring ideas over action in her analysis, Crawford opts to make "an explicitly normative account of behavioral norm change."[253] In other words, *normative beliefs* undergird *normative behavior* and how the practice of norms change over time. This allows Crawford to delve into the ethical motivations behind changes in habitual practice. The point that I carry through my analysis is that even when observing the behavioral indicators (norms as the "normal" way actors typically act), there are underlying shared ideas that undergird commonly held ways of doing things. The second distinction is that the political phenomena considered in this project are

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[251] *Ibid,* pp. 694-702.

[252] Crawford, *Argument and Change in World Politics*. pp. 86-97. Here she defines "Behavioral norms are simply "typical, or modal, behavior" or the dominant practice in certain contexts. Normative beliefs are beliefs about what it is *right* to do." pp. 86.

[253] *Ibid.* pp. 97.

global or *transnational* and go well beyond the *international*. This may seem like a minor question of semantics, but in light of the range of actors now involved in global politics, it is important that I acknowledge that norms fall well beyond the narrow purview of state-to-state interactions that the adjective *international* implies.[254]

Narrowing to how norms related to the emerging technology of killer robots, it is important to consider the focus and mechanism at play in different generations of norm theory. Again, accounting for continuity in international relations was a significant challenge for first-wave constructivism in this sense.[255] The second-wave of IR constructivists built out theories about international politics with an emphasis on shared norms across the spectrum of global actors in order to account for stability in international politics. Thus, these scholars emphasized the phenomenon of norm emergence and examined under what conditions new norms as intersubjectively shared ideas about appropriate behavior gained acceptance.[256]

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[254] For the concept of IR outgrowing the adjective "international" see Friedrich Kratochwil, "Re-Thinking the 'Inter' in International Politics," *Millennium - Journal of International Studies* 35, no. 3 (2007): 495–511; and Christine Sylvester, "Whither the International at the End of IR1," *Millennium - Journal of International Studies* 35, no. 3 (2007): 551–73.

[255] Nicholas Onuf, *World of Our Making*, 1 edition (London: Routledge, 2012); Alexander Wendt, *Social Theory of International Politics*, vol. 67, Cambridge Studies in International Relations, (New York: Cambridge University Press, 1999). For an updated overview of constructivism in IR see: Stefano Guzzini, "A Reconstruction of Constructivism in International Relations:" *European Journal of International Relations*, July 24, 2016.

[256] Margaret E. Keck and Kathryn Sikkink, *Activists beyond Borders: Advocacy Networks in International Politics* (Cornell University Press, 2014); Martha Finnemore and Kathryn Sikkink, "International Norm Dynamics and Political Change," *International Organization* 52, no. 4 (ed 1998): 887–917; Martha Finnemore, *National Interests in International Society* (Cornell University Press, 1996); John Gerard Ruggie, "What Makes the World Hang Together? Neo-

This generation of theories was not able to account for how norms change over time, how they are applied in different contexts, or how norms come to an end. A third-wave of constructivist theorists took up this challenge, analyzing norm contestation in greater detail. Several mechanisms proffered by these thinkers accounted for why norms were not taken up in different regions, how internalization of existing norms often mutated their outcomes.[257] Others suggested that different state actors articulate and understand norms variably depending on if they are the prime authors of those norms (makers) or if they inhabit the role of takers.[258] Another branch of the third generation focused on the dynamic nature of norms as they are continually contested rather than settled.[259]

Utilitarianism and the Social Constructivist Challenge," *International Organization* 52, no. 4 (October 1, 1998): 855–85.

[257] Amitav Acharya, "How Ideas Spread: Whose Norms Matter? Norm Localization and Institutional Change in Asian Regionalism," *International Organization* 58, no. 2 (April 2004): 239–75; Andrew P. Cortell and James W. Davis, "When Norms Clash: International Norms, Domestic Practices, and Japan's Internalization of the GATT/WTO," *Review of International Studies* 31, no. 1 (2005): 3–25;

[258] Sikina Jinnah, "Makers, Takers, Shakers, Shapers: Emerging Economies and Normative Engagement in Climate Governance," *Global Governance: A Review of Multilateralism and International Organizations* 23, no. 2 (April 1, 2017): 285–306; and Kathryn Sikkink, "Latin American Countries as Norm Protagonists of the Idea of International Human Rights," *Global Governance* 20, no. 3 (2014): 389–404.

[259] Betcy Jose, "Norm Contestation: A Theoretical Framework," in *Norm Contestation: Insights into Non-Conformity with Armed Conflict Norms*, ed. Betcy Jose, Springer Briefs in Political Science (Cham: Springer International Publishing, 2018), 21–46; Holger Niemann and Henrik Schillinger, "Contestation 'All the Way down'? The Grammar of Contestation in Norm Research," *Review of International Studies* 43, no. 1 (June 24, 2016): 29–49; Thomas Risse, "'Let's Argue!': Communicative Action in World Politics," *International Organization* 54, no. 1 (2000): 1–39; Wayne Sandholtz, "Dynamics of International Norm Change: Rules against Wartime Plunder," *European Journal of International Relations* 14, no. 1 (March 1, 2008): 101–31; Antje Wiener, "Contested Compliance: Interventions on the Normative Structure of World Politics," *European Journal of International Relations* 10, no. 2 (June 2004): 189–234; Antje Wiener, *A Theory of Contestation*, 2014 edition (New York: Springer, 2014); Antje Wiener and

In the instance of AWS, there is a different mix of norm dynamics at play. The debates and normative prescriptions around autonomous weapons appear to be both emerging and contested at the same time. Indeed, the effort underway since 2012 to preemptively ban killer robots under the framework of the CCW has proven elusive and immensely frustrating for transnational humanitarian arms control activists.[260] It appears that contestation over these norms is hindering the emergence of any tangible regulations on the new technology. On the other hand, even a cursory survey of mainstream media reports, the defense trade press, and across broader policy circles reveals not only a plethora of interest in the particular military technologies of drones and autonomous weapons, but also widespread alarm over the emergence of this specific technology. While constellation of norms concerning this emerging technology has yet to coalesce into formal arms control instruments that would clarify the global governance of this technology, the sheer volume of attention paid to autonomous weapons is an indicator in itself that norms are emerging. This is not an instance of norm diffusion being taken up by different

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Uwe Puetter, "The Quality of Norms Is What Actors Make of It," *Journal of International Law and International Relations* 5, no. 1 (2009): 1–16.

[260] Federico Guerrini, "The Arms Industry Is Racing To Create Killer Robots: Does Anybody Care?," December 15, 2019, *https://www.forbes.com/sites/federicoguerrini/2019/12/15/the-arms-industry-is-racing-to-create-killer-robots-does-anybody-care/#664fe7c12b56*; Jonah M. Kessel, "Killer Robots Aren't Regulated. Yet," *The New York Times*, December 13, 2019, sec. Technology, *https://www.nytimes.com/2019/12/13/technology/autonomous-weapons-video.html?auth=login-google&login=google*; "UN Impasse Could Mean Killer Robots Escape Regulation," Deutsche Welle , August 20, 2019, *https://www.dw.com/en/un-impasse-could-mean-killer-robots-escape-regulation/a-50103038*; Neil C. Renic, "Death of Efforts to Regulate Autonomous Weapons Has Been Greatly Exaggerated," *Bulletin of the Atomic Scientists* (blog), December 18, 2019, *https://thebulletin.org/2019/12/death-of-efforts-to-regulate-autonomous-weapons-has-been-greatly-exaggerated/*.

actors depending on how they are situated geopolitically or under different roles given that the *meaningful human control* norm over autonomous weapons is just being established. The same could be said of the mechanism by which a norm evolves due to contestation.

Norms and Autonomous Weapons

Thus far, I have noted two general problems in the current analysis of norm dynamics. First, the general tendency to confuse international law outcomes with the norms themselves. The second problem is when norms are conflated with habitual practice. Within the norms-oriented research concerning autonomous weapons, both of these pitfalls are evident. As considered in the next chapter, there is substantial overlap between the academic community engaged in norms surrounding AWS and transnational activists that advocate for a treaty instrument to preemptively ban these weapons. Indeed, after six years of international negotiations, many activists are frustrated with the lack of progress to rein in the development of these weapons. This frustration is mirrored in the academic assessment that the international community has failed to coalesce around norms concerning killer robots.[261] Equating the unsuccessful attempt to preemptively ban autonomous weapons with the failure of norm formation has led to the second

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[261] Rosert and Sauer, "How (Not) to Stop the Killer Robots."; Maas, "How Viable Is International Arms Control for Military Artificial Intelligence?"; and Rosert and Sauer, "Prohibiting Autonomous Weapons."; Neil C. Renic, "Death of Efforts to Regulate Autonomous Weapons Has Been Greatly Exaggerated."; and "UN Impasse Could Mean Killer Robots Escape Regulation," Deutsche Welle, August 20, 2019, *https://www.dw.com/en/un-impasse-could-mean-killer-robots-escape-regulation/a-50103038*.

misstep in scholarship on this topic: conflating standard practice within military organizations with norms. Bode and Huelss are the primary scholars of this approach with the hypothesis that norms are shaped by non-deliberative practices of creating and deploying AWS. In addition, the characteristics of autonomous weapons technology itself influence the norms adopted towards warfare.[262] This approach discounts any ideational basis or deliberative rationale behind the creation of this technology, simply attributing it to a standard operating procedure of advanced militaries.

Given the trajectory of norms research, my approach in this dissertation seeks to avoid these conceptual pitfalls. The first step in this effort is to keep the definition of norms in mind: a collective standard of appropriate behavior for actors of a given identity.[263] Thus, norms are founded on ideas about roles and how the associated responsibilities of those identities should be fulfilled. Second, I echo Jurkovich's admonishment to identify norms by their three characteristics: <u>ethical</u> prescriptions for <u>actions</u> associated with actors of a <u>specific identity</u>. Third, I follow Crawford's lead by situating my analysis in terms of tracing the normative beliefs that underwrite behavioral norms rather than a dichotomy between the two. But the

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[262] Bode and Huelss, "Autonomous Weapons Systems and Changing Norms in International Relations" pp.394-396; Huelss, "Norms Are What Machines Make of Them." pp. 112-113.

[263] See Martha Finnemore and Kathryn Sikkink. "International Norm Dynamics and Political Change." *International Organization* 52, no. 4 (ed 1998): 887–917; and Katzenstein, Peter J. *The Culture of National Security: Norms and Identity in World Politics*. New York: Columbia University Press, 1996. The kernel of norms as a concept is also found in James G. March and Johan P. Olsen, "The Institutional Dynamics of International Political Orders," *International Organization* 52, no. 4 (ed 1998): 943–69.

original conundrum is still present: how is it that the global norms surrounding AWS elude the translation into arms control instruments? My argument relies on the concept of "norm collision" that has evolved out of the third-wave of constructivism. As Gholiagha *et alia*, proffer:

> *"We define norm collisions as instances in which actors claim that two or more norms provide conflicting or incompatible expectations about appropriate behavior in a specific situation. It is essential to add that a norm collision can either take place between two norms that had existed before they were perceived to be colliding, between two newly emerged norms that had hitherto not been related to each other, or between an already existing and a newly emerged norm."*[264]

In the case of AWS, there are two different sets of norms that collide on the topic of the appropriate use of these weapons or if they should be developed at all. Foreshadowing chapter four, the global norms surrounding AWS are informed by a widespread apprehension about letting machines make life or death decisions on the battlefields of tomorrow. The resulting norm is proscriptive (negative or prohibitive of behavior) rather than prescriptive (establishing the correct method of behavior.) I characterize this emerging norm in these terms: *it is ethically impermissible for law-abiding, civilized states to develop or use autonomous weapons that exceed meaningful human control over lethal outcomes*. As suggested, there is an opposing norm that is somewhat submerged in its origins outside of the arena of intergovernmental organizations or on the floor of

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[264] Sassan Gholiagha, Anna Holzscheiter, and Andrea Liese, "Activating Norm Collisions: Interface Conflicts in International Drug Control," *Global Constitutionalism* 9, no. 2 (July 2020): pp. 295.

multilateral negotiations. This norm is shared by advanced military powers and is an ethos the permeates global security cultures. I characterize this second norm in these terms: *national security professionals are ethically duty-bound by their role and identity to develop AWS technology in opposition to any possible future adversaries in order to maintain the sovereignty of their state and secure core national interests*. As the leading state across the contemporary global security culture, the United States occupies a key position setting the parameters of this norm as it relates to AWS in particular, and this role is the subject of chapters five and six.

Global Security Cultures and the Conundrum of Strategic Planning

An important component of my argument is that norms exist outside of the confines of international negotiation and prescribed dialogue between international actors. In this sense, militaries have global norms too. This places an additional burden on my explanation beyond simply analyzing two sets of norms. Indeed, this necessitates mapping out the institutional landscape as the origin of military norms and delving into the distinct norms concerning technology in the strategic calculus of advanced military states. In order to do so, more theoretical groundwork is needed.

The idea that states and the agents charged with their defense share similar notions about security and develop a logic of appropriate behavior around those ideas is not a provocative contention. As detailed in the literature on military isomorphism—or the tendency of armed forces to mimic each other's structures and behaviors—is prevalent across all types of states, from the most economically developed down to the smallest power. In terms of diffusion, previous scholars have noted the tendency of state leaders to see out the most advanced weapons they can afford to purchase, often flying in the face of obvious strategic need. In short, there is prestige in fielding high-tech weaponry that many governments are willing to pay for regardless of practical strategic needs.[265] However, not all states foster an indigenous project of innovation in order to meet these perceived needs. In fact, the vast majority of small to middle military powers are happy to simply purchase advanced arms from the major arms-producing states.[266] The role of innovators in this instance is taken up by the small number of advanced military powers. Indeed, this behavior is what defines the identity of great power states.

The dynamics of how these roles and ideas interact are the subject of disparate scholars who focus on national and global security: Mary Kaldor and Samuel Huntington both commented on military ideals that are shared across different societies. Kaldor's work in the area of Human Security was notable in that it redefined the characteristics of warfare in the post-Cold War era. She posited that the logics of warfare in terms of those that organized violence and the motivations

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[265] Regarding these phenomena see: Dana P. Eyre and Mark C. Suchman, "Status, Norms, and the Proliferation of Conventional Weapons," in *The Culture of National Security: Norms and Identity in World Politics*, ed. Peter J. Katzenstein (New York: Columbia University Press, 1996), 79–113.

[266] See most of the Gulf States in the Middle East as an example: their GDP is large enough to support domestic research and development of home-grown innovation but high-tech arms have traditionally been acquired from allied states instead.

for taking up arms had so radically changed, the field of security studies should rethink its state-centric focus.[267] After the challenges within global security after September 11, the subsequent War on Terror, and the refocus of Western countries back to great power competition, Kaldor updated her original thesis. Without abandoning her formulation of New Wars, she instead stipulated that there are four different global security cultures. The first two types are familiar: the traditional "geopolitical" form of interstate competition and her aforementioned "new wars" variant where armed conflict is less about political claims between formal states than they denote a synergistic relationship between profit-motivated criminality that feeds off armed chaos and competing subnational groups vying for state power along ethnonationalist lines. To this Kaldor adds the culture of "liberal peace," where Western powers have sought to intervene often in new war situations in order to stabilize the global international order. The last military culture she details is one that branched off during the global "war on terror" focused on the armed conflict between terrorist organizations and counterterrorism efforts across military institutions. This last type blurred the line between warfare and policing.[268] In terms of how norms operate across the different national military organizations, my focus is on her formulation of the "geopolitical" security culture.

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[267] Mary Kaldor, *New and Old Wars: Organized Violence in a Global Era* (Malden: Polity Press, 2013).

[268] Mary Kaldor, *Global Security Cultures* (Medford: Polity, 2018).

To be clear, this formulation is significantly different from many of the cultural accounts of military innovation. Instead of attributing alternate approaches to technology rooted in varied societies and then comparing those approaches, Kaldor stipulated a set of military cultures that spanned the state system and were defined as a: “constellation of socially meaningful practices, that expresses or is the expression of *norms* and standards embodied in a particular interpretation of security and that is deeply imbricated in a specific form of political authority or set of power relations.”[269] For present purposes, my focus is on the more traditional geopolitical variant of military culture that still dominates the others in terms of dedicated resources, institutional frameworks, and political salience. Even if this is regarded as the more traditional function for military forces vis-à-vis the state, Kaldor makes clear that her account is not typical of conventional security studies of the Cold War period. Acknowledging the insights of Critical Security Studies, she emphasized the discourse around security, the projected nature of even this traditional variant, and the imagined ends that the geopolitical military culture seeks to achieve.[270]

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269 *Ibid.* pp. 2. Emphasis added.

270 *Ibid.* pp. 41. “Geo-politics still remains the dominant culture at least in terms of resources and rhetoric. Indeed, at the time of writing, there is a widespread view that geo-politics has bounced back… Yet it is a funny kind of twisted geo-politics. It is no longer about securing borders or acquiring territory. It is about communication and political control, not about control of territory; this is why the term ‘hard power’ is misleading—geo-politics is about ‘soft power’, that is to say, communication. To put it another way, geo-politics is about fighting old-fashioned war or ‘old war’ in the imagination, and it functions as much through the discourse as through physical control. Geo-politics is supposed to be about the military capture of territory; nowadays it is about imagining the military capture of territory—a discourse that legitimizes its own existence.”

To probe further into the norms that structure this military culture, I turn to a more orthodox authority on security studies and military culture. Before establishing himself as an expert on democracy and advancing his most well know thesis in the *Clash of Civilizations,* Samuel Huntington was regarded as the definitive expert on civil-military relations. His first major book, *The Soldier and the State* charted the history of military professionalism and the establishment of the modern military as a public institution set apart but under civilian political control. In this work, he maps out how the military across modern society is shaped by two general forces: the functional imperative to defend the state against security threats and societal imperatives that draw from the ideology of any given society and the dominant institutions. In the case of the former, the norms within the military in every state are equally shaped by common factors. For example, every military is organized hierarchically to maintain control over the use of force, and senior officers are expected to not only comport themselves above reproach but also to make every decision with the aim of securing the state. For the latter, societal imperatives drive norms towards particularism in the sense that social forces or general ideology structure expectations about military behavior. Despite variation on these two broad factors, Huntington posited that every military in the modern era set itself apart from society through professionalization across the upper ranks in order to most effectively inhabit the unique role armed force served for national security. This distinction of a military role was established by written and unwritten norms and values, instilled via training, professional military education, laid out in official ethics, and doctrine.[271] What is readily apparent in Huntington's overview of the military mindset—and borne out by the historical record—is that professional military norms are deeply informed by a realist view of international relations that stress competition between states in an anarchic system. This is unsurprising given the functional imperative to guard against potential rival threats to a state's security. Yet, Huntington's insights are compatible with those of Kaldor that are based on a constructivist understanding. Combined, these two analyses highlight the social role of armed forces: the military is charged with a sacred duty and responsibility to protect the state, sovereignty, territorial integrity, national interest, individual citizens, values, and the viability of its own armed force even during periods absent of war.[272]

These insights establish the framework to speak of a transnational culture across national militaries that are informed by norms. A modified version of our norm definition in this context is as follows: there are shared ideas about the appropriate roles that military institutions and actors inhabit towards ethical ends. Here, the ethics of military norms reference the duties and responsibilities of

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271 Samuel P. Huntington, *The Soldier and the State: The Theory and Politics of Civil-Military Relations* (Cambridge: Belknap Press of Harvard University Press, 1957).

[272] To the point of norms in arms control, military professionalism also lends itself to ethical behavior where global norms of restraint in the use or development of weapons are "diffused" to defense institutions. This is to say, the *innovation imperative* norm is not a proto-realist, unfettered impulse to create and use the worst technology imaginable beyond any restraint. As I detail in chapter six, there is caution across military thinkers regarding the prospects of autonomous weapons. Instead, the issue is how does the *innovation imperative* norm overcome the *meaningful human control* norm in the current moment.

military actors to ensure the security of their respective states and the appropriate behaviors associated with this role. With this in mind, we can ask what particular norms across the global military culture of geopolitics, as put forward by Kaldor, inform the development of emerging military technologies? While this framing gives us a good initial point of reference for military norms, an additional layer is needed because of the temporal constraints placed on strategic planning in the area of technology. In short, the *innovation imperative* norm dictates that military leadership must organize, plan, and develop weapons today for possible wars of tomorrow. Thus, I need to account for how military norms are impacted by the shadow of the future.

The broad realist and neoliberal assumption that the international arena is anarchic and essentially a self-help system is prevalent across military organizations. The result is that every state is faced with the same security challenge of dealing with strategic uncertainty about the future.[273] The logic of prudent preparation for contingencies that may threaten state survival informs much of strategic thought and planning. Indeed, the options available to states in this sense vary widely depending on material capabilities, historic national experience in warfare, regime type, relations with neighboring states, and especially the political and geographic positioning of various state actors. Hence the response of one state

[273] For a comprehensive and excellent discussion of the challenge posed by uncertainty in military planning see: Michael Fitzsimmons, "The Problem of Uncertainty in Strategic Planning," *Survival (00396338)* 48, no. 4 (Winter2006/2007 2006): pp. 132.

(e.g., Switzerland) may be strict neutrality while other states may choose entry into a formal alliance system with an established collective security system of stronger states (e.g., Lithuania) or a declaration of de-militarization (e.g., Costa Rica) while others may seek deep integration within the institutions of the liberal international order and foster key bilateral security arrangements (e.g., Japan).

The need to anticipate future threats, or what practitioners refer to as the Future Operating Environment, depends on informed and rational forecasting.[274] This entails sorting out potential versus probable adversaries and future scenarios that a given state can anticipate. There is also a general issue of temporality in this forecasting endeavor: short-term issues are certainly easier to discern rather than long-term security threats. This is complicated by the fact that initial moves in the short-term will limit the range of options in the longer-term forecast. If country A builds up its naval forces to counter today's rival at sea (country B), producing battleships rather than tanks, when A's neighbor C invades five years from now with ground forces, A will lose the war and territory. In addition, strategic planners have to anticipate their own state's future material capabilities and the position of a state in the international system realistically in order to shape their own strategic vision and make choices in the present to prepare for the future. For those with the luxury of an advanced industrial (or post-industrial) economy, the option to turn

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[274] Dan Cox and Michael Mosser, "Defense Forecasting in Theory and Practice: Conceptualizing and Teaching the Future Operating Environment," *Small Wars Journal* 9, no. 1 (January 2013), accessed February 2, 2018 *http://smallwarsjournal.com/jrnl/art/defense-forecasting-in-theory-and-practice-conceptualizing-and-teaching-the-future-operatin.*

towards R&D for new solutions makes sense intuitively. Of course, for a large portion of small and middle powers in the international system, procurement of advanced weapons systems makes much more sense than the cost and uncertainty of indigenous innovation.[275] Hence, international hierarchies are only reinforced by the dynamics surrounding strategic uncertainty and the diffusion of advanced weapons.[276] This conundrum is exacerbated by the accelerating pace of advances in dual-use technology in the commercial sector and their increasing diffusion.

Because of this strategic challenge posed by the necessity to plan for an unknowable future, military norms, especially as they relate to weapons technology, have a speculative element that one needs to take into account. To reiterate, the common issue of strategic uncertainty necessitates that military-planners perform a certain amount of well informed, reality-based projection of what the global context will reasonably be in the future in order to allocate resources, assess strategic options, and in some instances, foster weapons innovations to meet anticipated threats. This future projection is what I term the strategic imaginary. To borrow heavily from Jasanoff and Kim's definition of the sociotechnical variant, the strategic imaginary is defined as a collectively held, institutionally crafted, distributed, advocated, and operationalized vision of the

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[275] Mark Zachary Taylor, *The Politics of Innovation: Why Some Countries Are Better than Others at Science and Technology* (New York, NY: Oxford University Press, 2016).

[276] Horowitz, *The Diffusion of Military Power*.

future threat environment that is ultimately performed via military-bureaucratic processes, doctrine, and weapon technologies.

This conceptual framework draws upon a variety of disciplines that have deployed the imaginary as a conceptual tool, including science and technology studies (STS), political theory, critical geography, communications, and international relations. First among these sources (as mentioned above) is the work of Jasanoff and Kim in their definition of sociotechnical imaginaries employed in their STS studies of variation between societies and their respective scientific development.[277] This dissertation differs in scope and utilizes a different method compared to Jasanoff and Kim. First, I am only concerned with the imaginary within a subset of institutions (those that make up the national security community) given the focus on strategic uncertainty. On the other hand, the Sociotechnical Imaginaries Project at the Harvard Kennedy School hopes to explicate widely held view of science and technology across whole societies. Second, Jasanoff and Kim are decidedly focused on comparative techniques. While the present study shares their use of interpretive methods, the goal is to illustrate how visions of international relations in these imaginaries drive the norm to innovate. Rather than comparing across various states or societies, the method employed here is discourse

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[277] See Sheila Jasanoff, "Future Imperfect: Science, Technology, and the Imaginations of Modernity," in *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*, ed. Sheila Jasanoff and Sang-Hyun Kim (Chicago ; London: University Of Chicago Press, 2015) pp. 4-5; and "STS Program » Research » Platforms » Sociotechnical Imaginaries » Sociotechnical Imaginaries," accessed March 2, 2018, *http://sts.hks.harvard.edu/research/platforms/imaginaries/*

analysis as we are concerned with the preeminent military and most technologically advanced power, the United States.

The concept of the imaginary has certainly been applied to numerous subjects and was developed within various disparate contexts. Castoriadis first developed the concept in his account of the social imaginary in his Marxist theory of the state and other institutions like Capitalism drawing from the psychoanalysis of Lacan.[278] One of the most widely read works that utilized the concept is Anderson's seminal work on nationalism that recounts the development of nationalism as a state project of creating imagined communities that instill within each citizen a sense of belonging to a construct, the nation.[279] The political theorist Charles Taylor also explored the emergence of the modern and its attendant cultural forms of the economy, the public sphere, and secular self-governance through the concept of the imaginary.[280] Jasanoff and Kim draw from these previous theories in order to develop their own account of sociotechnical imaginaries across today's world.[281] Within the discipline of critical geography, the concept of the imaginary

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[278] Cornelius Castoriadis, *The Imaginary Institution of Society*, (Cambridge, Mass.: MIT Press, 1987).

[279] Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism*, (London; New York: Verso, 1991).

[280] Charles Taylor, *Modern Social Imaginaries*, Public Planet Books (Durham: Duke University Press, 2004).

[281] The ambition of this paper is comparatively circumspect, applying the concept of the imaginary to a tailored and particular set of circumstances where the imaginary is necessitated by the nature of strategic planning.

was deployed by Coward to elucidate the “military imaginary” of the USAF, drawing from Gregory’s related model of the scopic regime.[282]

The field of IR and the subfield of International Security have also seen a number of scholars engage with the concept of a shared imaginary. While not explicitly referencing this tradition, feminist IR theorist Carol Cohn certainly captures the spirit of a shared imaginary among defense intellectuals in her seminal article, “Sex and Death in the Rational World of Defense Intellectuals.”[283] Employing a cognitive approach to policy preferences in nuclear doctrine, Zwald also utilizes the concept of the imaginary in the context of the Bush administrations and the debate over the New Triad in the early 2000s. Here the imaginary is held by specific defense officials and is shaped by their formative policy experience within the Nixon, Ford, and Reagan administrations.[284] As previously mentioned, Pretorius draws on Mary Kaldor’s work to consider why variegated state actors choose to emulate each other in the form of their armed forces and why strategic aims are so similar across the boards –what she calls military isomorphism. Within her explanation, she develops the concept of a “security imaginary” that fixes

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[282] Martin Coward, “Networks, Nodes and de-Territorialized Battlespace: The Scopic Regime of Rapid Dominance,” in *From Above: War, Violence, and Verticality*, ed. Peter. Adey, Mark Whitehead, Alison Williams, (New York, NY: Oxford University Press, 2013), 95–117; Derek Gregory, “The Everywhere War,” *The Geographical Journal* 177, no. 3 (June 24, 2011): 238–50; and Derek Gregory, “From a View to a Kill: Drones and Late Modern War,” *Theory, Culture & Society* 28, no. 7–8 (December 1, 2011): 188–215.

[283] Carol Cohn, “Sex and Death in the Rational World of Defense Intellectuals,” *Signs* 12, no. 4 (1987) pp. 704 and 713.

[284] Zachary Zwald, “Imaginary Nuclear Conflicts: Explaining Deterrence Policy Preference Formation,” *Security Studies* 22, no. 4 (October 1, 2013): 640–71,

meaning to things (weapons), identities, and roles in order to meet perceived threats.[285] Lawson takes a similar approach utilizing the military imaginary to historically compare the emergence of mechanized warfare on the one hand and network-centric warfare on the other. In this, he delves deeper into the links between national expressions of science, economics, and military organization drawing on the communication theory of articulation.[286]

In the case of the military norms that propel the development of advanced weapons, the strategic imaginary is a key component of the norm that translates collectively shared ideas about prudent military duties to ensure future security for the state into technologies like autonomous weapons. Again, drawing on Jasanoff's Sociotechnical Imaginaries Project, the concept of the imaginary is favored over other parallel social science concepts like ideology, discourse, or master narratives. These rival concepts tend to infer static shared ideas or normative language games that are dependent on structures of power. The imaginary, instead, emphasizes shared meanings and the processes of meaning-making within institutions and polities.[287] Deployed here with the adjective "strategic," the concept helps us

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[285] Joelien Pretorius, "The Security Imaginary: Explaining Military Isomorphism," *Security Dialogue* 39, no. 1 (2008): 99–120, pp. 100, 106-107, 113-114.

[286] Sean Lawson, "Articulation, Antagonism, and Intercalation in Western Military Imaginaries," *Security Dialogue* 42, no. 1 (February 1, 2011): pp. 44.

[287] Jasanoff favors the concept of *imaginaries* over other possible concepts developed in the social sciences for collective ideas along the following lines: "*Discourse* shares with imaginaries the properties of being collective and systemic (e.g., Hajer 1995), but it usually focuses on language and is less directly associated with action and performance or with materialization through technology. Political ideologies are perhaps more obviously tied to power and social structure than are sociotechnical imaginaries, but ideology is generally seen as entrenched and immovable. Ideology also lacks the imagination's properties of reaching and striving towards possible futures,

understand how shared narratives are formed, sustained, and disseminated in the interest of a common institutional goal and also favors a sympathetic reading of national security activities given the exigencies of strategic uncertainty rather than chalking up a "military" imaginary to a sordid case of brute militarism. This formulation also suggests an analysis that considers the narrative arch involved in stabilizing these shared visions of probable future security threats, the motifs that echo shared histories among military professionals, the motivation behind specific strategic innovations, and the functional roles practiced by the constituent parts of the national security enterprise.

But why use the concept of "the imaginary" in particular, and how does one implement such an approach? Jasanoff and Kim suggest that sociotechnical imaginaries help overcome limitations of rival concepts such as ideology or discourse in four ways: they allow for comparisons between political units; they allow for both durability and change in collective ideas without skewing too far towards fixity (attributing an ideology to all defense actors) or towards a completely malleable contingency (discrete discourses among actors); they allow for a

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and ideology has not typically been analyzed as being encoded in material technologies. Policy itself refers to formal or tacit programs of action, not to the underlying rationale or justification that may be provided by sociotechnical imaginaries. Similarly, a plan conveys the intentionality of sociotechnical imaginaries, but it usually refers to near-term futures with specific, designated goals (e.g., a plan to build a weapon or a highway) and is usually a product of formal institutional authority rather than a shared cultural property. In the same vein, a project usually involves a single, targeted, technological endpoint, such as the Apollo moon landing, the "cure for cancer," the sequencing of the human genome, or the mapping of the brain; such projects may themselves reflect animating sociotechnical imaginaries." Sheila Jasanoff, "Future Imperfect" in *Dreamscapes of Modernity,* pp. 20.

grounding of shared ideas within a given space and time; and they help illuminate the interaction between collective formations and individual identities.[288] In this case, the object of study is the projected future as envisioned by the U.S. military—as the leading power in the global security system—and how these hypothetical versions of future conflict inform decisions about the technologies developed today. Hence, an interpretive method is called for, as the data that comprises the object of study is text and speech. In the case of the strategic imaginary, the comparative method is less useful as the concern here is with a single imaginary rather than a comparison with other states' conceptions of technology necessary for their security. However, Jasanoff and Kim's formulation is helpful to demonstrate the longevity of this particular imaginary and the contestations within the US national security community and especially the attitudes implicit within these shared visions regarding technological innovation. The sociotechnical imaginary framework also helps us analyze how ideas about the future inform the institutional identities of actors within the national security enterprise and how contention marks the evolution of any given imaginary.

Generally, the field of Science and Technology Studies (STS) posits that societies imagine future technologies across entire cultures. Sheila Jasanoff and Sang-Hyun Kim detail this process via the analytic concept of sociotechnical imaginaries:

[288] *Ibid.* pp. 21-24.

> "[C]ollectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology."[289]

The first set of research challenges included concerns about the speculative nature of future technology and the secrecy surrounding the development of such weapons. Because autonomous weapons do not exist, there are no objects of study or use of such weapons yet. Thus, it is premature to conclude if this technology will significantly influence global security politics or, if so, what type of impact would be in store. The esteemed scholar of military strategy, Sir Lawrence Freedman, cautions us against preemptively ascribing the effects of developing weapon technologies given the poor track record of such prognostications in the past.[290] One solution to this conundrum is to define the scope conditions on the subjects under review, given the theoretical framework. Thus, the subject of analysis in this project is the discourse itself concerned with these technologies. Ultimately, this focus is much more productive and amenable to research than a foray into a speculative exercise focused on the possible impact of emerging technologies in an attempt to adjudicate what forecast is most likely to come to pass. While the discourse itself is speculative and future-oriented, the politics and controversies over killer robots are grounded in the here and now. The ideas and debates are also

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[289] Sheila Jasanoff and Sang-Hyun Kim, eds., *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* (Chicago; University of Chicago Press, 2015) pp. 4.

[290] Lawrence Freedman, The Future of War: A History (New York, N.Y: Public Affairs, 2017).

presaged by recent disputes over the use of unmanned aerial vehicles and historically based expectations about technology in strategic military competition.

Two important points need to be made concerning the strategic imaginary framework. First, the Cold War saw the creation of a sprawling national security apparatus within the U.S. government that evolved into a contingency planning factory. The end of the Cold War did not mark the end of this vast network of projection. Rather, institutional proliferation further complicated strategic uncertainty at a time when the concept of security was redefined and expanded in the post-Cold War period along with a multiplication of threat contingencies from the American perspective.[291] As the last superpower standing, the U.S. and its military inherited the institutional legacy of the Cold War that thrived on threat and contingency Despite the passing of the Cold War, the bloated military apparatus that America had built up was slightly curtailed by some budget cuts, but not to the extent that one would expect with the demise of a superpower competitor.[292] Thus, the imaginary was a self-sustaining discourse that dovetailed well with institutional motives to retain resources and US domestic politics that further shifted national

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[291] Again see Fitzsimmons, "The Problem of Uncertainty in Strategic Planning," and in terms of how security was redefined post-Cold War see: Barry Buzan, *People, States & Fear: An Agenda for International Security Studies in the Post-Cold War Era* (ECPR Press, 2008); Barry Buzan, Ole Wæver, and Jaap de Wilde, *Security: A New Framework for Analysis* (Lynne Rienner Publishers, 1998); Ken Booth, *Critical Security Studies and World Politics*, Book, Whole (Boulder, Colo.: Lynne Rienner Publishers, 2005); Ronnie D. Lipschutz, ed., *On Security*, New Directions in World Politics (New York: Columbia University Press, 1995).

[292] Daniel Wirls, *Irrational Security: The Politics of Defense from Reagan to Obama* (Baltimore: Johns Hopkins University Press, 2010).

security policy away from the legislature to the executive. On the other side of this coin, a second point is in order concerning the strategic imaginary. The use of the term imaginary in conjunction with strategic planning in no way suggests that these narratives are purely fictional or should be discounted as mythology. Indeed, the envisioned worlds they portend and the threats to national security contained within them could very well come to fruition. Imaginary in this sense is not used as a pejorative or in a critical manner. Instead, it is deployed with the very real understanding that strategic forecasting is a deadly serious endeavor (quite literally) and is suggested as a theoretical construct with all respect paid to the military professionals who deal with the challenges of strategic uncertainty. As we will see, the strategic imaginary does, however, lend itself to self-fulfilling prophesy, especially as it is applied to developing new military technology.

To recap, this conceptual framework locates my argument on the ground of global norms regarding emerging weapons. The explanation for why norms around autonomous weapons elude validation in international agreements is due to the dynamics of norm collision. On one side resides norms developed in a more familiar setting within the confines of a multilateral international negotiation that press for some type of arms control of killer robots. The countervailing global norms propelling the development of autonomous weapons are embedded in the role of national security practitioners within a global security culture. Because of the preemptory nature of developing weapons before the instigation of conflict, the perceived need to prepare for future warfare is baked into the application of military norms to these technologies. Because of this strategic conundrum, norms about technological development have an underlying strategic imaginary that forms the rationale for possible future conflicts and the anticipated character of warfare in this projected future.

Research Design: Discourse, Historiography, and Narrative

In light of the conceptual scaffolding detailed above, the research design employed to explore the collision of norms over autonomous weapons is predicated on the nature of the phenomenon under analysis and the data available to illuminate this subject. The social sciences and the field of International Relations, in particular, have engaged in a robust debate concerning research methods over the past thirty years. It is well beyond the purview of this dissertation to resolve any of these debates. However, it is incumbent upon me to briefly and clearly state the positions that inform this inquiry.

The status of IR as a science of global political interaction has undergone a number of examinations in recent decades. The seminal work of King, Keohane, and Verba (hereafter KKV) is widely regarded as a call for the study of politics, especially in its qualitative approaches, to adhere to the systematic and rigorous standards of the natural sciences.[293] In their formulation, the *ideal* political science research design would consist of quantitative methods that combine causal inference with randomized, large-N observations subject to experimental methods

[293] Gary King, Robert O. Keohane, and Sidney Verba, *Designing Social Inquiry: Scientific Inference in Qualitative Research* (Princeton: Princeton University Press, 1994).

and statistical analysis. To their credit, KKV recognizes that the social sciences operate under different constraints (in terms of direct access to observation and ethics) that preclude operating under this ideal type. Instead, they propose that political science adheres to common scientific standards of inquiry, allowing for some divergence into qualitative methods but with a general commitment to mimic quantitative rigor and adherence to positivism. Without delving into the deep philosophical debates over epistemology, it is fair to say that there was a stark reaction across the field of IR, in particular to these admonishments. Instead of subduing the debate between quantitative and qualitative methods, KKV actually spurred a new debate over how to adjudicate knowledge claims over social facts in cases that were not amenable to quantification. Several figures across the social sciences advocated for the inclusion of a greater number of research methods. Many of the subsequent works to come out of this debate highlighted not only the advantages of multiple approaches to research design but also advanced the rigor of non-paradigmatic design.[294] By the late 2000s, the discipline of IR settled into a range of methodological options improved upon by a variety of scholars. While this outcome was antithetical to the original project to impose shared standards across

[294] For example: David Collier and Henry E. Brady, *Rethinking Social Inquiry: Diverse Tools, Shared Standards* (Lanham, Md: Rowman & Littlefield Publishers, 2004); Jason Seawright and John Gerring, "Case Selection Techniques in Case Study Research: A Menu of Qualitative and Quantitative Options," *Political Research Quarterly*, February 9, 2008; Kristin Luker, *Salsa Dancing into the Social Sciences: Research in an Age of Info-Glut* (Cambridge: Harvard University Press, 2010); John Gerring, *Social Science Methodology: A Unified Framework* (New York: Cambridge University Press, 2011); Peregrine Schwartz-Shea, *Interpretive Research Design* (New York: Routledge, 2012); and Gary Goertz and James Mahoney, *A Tale of Two Cultures: Qualitative and Quantitative Research in the Social Sciences* (Princeton University Press, 2012).

the social sciences, many commentators expanded on the benefits of embracing methodological pluralism as an enriching development.[295]

In this context, my own approach to research design fits into the pluralist categories of empirically-based, qualitative analysis that skews towards an interpretive yet rigorous framework. These research choices were made in the interest of deepening an understanding of the political phenomena at play and reflecting on the nature of the data available to investigate norms as collective ideas. As previously noted, investigators cannot directly access norms, but instead they have to discern shared ideas from either behavior or rhetoric between actors. In the case of arms control and autonomous weapons, behaviors are less illuminating at this point, given that these weapons are fairly hypothetical in terms of being fully developed or actually deployed in combat. Hence, their direct impact on the political world is unproven at this point.[296] On the other hand, the data on the

[295] For those that advocate for various methods to flourish within the discipline see: Audie Klotz, *Strategies for Research in Constructivist International Relations*, International Relations in a Constructed World (Armonk: ME Sharpe, 2007); Brian M. Pollins, “Beyond Logical Positivism: Reframing King, Keohane, and Verba,” in *Theory and Evidence in Comparative Politics and International Relations*, ed. Richard Ned Lebow and Mark Irving Lichbach, *New Visions in Security* (New York: Palgrave Macmillan US, 2007), 87–106; James Mahoney, “After KKV: The New Methodology of Qualitative Research,” *World Politics* 62, no. 1 (December 2010): 120–47; Jason Glynos and David R. Howarth, *Logics of Critical Explanation in Social and Political Theory*, (New York: Routledge, 2007); Michael Keating and Donatella della Porta, “In Defence of Pluralism in the Social Sciences,” *European Political Science* 9 (November 2, 2010): 111–20; Audie Klotz and Deepa Prakash, eds., *Qualitative Methods in International Relations: A Pluralist Guide*, Research Methods Series (New York: Palgrave Macmillan, 2008); Rudra Sil and Peter J. Katzenstein, *Beyond Paradigms: Analytic Eclecticism in the Study of World Politics*, (New York: Palgrave, 2010); Patrick Thaddeus Jackson, *The Conduct of Inquiry in International Relations: Philosophy of Science and Its Implications for the Study of World Politics* (New York: Routledge, 2011).

296 Thank you to members of my dissertation committee—David Gordon, Sikina Jinnah, and Roger Schoenman—for pointing out this insurmountable obstacle in an earlier version of my

discourses over these possible weapons is widely available and readily accessible. But there is an issue with this approach. I take the definition of discourse from Dunn and Neumann as a system of meaning production that enables actors to make sense of the world and act within it.[297] A discourse is comprised of texts: an unstructured, complex form of data. Even if it were feasible to operationalize texts into a quantitative form, propose independent and variables, and then measure their effects, again, this would miss the mark of illuminating norms. As the outcome of a discourse, norms are a form of meaning-making for those that participate and result in defining both roles, and appropriate behaviors actors are ethically subject to. In this sense, when one engages discourse as the object of study, there is little choice but to employ interpretive methods. Thus, instead of an account that relies on causal inference, my less ambitious aim is to gain an understanding of norm

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research proposal. My subsequent approach honing in on the empirical evidence regarding autonomous weapons has led me to emphasize dialog over actions simply because the pertinent actions have not yet occurred while there is a plethora of debate signaling the political salience of the issue. This approach is bolstered by Annika Björkdahl, "Norms in International Relations: Some Conceptual and Methodological Reflections," *Cambridge Review of International Affairs* 15, no. 1 (April 1, 2002): pp. 13. "As with most other motivations of political action there is often only indirect evidence of the existence of a norm. The influence of norms can therefore be studied by analyzing the norm-induced pattern of behaviour. In addition, because norms by definition are shared and intersubjective and relate to shared moral assessments—'they are not merely individual idiosyncrasies'—evidence for the existence of norms can be found in the discourse addressing a particular behaviour, i.e. rhetoric. Because norms are held collectively, they are often discussed before a consensus is reached. Frequently, norms prompt justification for action and leave a trail of communication that can be studied. The manner in which states talk about norms is often just as important, if not more so, than how they act. Hence, an exclusive focus on action would recognize norms only after states decided to adhere to the norm in question or act upon it."

[297] Kevin C. Dunn and Iver B. Neumann, *Undertaking Discourse Analysis for Social Research* (Ann Arbor: University of Michigan Press, 2016) pp. 17-18.

collision as a causal mechanism.[298] This entails organizing a large amount of textual evidence into a manageable form and then systematically analyzing the discourse.

Undertaking discourse analysis as a form of research design has traditionally carried a number of connotations that should be dispelled at this point. As an interpretive approach, mainstream figures within IR have written-off these methods as unscientific, self-indulgent, and untethered from empirical analysis.[299] This critique is based on a caricature of discourse analysis as based in a completely relativist, a postmodernist worldview that suggests facts or truths are inaccessible, and the political world is made up of completely malleable ideas. The grain of truth in this caricature is that these methods were originally championed by scholars who were skeptical of positivist accounts and did rely on French poststructuralist political thinkers, chief among them Foucault. Marking the "linguistic turn" in the social sciences, many researchers turned to the analytic tools of genealogical readings of concepts, interpellations of subjects, and the deconstruction of concepts that were often previously taken for granted. The grand philosophical question

[298] I take this approach of investigating causal mechanisms rather than attempt to shoehorn the live political debates over killer robots into an IV, DV format from the following sources. Jeffrey T. Checkel, "Tracing Causal Mechanisms," *International Studies Review* 8, no. 2 (June 1, 2006): 362–70; Benjamin Banta, "Analyzing Discourse as a Causal Mechanism," *European Journal of International Relations* 19, no. 2 (June 1, 2013): 379–402; and Andrew Bennett, "The Mother of All Isms: Causal Mechanisms and Structured Pluralism in International Relations Theory," *European Journal of International Relations* 19, no. 3 (2013): 459–81.

[299] Stephen M. Walt, "The Renaissance of Security Studies," *International Studies Quarterly* 35, no. 2 (June 1, 1991): 211–39; Robert O. Keohane, "Beyond Dichotomy: Conversations between International Relations and Feminist Theory," *International Studies Quarterly* 42, no. 1 (1998): 193–97; and John J. Mearsheimer, "The False Promise of International Institutions," *International Security* 19, no. 3 (1994): 5–49.

concerning positivism—of whether one can objectively and dispassionately observe the political world incrementally to then build law-like rules about global politics or if adherence to that philosophy is misplaced and knowledge is contingent—is well beyond the scope of this project. Indeed, I am ambivalent about staking out a position in a debate between positivist versus post-positivist social science or quantitative versus qualitative research method primarily because entering into such a debate is unproductive in relation to the research at hand. My epistemological position is closer to what is label in the field as Critical Discourse Analysis in that I wager that one can take discourse as an existing social fact that represents collective ideas to an acceptable degree of accuracy.[300] The ramifications of these collectively held ideas about appropriate behavior are ontologically expressed in the weapons technologies that are developed out of ideas of necessity or restrained by successful norms of arms control. To put it another way, science and technology is a cumulative process that is embedded in social contexts that are neither wholly contingent on ideational or material factors.

The core disapproval of interpretive methods hinges on concerns over external validity, replicability, and generalizability. In order to mitigate some of the standing critiques lodged against interpretive methods, I have taken a number of steps to augment established procedures in discourse analysis to address these concerns. The first step is to modify discourse analysis methods with the aim to

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[300] Locke provides a rational that coincides with Terry Locke, *Critical Discourse Analysis*. New York: Palgrave, 2004.

simplify and systematically develop procedures to establish validity and replicability. Recognizing recent discussions over replicability in qualitative research, I also take a step towards data access and research transparency by maintaining a "codebook" detailing the steps taking in my analysis (Appendix 1) and providing access to the source material for my corpus of textual data.[301] To be clear, the referent objects of analysis are the two different discourses related to the two separate tracks of norms. Examining these referent objects entails mapping out the trajectory of these political discourses and considering how they interact. My research subjects are the actors that engage in these discourses, and (because of the focus on norms) I pay distinct attention to the roles and ideas about appropriate behavior in these roles that each subject inhabits.

I engage with a historiography of U.S. military technology thinking that informs one set of norms I am concerned with.[302] This is a less esoteric method examining how the Department of Defense literally tells its own history of technological development and how that story relates to the contemporary attitude

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[301] Andrew Moravcsik, "Active Citation: A Precondition for Replicable Qualitative Research," *PS: Political Science & Politics* 43, no. 1 (January 2010): 29–35; Andrew Moravcsik, "Trust, but Verify: The Transparency Revolution and Qualitative International Relations," *Security Studies* 23, no. 4 (October 2, 2014): 663–88, Verónica Perez Betancur, Rafael Piñeiro Rodríguez, and Fernando Rosenblatt, "Unexplored Advantages of DART for Qualitative Research," *Qualitative & Multi-Method Research* 16, no. 2 (September 30, 2018): 31–35; Samantha Majic, "Not There for the Taking: DA-RT and Policy Research," *Qualitative & Multi-Method Research* 16, no. 2 (September 30, 2018): 14–16; and Mohan J. Dutta, Satveer Kaur, and Phoebe Elers, "Validity in Interpretive Methods: Frameworks and Innovations," *Annals of the International Communication Association* 44, no. 3 (July 2, 2020): 185–200.

[302] Thank you to my committee member, Dan Wirls, for his encouragement to focus on straightforward methodology rather than conflating genealogy with historical methods.

towards technology in warfare. In short, I map out the narratives surrounding this emerging weapons technology to trace the intersubjective sources of norms regarding them.

Helpfully, discourse analysis methods specific to research in global politics have been well established over the last decade. Certainly, several examples of excellent scholarship that employs discourse analysis as a research method are prominent in the IR literature.[303] Here it is important to point out that there are different flavors of discourse analysis that entail different procedures.[304] A more fine-grained version of the method entails breaking down the discourse into its minute parts with an emphasis on semiotics identifying the elements of the verb, tense, speaker, and sentiment of each constituent sentence. This level of specificity is unnecessary for my purposes. Instead, my approach to discourse analysis focuses on meaning and meaning-making as an intersubjective practice between actors at a higher level of analysis.[305] Dunn and Neumann outline a number of procedures in

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[303] For example, see: David Campbell, *Writing Security: United States Foreign Policy and the Politics of Identity* (Minneapolis: University of Minnesota Press, 1992); James Der Derian, *On Diplomacy: A Genealogy of Western Estrangement* (Oxford: Blackwell Publishers, 1987); K. Dunn, *Imagining the Congo: The International Relations of Identity* (New York: Palgrave Macmillan, 2003); and Lene Hansen, *Security as Practice: Discourse Analysis and the Bosnian War* (New York: Routledge, 2006).

[304] Iver B. Neumann, "Discourse Analysis," in *Qualitative Methods in International Relations: A Pluralist Guide*, ed. Audie Klotz and Deepa Prakash, Research Methods Series (New York: Palgrave Macmillan, 2008), 61–77; and Kevin C. Dunn and Iver B. Neumann, *Undertaking Discourse Analysis for Social Research* (Ann Arbor: University of Michigan Press, 2016).

[305] My approach to methods in this case is informed by the insight of Weiner on the central role of meaning making contained within transnational discourses. "[T]he challenge for research on the role of norms in IR is to find out how meaning is enacted and whether it is possible to identify distinct patterns or conditions of this process so as to carry out empirical research based on some general research assumptions." See: Antje Weiner, "Enacting Meaning-in-Use: Qualitative

order to engage with just such a research design at this altitude. The first step is to establish the cultural and situational contexts that a discourse is taking place within. This helps with delineating the scope conditions for data collection and allows us to compile a corpus or collection of texts that comprise the discourse in question. Second, they then advise the analyst to map the patterns of representation within the discourse using a number of techniques. I augment my discourse analysis at this point with steps from the narrative analysis approach to identify the structure of the discourse and the narrative arch contained with these two discourses. The third step in discourse analysis is to "layer" the discourse or discern what becomes the dominant, accepted theme of the discourse over time and what alternate parts of the discourse are abandoned or modified.[306] It is in this third step that the dynamics of norm collision is evident. Let us consider each of these three steps in detail.

Context

In the interests of clearly identifying the grounds upon which norms concerning AWS coalesce, I first lay out the international context for this discourse and consider the relevant forums for these discussions. This initial sketch includes the current technical status of the weapons systems under consideration. For the

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Research on Norms and International Relations," *Review of International Studies* 35, no. 1 (2009): pp. 176. Milliken also makes this distinction Milliken, Jennifer. "The Study of Discourse in International Relations: A Critique of Research and Methods." *European Journal of International Relations* 5, no. 2 (June 1, 1999): 225–54.

[306] Neumann, "Discourse Analysis," and Dunn and Neumann, *Undertaking Discourse Analysis*. Procedures for narrative analysis are modified from Alister Miskimmon, Ben O'Loughlin, and Laura Roselle, *Forging the World: Strategic Narratives and International Relations* (Ann Arbor: University of Michigan Press, 2018).

discourse at the international level within the UN and CCW, I detail the trajectory of issues surrounding drone technology within humanitarian arms control discussions and how they segued into concerns over autonomous weapons. In the case of the discourse across U.S. national security practitioners, I map out the institutional framework involved in developing these weapons technologies. Because of the unexplored nature of norms originating from the global security culture, I also take the step of exploring the historical background for the discourse within the contemporary defense establishment. I do this by employing the techniques of historiography to the internal narrative concerning technology in U.S. military power.[307]

Data Collection

A key component in this first step is data collection. Considering the overwhelming amount of textual data available, even within the parameters of the discourse over a specific class of weapons, it is incumbent on the researcher to

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[307] For this methodological approach I follow in the footsteps of: Behavioral and Social Sciences Survey Committee, Charles Tilly, and David S. Landes, *History as Social Science.*, Spectrum Book (Englewood Cliffs: Prentice-Hall, 1971); Carol Reardon, *Soldiers and Scholars: The U.S. Army and the Uses of Military History, 1865-1920* (Lawrence: University Press of Kansas, 1990); Ian S. Lustick, "History, Historiography, and Political Science: Multiple Historical Records and the Problem of Selection Bias," *American Political Science Review* 90, no. 3 (September 1996): 605–18; Cameron G. Thies, "A Pragmatic Guide to Qualitative Historical Analysis in the Study of International Relations," *International Studies Perspectives* 3, no. 4 (2002): 351–72; Geoffrey Roberts, "History, Theory and the Narrative Turn in IR," *Review of International Studies* 32, no. 4 (2006): 703–14; James Mahoney, Erin Kimball, and Kendra L. Koivu, "The Logic of Historical Explanation in the Social Sciences," *Comparative Political Studies* 42, no. 1 (January 1, 2009): 114–46; Vivien A. Schmidt, "Taking Ideas and Discourse Seriously: Explaining Change through Discursive Institutionalism as the Fourth 'New Institutionalism,'" *European Political Science Review* 2, no. 1 (March 2010): 1–25; and David Machin and Andrea Mayr, *How to Do Critical Discourse Analysis: A Multimodal Introduction* (London: SAGE Publications, 2012).

narrow the field down to the pertinent texts. The building of two different corpora for the two separate discourses starts by identifying the boundaries of these discourses in terms of characteristics. These criteria include delimiting by time period, actor type, the particular subject of the text, and genre. While collecting any and all documents on the subject of autonomous weapons over the last two decades would give us a comprehensive corpus of the discourse over these weapons, a large portion of those texts would be purely speculative or in the genre of entertainment (science fiction books, films, and television programs.) In this study, I am concerned with the discourse among those that may effectuate either the development or limitation of this weapon technology. Thus, popular culture is less pertinent to the discourse and is excluded early on from inclusion in the corpus.[308] This also highlights a difficulty in delineating either journalism or academic publications from the technical and political milestones they identify in the discourse. Here it is helpful to borrow the distinction of primary and secondary sources from historical analysis. The secondary sources like mass media and pop culture do serve a function I will discuss later, but they are not the focus of coding and analysis.

The result is two separate sets of texts. One set collected across the international community and one set from within the military power at the cutting

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[308] Here I acknowledge that members of the international community and national security practitioners also live in the world and are consumers of media. Pop culture did impact the discourse at the international level but in an unintended way as seen in the next chapter.

edge of development. I collated these texts into NVivo qualitative research management software in PDF form. This software that allows for text search, automated coding, and automated transcription of audio recordings. The first corpus within the international community resembles that of previous works of discourse analysis in IR. Official statements, reports, transcripts of debates, and press statements from international actors (both of the state and non-state variety) are readily available to researchers online. While these efforts result in a collection of 878 separate documents that represent the overall discussion within the UN, it should be acknowledged that not all deliberations are captured. I will further detail this data collection in chapter four below.

The second set of texts concerning the U.S. military's approach to this technology is much more diffuse and involves a larger set of actors. This is not surprising given the policy landscape for national security includes a wide variety of government institutions, interest groups in the defense industry, academics, think tanks with specific viewpoints, and media actors. Here the category of "government institution" encompasses a plethora of different actors from leadership in the different services, organs of the centralized Department of Defense, the U.S. Congress, the State Department, and professional military education universities. This corpus is more varied than the previous in the forms of texts produced: beyond testimony and statements, reports, directives, policy memos, speeches, presentations, and conferences are prevalent. The depth and breadth of the possible textual data is intimidating, but the Obama administration launched a concerted defense modernization effort upon re-election that prominently featured autonomous technologies. Helpfully, the DoD undertook this endeavor largely in the public eye and labeled it the Third Offset Strategy.

Mapping Representations

The second stage of the methodology is to map out the representations within a discourse and identify the predominant threads that shape collective ideas. Dunn and Neumann advise the analyst to identify "monument" texts or canonical documents from which the discourse flows.[309] As the heart of intertextuality, canonical texts naturalize the discourse about a subject and hem in the boundaries of what is penitent to discussion and what is not. They set the terms of discussion with authoritative definitions, themes and identify the authorized actors who may join the discussion.[310] This does not mean that only canonical texts are analyzed. But these are texts that are habitually referenced or called upon within the discourse as a signal of bona fides by subsequent actors in their own contributions. The implication is that a discourse—and especially one orbiting questions of norms—will flow in time from specific texts as provocations. Within this methodological

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[309] Dunn and Neumann, *Undertaking Discourse Analysis.* pp. 93-127.

[310] An authoritative example is found in Campbell, *Writing Security*. In his groundbreaking work on American discourse during the Cold War, he identifies National Security Council document 68 (NSC-68) as a canonical text within the narrativized historiography of the Cold War that articulated the danger posed by the Soviet Union, what the U.S. defense establishment was compelled to do in the face of that threat, and how the representations within this discourse were framed to solidify American identity. Subsequent discussion and debate over what to do about this situation were adjudicated by the tone, rationale, themes, and authorizations contained within this document. If actors came to the discussion with different viewpoints or arguments about the direction of policy, they were deemed serious or superfluous to the discourse with (direct or indirect) reference to this text.

step of mapping, Dunn and Neumann recommend the scholar should identify dominant positions, challenges to those positions, label recurring motifs, and metaphors deployed to bolster a discourse. A significant part of discourse mapping is locating points where a discourse opens up about a particular topic and the subsequent closing or settling of discussion. Here canonical texts often mark these beginning and endpoints though not with law-like regularity.

At this stage of mapping the discourse, I augment the methodology of discourse analysis with the addition of techniques from narrative analysis.[311] This step is motivated by the nature of the discourses in question. Fundamentally, norms surrounding autonomous weapons—both on the side of the international community and within the U.S. defense establishment—are concerned with the future. As such, the discourses that undergird these norms focus on competing visions about what is to come. This speculation about the future necessarily relies on narratives. What this entails, methodologically, is identifying how texts present narrative elements in their telling of the future:

- The settings presented where they imagine future AWS will operate.
- How actors are typified as protagonists or antagonists.
- The purpose or motivations for actors.
- The action or conflict that drives the narrative forward.
- The resolution of the conflict in these stories.

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[311] Alister Miskimmon, Ben O'Loughlin, and Laura Roselle, *Forging the World: Strategic Narratives and International Relations*, Reprint edition (Ann Arbor: University of Michigan Press, 2018) pp. 6-10.

Discourse analysis coming from the post-positivist tradition eschews narrative because of epistemological commitments against imposing a structure on the social world. However, I am much less partisan on these philosophical grounds. My focus is more prosaic, concerned with systematizing and rigorously analyzing the political world on its own terms. In the field, these narratives are highly structured ontologically, so it makes little sense to disregard these characteristics. Indeed, these discourses are very stylized and follow certain conventions that ware readily identify. Diplomatic discussions have a cadence and obligatory format that each actor practices. Certainly, the military is famous for its use of neologisms, acronyms, and buzzwords that serve almost like currency to gain legitimacy within their own discussions. These general characteristics impact the outcome of the discourse, and the norms that shape appropriate action eventually translated into R&D policy that produces technology.

Layering Discourses

The final stage of the method consists of distinguishing between those representations that are less susceptible to change than others and focusing on the enduring meaning-making function of discourse. Indeed, as a method to explore ideas as constitutive of social action, this type of analysis is anchored by the notion that political action and social roles are stabilized by discourse.[312] Key to the constructivist research paradigm is demonstrating the fixity and stability of social

[312] Dunn and Neumann, *Undertaking Discourse Analysis.* pp. 121-127

relations over time.[313] Layering is the step of the method where all of the component elements detailed in mapping come together to illuminate the dominant discourse as a set of shared ideas that persist over time. As Dunn and Neumann suggest, not all representations are equally as lasting. In the final analysis, an overarching organizing principle of how the world works will frame the conditions of possibility and bound the limits of what is considered possible.

Put in these terms, layering might seem esoteric. But intuitively, it is easy to see how a dominant discourse operates empirically. Understanding the process whereby certain representations become sticky and eventually accepted as natural or common knowledge gives us a window into what is deemed feasible, especially in debates over the future. For example, what arguments are regarded as “science fiction” regarding autonomous weapons and what technological streams are pursued as practicable. For my purposes, “layering” or identifying and exploring how a discourse becomes the dominant received wisdom is critical to explicating the “collectively held belief” component of shared norms. As there are two different discourses at play concerned with the same technology, the resulting collectively held views of each diverge over what ought to be the final disposition of this weapons technology. At base, this collision of norms is a form of discourse layering in progress and constitutes the heart of the research findings and the core of the concluding chapter.

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[313] Again, a primary concern that the first generation of norm scholars tried to address.

Part II

Chapter 4 International Norms Surrounding Autonomous Weapons: Emergence, Contestation, and Collision

"The weaponization of artificial intelligence is a serious danger, and the prospect of machines that have the capacity by themselves to select and destroy targets is creating enormous difficulties, or will create enormous difficulties, to avoid the escalation in conflict and to guarantee that international humanitarian law and human rights law are respected in the battlefields. For me there is a message that is very clear – machines that have the power and the discretion to take human lives are politically unacceptable, are morally repugnant, and should be banned by international law."

UN Secretary-General António Guterres [314]

The international community engaged in diplomatic talks over autonomous weapons starting in 2010 that evolved over the next nine years. The result was a statement of shared principles but without the resolution of a new negotiated arms control treaty. However, these principles reflected the collective expectation that responsible military powers must maintain meaningful human control over newly developed weapons. The precedent of successful humanitarian arms control regimes for anti-personnel landmines and cluster munitions set the stage for an effort to address the issues surrounding this new weapons technology at the global level. Transnational activists took up the cause of preemptively banning killer robots by following the playbooks of these earlier campaigns and bringing the issue

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[314] António Guterres, "Remarks by the United Nations Secretary-General" (Web Summit, Lisbon, November 5, 2018), https://www.un.org/sg/en/content/sg/speeches/2018-11-05/remarks-web-summit.

to the international stage to establish a robust norm against the development of autonomous weapons systems (AWS) and codify that norm into international law via a multilateral arms control instrument.

In this chapter I consider the empirical record of that effort in the form of the discourse around autonomous weapons, the shared expectations of appropriate behavior that emerged from this discourse (the *meaningful human control* norm), and the global politics embedded in these discussions. Thus, the purpose of this chapter is to explore the parameters of the debate around this specific category of weapons technology and the origin of the norm that formed around AWS.

To comprehensively engage with these politics, this chapter is organized as follows. In the first section, I detail the political and technical context out of which this discourse emerged. This first step gives a sense of how the technopolitical issues around U.S. drone strikes pivoted to international concerns over fully autonomous weapons—a technology that is not fully developed.

Next, I turn towards the international political contention over these emergent weapons outlining the contours of the debate. As mentioned in chapter three, a narrative-inflected discourse analysis methodology is utilized to excavate the origins of the *meaningful human control* norm pertaining to autonomous weapons. Because the object of concern here is a norm (a collectively held idea) that is impossible to observe directly, I engage with the rhetoric expressed by political actors over the process of establishing this norm. Helpfully, discourse around this issue is highly organized, generally available in transcript format, and publicly accessible because it takes the form of an international debate and subsequent negotiations over international action. Detailing the data collection of texts, and covering my analysis of the debates, I chart out the structure of the political contention at the global level on the topic of autonomous weapons.

The third step is to map the representations of the AWS discourse by identifying prominent, canonical texts that serve as a touchstone for the rest of the debate, and I detail the points of contention that emerge from the textual data. Again, I follow Dunn and Neumann's suggested procedures to identify these texts.

In the final step, I layer the discourse identifying the emerging norm delineated in the eleven principles resulting from negotiations within the Convention on Certain Conventional Weapons (hereafter, the CCW) by 2019. I present a typology of the actors' positions regarding what actions to take about the norm. The conclusion of the chapter reflects on two general considerations. First, the international norm surrounding AWS technology that results from these negotiations that such weapons ought to remain under human control in order to fully comport with international humanitarian law. Second, the narratives about the CCW negotiation process itself propagated by those vehemently opposed to AWS technology and those that advocate for the development of such weapons. While actors differed on how to implement the *meaningful human control* norm that emerged from this discourse, there was ultimately a shared expectation around responsible behavior for states established.

Context: Global Security Politics and Technological Aspects

While there is a technological distinction between unmanned aerial vehicles (UAV) and AWS, the two military technologies are intertwined politically. The U.S. conducted its first remotely piloted armed drone strike early in the War on Terror in 2001. The use of uninhabited but remotely piloted UAVs continues to this day with remarkably little notice. Indeed, only a few years ago the international press would typically report on drone warfare with hyperbolic headlines heralding a revolution in warfare.[315] It wasn't until 2010 that the United Nations (UN) Human Rights Council took up the issue of targeted killings under the American drone program with an inquiry and report. While domestic activists in the U.S. erroneously conflated robotic warfare with autonomous weapons in their protests,

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[315] Some examples from the popular press: Peter Pae, "No Pilot Is No Problem for Planes of the Future," *Orlando Sentinel*, February 3, 2002, https://www.orlandosentinel.com/news/os-xpm-2002-02-03-0202020004-story.html; Anthony H. Cordesman, "The Pentagon's Scariest Thoughts," *The New York Times*, March 20, 2003, sec. Opinion, https://www.nytimes.com/2003/03/20/opinion/the-pentagon-s-scariest-thoughts.html; Steven Komarow, "The New Breed of Soldier: Robots with Guns," *USA Today*, April 14, 2006, https://usatoday30.usatoday.com/tech/news/techinnovations/2006-04-13-robot-soldiers_x.htm; Christopher Drew, "Drone Aircraft: Unmanned, Unstoppable?," *The Bulletin*, March 22, 2009, https://www.bendbulletin.com/business/drone-aircraft-unmanned-unstoppable/article_f15c2f35-209d-53ba-bada-99863bfe94bf.html; David Kilcullen and Andrew McDonald Exum, "Death From Above, Outrage Down Below," *The New York Times*, May 17, 2009, sec. Opinion, https://www.nytimes.com/2009/05/17/opinion/17exum.html; Fred Kaplan, "Attack of the Drones: The Death of the F-22 Fighter Plane," *Newsweek*, September 28, 2009, https://www.newsweek.com/death-f-22-fighter-plane-79281; Jonathan D. Moreno, "Robot Soldiers Will Be a Reality—and a Threat," *Wall Street Journal*, May 11, 2012, sec. Opinion, https://online.wsj.com/article/SB10001424052702304203604577396282717616136.html; Tara McKelvey, "Could We Trust Killer Robots?," *Wall Street Journal*, May 19, 2012, sec. Life and Style, https://online.wsj.com/article/SB10001424052702303448404577410032825529656.html; Michael Hastings, "The Rise of the Killer Drones," *Rolling Stone*, April 16, 2012, https://www.rollingstone.com/politics/politics-news/the-rise-of-the-killer-drones-how-america-goes-to-war-in-secret-231297/; Bill Keller, "Smart Drones," *New York Times*, March 16, 2013, sec. Opinion.

the Obama administration dramatically increased the use of drone strikes, especially outside of declared areas of conflict (e.g., Pakistan, Yemen, and Somalia) peaking in that year.[316] The issue of autonomous weapons rapidly branched off from concerns over these drone strikes. Global civil society activists were instrumental in identifying autonomous weapons as another area of concern and prodded the international community to address this emerging technology with new arms control instruments.

To understand the contours of this debate, we need to consider the technical aspects of the technology in question before an in-depth consideration of the political arguments. In essence, it is difficult to understand the discussion around killer robots without knowing precisely what weapons fall into this category. Initial missteps by activists highlight the necessary work of specifically delineating what weapons technology is subject to debate. For example, activists from Code Pink conflated piloted UAVs with autonomous killer robots in their rhetoric protesting America's drone strike program. This "nightmare scenario" approach—characterizing drone strikes as robotic death from the skies—drew on popular culture and underlying fears about technology and gained media attention for the

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[316] Micha Zenko. "Obama's Final Drone Strike Data." *Council on Foreign Relations: Center for Preventive Action* (blog), January 20, 2017. https://www.cfr.org/blog/obamas-final-drone-strike-data. Accessed February 5, 2020. It should be noted that it is estimated that UAV strikes increased during the Trump administration but his administration walked back the small amount of official transparency developed under the previous president. See: Kelsey D. Atherton, "Trump Inherited the Drone War but Ditched Accountability." *Foreign Policy*, May 22, 2020. https://foreignpolicy.com/2020/05/22/obama-drones-trump-killings-count/.

organization's antiwar stance. However, it was quickly evident that Code Pink's rhetoric about robotic killing was overplayed, given that these UAVs are piloted remotely. The naming of the "Campaign to Stop Killer Robots," a coalition of international activists aiming to ban these weapons before they are even deployed, also played on the collective science fiction images of the Terminator, HAL-2000, or Cylons mindlessly bent on destroying humanity. While this rhetorical tactic helped gain wider public recognition, it also detracted from the aim of addressing real-world issues evidenced by the easy dismissal of their argument by diplomatic and military officials. Lambasted as peddling in science fictional fears, the label "killer robots" (while technically correct in its description of weapon systems under consideration) quickly became a liability that activists had to address.[317]

More fundamentally, the ongoing debate over terminology signaled the difficulty in defining what was at issue. In short, what are we talking about when we debate autonomous weapons? First, it is helpful to consider the context of what weapons exist currently and what weapons are actively under development to come online in the near future. Again, this typology of different systems illustrates the link between today's military drones and tomorrow's AWS. Militaries worldwide use hundreds of different unmanned systems for various discrete functions. The

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[317] Charli Carpenter, "Rethinking the Political / -Science- / Fiction Nexus: Global Policy Making and the Campaign to Stop Killer Robots," *Perspectives on Politics* 14, no. 1 (March 2016): 53–69; and Kevin L. Young and Charli Carpenter, "Does Science Fiction Affect Political Fact? Yes and No: A Survey Experiment on 'Killer Robots,'" *International Studies Quarterly* 62, no. 3 (September 1, 2018): 562–76.

largest share of UAVs are used for intelligence, surveillance, and reconnaissance (*ISR* for short) with the smaller systems designed for use at the squad or tactical level (e.g., the RQ-1 Raven) with medium-sized systems used at the theatre or operational level to provide intelligence for battlefield commanders (e.g., MQ-8 Fire Scout).[318] The more well-known UAVs—like the Predator and MQ-9 Reaper drones highlighted across the popular media—are associated with the Strike-Capable ISR category that combines a limited amount of firepower with the traditional ISR mission. Larger, jet-powered uninhabited aircraft are also used for High-End Reconnaissance missions at greater altitudes, fulfilling a role typically inhabited by satellite assets (for example, the RQ-4 Global Hawk.) Apart from these more familiar types of drones, a contemporary class of weapons straddles the distinction between a cruise-missiles and UAVs. Termed a "loitering munition," this UAV flies over a designated area for an extended period, scanning for a radar signal and returning to base if no target is detected. If an enemy radar is detected, the drone flies, kamikaze-like, into an enemy air defense, destroying the target with its explosive warhead. The most well-known of this variant is the Israeli IAI Harpy. What the Harpy and other defensive systems like the Phalanx close-in weapon system (designed to defend navy ships from missile attack) have in common are

[318] Drones are classified by the U.S. military according to their size, weight, and operating altitude spanning from Class I to III. The majority of UAVs used are in Class I on the smaller end. See: UAS Task Force and Airspace Integration Integrated Product Team, "Unmanned Aircraft System Airspace Integration Plan" (Washington: Department of Defense, March 2011); and Dan Gettinger, "The Drone Databook" (Annandale-on-Hudson: The Center for the Study of the Drone at Bard College, September 2019).

their autonomous functions narrowly tailored to specific types of military engagements.[319]

Beyond these weapons already in the field, several publicly known systems are under development for other mission parameters that push towards full autonomy. Previous chapters have mentioned two examples: the X-47B and the Perdix program. In the case of the X-47B, the UAV was designed for High-End Combat in a contested environment, and several related programs are underway for a similar mission. This framework builds off the U.S. experience with Strike-Capable ISR in what are called non-contested environments where Reaper drones are not particularly threatened by air defense systems. The High-End variant does anticipate these larger UAVs operating against other state militaries where active advanced defense systems are in play and electronic communications are potentially jammed. Hence, the development of weapons that can fulfill missions on their own. In the case of the Perdix, the rationale is for less stealthy but multiple cheap and small drones to work together in denied environments to overwhelm enemy defenses and even destroy targets with multiple small charges. Again, a guiding principle of the design is the assumption that communication with an operator would be blocked in the envisioned combat environments of the future. Thus, swarming drones are programmed to act autonomously. The lineage from

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[319] *Ibid.* and Center for the Study of the Drone, "The Drone Database," Proliferated Drones, September 2019, http://drones.cnas.org/drones/.

Loitering Munitions to drone Swarms in this respect is clear. For an overview of these existing and emerging uninhabited weapons, see Table 4.1 below. The most significant level of concern over autonomous weapons is located in these two transitions: from Strike-Capable ISR to High-End Combat systems and from Loitering Munitions to Swarms. Fundamentally, the difference between current UAV weapons and emerging AWS technology is a matter of human control over the weapon: whereas UAVs are remotely piloted, emerging autonomous weapons select targets and destroy them without human intervention.

Table 4.1: Typology of Current UAVs and AWS Under Development (circa 2019)

Role	**Control (Tech)**	**Status (Dispersion)**	**Examples (Origin)**
Tactical Reconnaissance	Remotely Piloted (drone)	Active (85 countries)	RQ-11 Raven (U.S.) Orlan-10 (Russia) Spy'Ranger (France)
Operational ISR	Remotely Piloted (drone)	Active (44 countries)	MQ-8 Fire Scout (U.S.) Heron TP (Israel)
Strike-Capable ISR	Remotely Piloted (drone)	Active (31 countries)	Bayraktar TB2 (Turkey) MQ-9 Reaper (U.S.) CAIG Wing Loong II (China) Shahed 129 (Iran)
High-End Reconnaissance	Remotely Piloted (drone)	Active (6 countries)	RQ-170 Sentinel (U.S.) RQ-4 Global Hawk (U.S.)
High-End Combat	Autonomous and Teaming (AWS/drone)	In Development (7 countries)	X-47B (U.S.) S-70 Okhotnik (Russia) AVIC 601-S Sharp Sword (China) XQ-58A Valkyrie (U.S.) nEUROn (France & Germany) EADS Barracuda (Germany & Spain) Loyal Wingman (Australia)
Loitering Munitions	Autonomous (AWS)	Active (17 countries)	IAI Harop (Israel) IAI Harpy (Israel) Coyote UAS (U.S.) Rainbow CH-901 (China)
Swarms	Autonomous (AWS)	In Development (4 countries)	Perdix (U.S.) Gremlins (U.S.)

			LOCUSTS (U.S.) CH-901 (China)

Sources: Dan Gettinger, "The Drone Databook" (Annandale-on-Hudson: The Center for the Study of the Drone at Bard College, September 2019), https://dronecenter.bard.edu/projects/drone-proliferation/databook/; Paul J. Springer, *Military Robots and Drones: A Reference Handbook* (Santa Barbara: ABC-CLIO, 2013); and Kelley Sayler, Paul Scharre, and Ben FitzGerald, "A World of Proliferated Drones: A Technology Primer" (Washington: Center for a New American Security, June 2015). This chart is not comprehensive of all UAV and AWS programs but merely illustrative.

Autonomy is also defined differently across stakeholders. Considering the history of "smart" precision-guided munitions, how to distinguish between automated *functions* in weapons and autonomous *systems* is an open question. There are three broad approaches to defining autonomy in this sense. It can be delineated along the lines of 1) the sophistication of capabilities in a system, 2) the functional attributes of a weapon as designed, or 3) the human-machine interaction system's design. Each of these definitions have inherent trade-offs and are deployed for different political reasons.[320]

Any system designed to respond to external stimuli would seem a reasonable starting point in terms of sophistication. There is a continuum of inherent capabilities across engineered tools from *automatic* to *automated* to fully

[320] The different approaches to defining autonomous weapons are detailed across the arms control community. The discussion below is based on: Vincent Boulanin and Maaike Verbruggen, "Mapping the Development of Autonomy in Weapon Systems" (Stockholm Sweden: Stockholm International Peace Research Institute, November 2017) pp. 6-18; UNIDIR, "The Weaponization of Increasingly Autonomous Technologies: Concerns, Characteristics and Definitional Approaches" (Geneva: United Nations Institute, 2017) pp. 19-22; and Andrew Williams, "Defining Autonomy in Systems: Challenges and Solutions," in *Autonomous Systems: Issues for Defence Policymakers,* ed. Andrew Williams and Paul Scharre (The Hague: NATO Communications and Information Agency, 2015), 27–62

autonomous.[321] Automatic is a category of technology that is mechanically engineered to repeat functions. The difference between a bolt action rifle and an automatic assault rifle comes to mind. Some automatic systems that rely on multiple inputs from the operator and sensors skirt the edge of automation. But the line of distinction is typically between mechanical analog computers and truly digital controls that involve computer software. For example, the Norden bombsight developed during World War II or modern landmines would fit the classification of automation. Hence, automation indicates a weapon that can respond to its environment through a series of *if*, *then* statements that, depending on predetermined rules, change the system's behavior. Much precision weaponry developed in the 1980s and 1990s fits this category, with software designed for an anticipated situation with the parameters around different actions "baked into" these weapons. The key to the distinction between *automatic* and *autonomous* is the limits of the software: fixed, predetermined responses to changing circumstances without human intervention indicates *automation*. A cruise missile that guides itself to its target with GPS or terrain contour matching is an example of an advanced automated weapon, but one that could not perform beyond the parameters of its computer code or in a location that does not match the preloaded terrain. An *autonomous* weapon—defined along these lines—would have the

[321] " To be autonomous, a system must have the capability to independently compose and select among different courses of action to accomplish goals based on its knowledge and understanding of the world, itself, and the situation." Defense Science Board Summer study June 2016, pp. 4.

ability to shape its own programming beyond the predetermined coding by a software developer. Thus, the weapon shapes its own responses to changing circumstances. This level of sophistication in software connotes a level of understanding or situatedness that—while nowhere near human consciousness—does mark a qualitatively different level of artificial intelligence where the software is designed to learn and adapt iteratively on its own. Using this standard, a weapon is defined as autonomous if it can change its operating parameters to make targeting decisions on its own. Here it is worth pausing to note that the weapon systems that advanced military powers are on the cusp of developing are designed to act on their own, changing their responses to the combat environment.

The second definitional framework concentrates on critical functions rather than overall weapon systems. This approach allows for the use of AI to improve operations across different categories of weapons. Still, it designates those tasks that would be ethically and legally objectionable without a human in control. For instance, some military functions like automated navigation of a plane or an algorithm to quickly sort through hours of video surveillance have fewer legal or ethical ramifications than a drone that does all of that *and then* kills combatants that the weapon self-designated. The benefit of this approach is to allow for technological improvement in arms without banning entire categories of weapons wholesale. Born of a recognition that autonomy is a characteristic of a system rather than a specific type of weapon.[322] Essentially, given anticipated advances in computing power and a little engineering, nearly any weapon system can be made autonomous. From this perspective, AI and the autonomy it affords is a type of general technology—akin to electricity or the internal combustion engine—that may be applied to many different military tasks. Thus, the functional approach focuses on defining those military actions deemed off-limits to weapons with full autonomy rather than sequestering AWS as a regulated category of weapons—the typical process within international arms control agreements.

A third framework to define autonomous weapons revolves around the command-and-control relationship between a human operator and the weapon itself. This approach is widespread and touches upon the overriding military rationale for greater autonomy in weapon systems. Organized around the decision-making steps involved in a combat engagement, this methodology describes three different types of relationships. We can think of a typical, existing weapons system as a human-in-the-loop where systems, sensors, and weapon design play a part in a combat engagement, but ultimately a person always decides to use lethal force against any type of target. These arrangements are categorized as *not autonomous* regardless of the engineered capabilities of a weapon system. The second tier of

[322] For example, with the addition of advanced software, the USAF converted a retired F-16 into an autonomous target drone and is also planning to expand the program to link these older planes with their more advanced replacements, making them "loyal wingman" or directed into subsidiary missions by manned platforms. See: Laura Mallonee, "What It Takes to Turn a Vintage F-16 Into a Drone," *Wired*, November 19, 2019, https://www.wired.com/story/what-it-takes-vintage-f-16-drone/.

autonomy is typified as semi-autonomous, where a human oversees the system and can intervene at any point to interrupt the weapon system. Described as a human on-the-loop arrangement, a service member would have a veto over a system's functions, either at any point of a mission or as a specified point to authorize that the weapon fires. For example, a swarm of UAVs can fly, navigate, maneuver to avoid countermeasures, and find targets independently. These weapons are also being designed to attack targets designated by the swarm itself. The addition of a kill switch for the authorized operator to veto lethal action would render this type of weapon system semi-autonomous. Of course, the third tier of this taxonomy is the human out-of-the-loop arrangement where a self-contained weapon system performs all aspects of combat independent of external control. This projected capability is the epitome of "fully autonomous" weapons where combat decisions are divorced from direct human oversight entirely.

The loop terminology in this third definition of autonomy reflects the broad rationale of why autonomous capabilities are desirable from a military perspective. Popularized by the U.S. Air Force pilot and strategist John Boyd, modern military thinking is often concerned with the OODA loop. This acronym stands for the steps of observe, orient, decide, and act as a general model for the rapid decision-making process in an adversarial situation with imperfect information. To gain tactical and—at scale—a strategic advantage over an opponent, it is advantageous to "get inside" their OODA loop or make accurate decisions quicker than they can react. In terms of AWS, the anticipated benefit of these weapons in a highly contested environment is the ability to counter an adversary's advanced defenses.[323] In effect, the design parameters of autonomous weapons across advanced military powers emphasize speed, agility, and the capability to overwhelm an enemy's command structure with rapid maneuver. Beyond the advantages of speed, military thinkers anticipate a host of other benefits: their relatively lower cost versus manned platforms, a level of expendability that allows for higher levels of risk in warfighting strategies, greater flexibility in design parameters without having to accommodate a pilot, and with autonomy the ability of the weapon to perform a mission despite anticipated jamming of communications or loss of communications. Above all, the prospect of fielding a precision weapon against an advanced adversary without any risk to servicemembers is especially attractive to American military thinkers.

Norm Formation on the International Stage

The international discourse over autonomous weapons took place over the course of four distinct phases. As referenced previously, the international community took up the issue of autonomous weapons as a unique area of concern in 2010 in the first phase of the discourse. We see a generalized concern over the use of UAVs by the U.S. in the Global War on Terror converted to a concern over what arms

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[323] The terms "highly contested environment" or "contested battlespace" references an anticipated fight against advanced, integrated air defenses that one could anticipate in a conflict between the U.S. and China or Russia. This is a very different combat situation from those encountered over the course of the Global War on Terror where air superiority for the U.S. military was easily secured.

technologies might supersede remotely operated drones at this point. The second phase, from 2013 to 2014, occurred primarily within the confines of the CCW where the issue of autonomous weapons was sequestered to a particular track of negotiations. This phase consisted of testimony by technical experts and informal talks across state parties to delineate the issues around the emerging technology. The third phase (2016-2019) was marked by a shift to formal negotiations across state parties—the sole actors with the legal power to take definitive legal action. In this phase, the debates came to a head, blocs formed around positions on arms control measures while, ironically, the international community coalesced around principles and a norm on AWS. For the purposes of this study, I am focusing on the first three phases of the discourse surrounding autonomous weapons on the international stage, given that the latter stage is still ongoing and we can see the kernel of a global norm by the end of phase three.

Once a generalized concern over rapidly evolving AWS technology was folded into the diplomatic arms control organs of the UN system, it took on a rigid structure with clear standards for engagement. Diplomatic language is very formal and repetitive. For example, nearly every opening statement across the various actors within the CCW process begins with a *de rigueur* congratulating the Chair for their appointment and leading the discussion. For representatives of the state parties to either the UN or the CCW, their statements are highly scripted, restrained in making specific commitments to action, and somewhat formulaic in their prose.

Regardless of this formalism and lack of specificity, I have identified the definitive positions amongst the various actors and how those positions evolved over time. Unsurprisingly, the same tone is employed by the representatives of international organizations themselves. However, the focus for this group of actors was to summarize, distill, and advocate for shared views across the negotiations. Similarly, participants filling the role of experts or think tank representatives express uniform deference in their texts to state and IGO representatives, but with greater variance in their language as they reflect a wider variety of approaches to AWS. The most strident language across the corpus is employed by representatives of NGOs pushing for international governance of these weapons, often expressing concern and frustration in dire terms. Even with the outlier of NGO activists using strident terms, this negotiation as a discourse is remarkable in that it is highly structured because it is organized as a debate, giving nearly every actor involved the opportunity to register their input. The discourse is regimented in an orderly cadence of opening statements, specified topics of discussion, and, being part of a broader process of negotiation, the discourse is directed towards an ultimate resolution of the debate.

Table 4.2: Forums and Actors in the AWS Conversation

Venue	Actors	Function	Years
UN General Assembly	State parties, Special Rapport	Aggregates the views of member states	2013-2018
UN General Assembly: First Committee	State parties	Subsidiary body within the UNGA concerned with disarmament and	2013-2019

UN Human Rights Committee	State parties, Special Rapport	Subsidiary body under the UNGA broadly concerned with human rights	2010-2017
CCW: Meeting of Parties	State parties, and transnational activists	Annual meeting of all CCW member states to consider the operations of the Convention	2013-2015, 2017-2019
CCW: Review Conference	State parties, and transnational activists	Meeting of all CCW member states every 5 years to review the status of the Convention and make any amendments to the protocols	2016
CCW: Informal Meeting of Experts	State parties, academics, national security practitioners, and transnational activists	Subsidiary forum within the CCW to collect expert testimony and information concerning the emerging technology of autonomous weapons	2014-2016
CCW: Group of Government Experts	State parties, academics, national security practitioners, and transnational activists	Subsidiary forum within the CCW for state parties to formally debate, negotiate, and recommend possible action on the issue of autonomous weapons	2017-2019
UN Secretary-General: Press Statements	Secretary-General and his staff	Expression of global moral leadership and agenda setting of the secretariat	2014-2019
UN Secretary-General: Advisory Board on Disarmament Matters	Senior diplomats and academics	Provides research and advice to the UN SG on arms limitation and disarmament issues, including on studies; oversees UNIDR.	2013-2019
UN Institute for Disarmament Research	UN affiliated academics	Global policy institute under UN auspices dedicated to research and outreach on issues surrounding arms control and disarmament	2014-2018
UN Office for Disarmament Affairs	UN Personnel	Provides substantive and organizational support for norm-setting in the area of disarmament through the work of the pertinent international bodies.	2014-2018
NGO Publicity and Outreach	Non-state arms control activists	Transnational advocacy to global publics, stakeholders, and governments with the aim of blocking the creation of AWS under the rubric of human rights	2011-2019

A corpus of the discourse was collected to capture and analyze the political contention within this broad discussion. As previously noted, the term corpus referrers to a database of available texts (both written and oral) that constitutes the debate. While not every utterance, discussion over drinks, informal side negotiations, or strategic planning discussion internal to each diplomatic team is available to the researcher, an incredible of amount of textual data is readily accessible representing the much of the official and informal positions taken by different actors. Much of this text is easily accessible online as primary sources of information (see Appendix 1 codebook for primary sources and access points.) The collection of primary texts spanning from 2011 to 2019 from within the UN system and the proceedings of the CCW was drawn from these sources.

The participants in this discourse inhabited one of four different roles that were explicitly flagged in the structure of the debate. The activist from the network of NGOs played a prominent role as norm entrepreneurs, mirroring previous campaigns for humanitarian arms control. The second set of actors are the diplomats that represent their respective states. Their statements are measured and reflect the official positions different countries take towards the issue of "killer robots." In many respects, states are the most important actors within the discourse as they are the principal agents to effectuate legally binding agreements over arms control. The third important group of actors within the discourse are experts of various stripes. Called upon to convey the state of the art in the field of autonomous weapons, these experts come from the militaries of multiple countries; the field of computer science across academia and high-tech industries; from policy think tanks; practitioners within the defense industries of advanced industrialized countries; lawyers, ethicists, and philosophers to speak to both the concrete terms of international humanitarian law and the wider ramifications of warfare with reduced human agency. The fourth and final bloc of actors were the representatives of various IGOs. Actors in this group included the Secretary-General of the United Nations, the UN Human Rights Committee (and the Special Rapporteur assigned by that committee), the General Assembly, experts from the UN Institute for Disarmament Research (UNIDR), and the ICRC.[324] In this specific discourse, it is evident that international actors play a substantial role in setting the agenda over the issue of autonomous weapons. They express particular views that influence the shape of the debate.[325]

Discourse analysis of this particular corpus involved a process of collecting texts, an initial read to gather the details of the debate, delineating the explicit roles of the actors, coding the themes or contentions across texts, identifying the canonical texts that shape the contours of the discourse, and then mapping the resulting representations across actors, institutions and time. Again, the texts

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[324] As the executor of the Geneva Conventions of 1949, the International Committee of the Red Cross occupies as somewhat liminal position in this particular discourse as both an advocacy group and a proto-international organization that attempts to maintain objectivity and legitimacy across the world's militaries.

[325] For the influence of IGOs writ large and the specific role that secretariats play in global politics see Sikina Jinnah, Frank Biermann, and Oran R. Young, *Post-Treaty Politics: Secretariat Influence in Global Environmental Governance*, (Cambridge: The MIT Press, 2014).

themselves are statements, reports, working papers, food for thought articles, and official documents from within the UN system as pertains to the issue of autonomous weapons. Assigning the role of each actor was relatively straightforward procedure given that UN documents summarizing each meeting explicitly names these roles and the representatives in attendance to each meeting. The coding process was iterative, taking place in several waves. First, keywords across the texts were marked up via a coding query in NVivo. Keywords were initially selected with the research question, and the background context in mind. Thus, a query on the keywords "autonomous weapon system" or "killer robot" and variations resulted in one set of coded keywords while a separate search for "ban" or "legally binding instrument" comprised a different set. Digging into those results, coding is expanded into more comprehensive themes. For example, upon examination of overlapping keywords, I noted the reoccurring theme of "meaningful human control." An additional coding query with this phase starts to build the picture of how AWS was debated across the international community. My identification of canonical texts follows the procedures suggested by Dunn and Neumann. These "anchoring" documents mark the start and ending points of debates or transitions with the discussions towards different themes. Often, the keyword search and a quest to track down the source of a phrase, leads to a canonical text that attempts to set the terms and stakes of a debate. Overt reference to previous documents in actors' statements also indicate a canonical text, or statements that speak for multiple actors going forward in the debate.

The natural starting point of my research was the forum of the CCW that was explicitly concerned with AWS as it was convened in 2013—but then also tracking back the origin of how the international community decided to focus on these weapons. The excavation of these origins resulted in a wealth of textual data from other sources at the UN and within the First Committee of the General Assembly. Where the position of any given state on the questions surrounding autonomous weapons was unclear, the references within these documents also pointed towards statements made within the UN (apart from the CCW process) and statements made at the national level within official, governmental forums like the legislature or pronouncements made by heads of state. This is to say, there are many veins to mine in textual data collection, and at many points, there are questions about whether to fold a document into the analysis or to exclude it.

The resulting corpus represents the cumulation of the debate over these weapons from the entry of this issue onto the world stage to establishing a norm regarding these weapons. The composition of this corpus includes the formal statements made by state representatives within open forums held by the UN; additional national level speeches and legislation; formal statements and reports by activist networks; reports and testimony by experts; sideline events, panels, and speeches held the course of CCW proceedings; and reports about the CCW process on AWS produced by governments and academic sources detailing the positions of various actors.

My approach to data collection was refined over time as I identified areas of overlap between sources. At first, press accounts across the print and broadcast media pointed towards the general points of contention. While I initially collected media accounts on the subject of autonomous weapons for eventual inclusion into the discourse, I abandoned the accumulation of press clippings. Generally, press reports simply pointed toward statements made in the official texts that were already part of the collection, and these "primary texts" proved more comprehensive data.[326] In the interest of cutting down on "double counting" statements in this way, data collection focused on official statements made within the confines of international forums. Some exceptions to this stipulation were made over the course of data collection. For example, if reports were introduced to stakeholders in the CCW forum from external sources (like reports presented as "food for thought" pieces for delegates), these documents were included in the corpus. Similarly, global NGOs are well known for their tactic of "naming and shaming" other actors within global debates over norms. Thus, many of the PR statements and newsletters documenting these discussions were included if they

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[326] For example: Adam Satariano, "Will There Be a Ban on Killer Robots?: Fears of an Algorithm-Driven Arms Race," *New York Times*, 2018, sec. Artificial Intelligence. https://www-nytimes-com.oca.ucsc.edu/2018/10/19/technology/artificial-intelligence-weapons.html. This article includes statements from the UN Secretary-General, a statement from the EU High Representative for Foreign Policy (Federica Mogherini), statements by NGO activists like the Future of Life Institute, and academic reports from the Institute for European Studies already incorporated into the corpus in full.

presented original content. However, press releases from these organizations that simply regurgitated statements made *in situ* were excluded.

The primary data sources for this corpus are the websites of the UN Secretariate, General Assembly, First Committee (on disarmament), and the UN in Geneva website for the CCW. Other sources for texts include the official websites of member states' missions to the UN, the UN Institute for Disarmament Research, and a number of NGO websites that collate many of the same documents in their capacity to advocate for a treaty to ban AWS and their own public statements. In addition, audio recordings of nearly all official sessions are available via the UN Geneva digital recordings portal, and because of simultaneous translation are provided in English as an official language. The timeframe for this discourse is bracketed from 2010 when concerns over targeted drone strikes shifted to AWS concerns until the 2019 CCW Meeting of High Contracting Parties.

Certainly, there are limitations to where discussions in the halls, during breaks, and at the side-events are simply not saved for posterity like official statements and speeches. I concede that the real political heavy lifting involved in diplomacy famously happens behind closed doors, in private and informally when representatives are not burdened with the duty to posture. However, the official statements do capture the outcomes of these unobserved parts of the discourse and, ultimately, the norms that result from them.

Once collected in text format, I analyzed this corpus via qualitative data management software, NVivo.[327] The first step in this coding process was to tag each text with the actor category and specify their self-identification. These categories directly correspond to the categories listed by the CCW itself in its proceedings. For example, a statement made by the Irish delegation on April 13, 2015, is categorized as a *state party* and tagged as *Ireland*, while a statement made on the same day by a representative of Article 36 is classified as *NGO activist* and tagged as *Article 36.*[328] The resulting corpus contains 878 distinct documents from over 160 actors spanning from 2011 to 2019. The initial reading of documents provides an overall sense of the discourse with a general shape of the points of contention. Word and phrase frequency queries offer more substance to these initial impressions. Grouping phrases together like "lethal autonomous weapons," "lethal robotic systems," "killer robots," and the various acronyms used throughout the corpus provides for more fine-tuned queries of content analysis to specificity the modulation of the discourse over time—seeing what actors are employing what language at points of the debate.

Mapping Representations of Autonomous Weapons

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[327] Statements available online in textual formats (Word, RTF, PDF, etc.) are easily imported into NVivo format that allows for tagging and coding. Where written statements were unavailable, audio files were easily accessible via the UN website and speech to text software via NVivo was utilized to produce transcripts.

[328] These examples can be found at: https://meetings.unoda.org/section/ccw-gge-2015-statements/

My approach to discourse analysis is grounded in the meanings and collective norms produced by a political discourse surrounding AWS. In short, I engaged with the different ways that various actors understand and represent AWS with a view towards better understanding how and why particular normative approaches emerged. This involves careful readings of reoccurring themes and points of contention expressed in the discourse. Coding the documents in the corpus for these themes is aided by qualitative software that can quickly flag search terms, such as X and Y. Closer inspection of these documents results in a coding scheme that identifies broader themes rather than simply a word count. For example, NGO advocates early on in the debate over killer robots insisted that these weapons could never meet the standards established in International Humanitarian Law (IHL) over the principle of distinction.[329] Projecting possible scenarios in the future where these weapons would incorrectly identify civilians as targets and kill them, this point of contention led transnational activists to the following conclusions. First, it highlighted abdication of human responsibility in the event of war crimes where identifying the perpetrators would be lost amid confusion over who could be saddled with lethal decisions made by machines. Second, this projected situation where the violations of IHL could simply be chalked up to a malfunction with no

[329] For example, see: Robert Sparrow, "Robots and Respect: Assessing the Case Against Autonomous Weapon Systems," *Ethics & International Affairs* 30, no. 1 (2016): 93–116, https://doi.org/10.1017/S0892679415000647. The principle of distinction is the moral imperative to accurately distinguish between combatants and civilians in targeting decisions. This principle is embedded in International Humanitarian Law and the laws of armed combat.

repercussions for the aggressor rendered these weapons as inherently unable to comply with IHL. By this logic, autonomous weapons are, therefore, *mala in se* or inherently illegal. Coding across the corpus allows me to follow the position of each actor in the discourse on this specific point and observe how these positions change over time. This is helpful analytically to understand how state parties, egged on by transnational activist, coalesced around a shared norm while consensus over how to enforce that norm was elusive.

In order to map the representations of AWS across the dataset, I track the arch that particular terms of the debate take. In other words, how terms are established, what motifs are built around them, and how those points are resolved or remain undetermined. Following the precepts of Dunn and Neumann, I paid special attention to particular texts that kick off debate or shape the terms of discourse across the corpus.[330] These are the canonical texts or—as they sometimes refer to them—the "monuments" within the discourse. This definition suggests the criteria for identifying canonical texts: these are particular documents within the discourse that other texts explicitly reference or that establish the terms of the debate going forward. In another sense, canonical texts serve as anchors or bookends that mark the arch of the discourse from beginning to end or signal twists and turns along the way. Canonical texts do more than simply signal the thinking

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[330] Kevin C. Dunn and Iver B. Neumann, *Undertaking Discourse Analysis for Social Research* (Ann Arbor: University of Michigan Press, 2016).

of any particular actor but represent calls to action or inaction (as the case may be) by the author.

With these criteria in mind, I identify seven texts within the corpus as monuments distinctly embedded within the three different phases of the discourse. The first two documents mark the opening salvos by the human rights activist community on the subject of autonomous weapons and brought the issue to the forefront of the international community. External to the UN, nongovernmental advocacy organizations responded to the AWS issue by late 2012. The well-known NGO, Human Rights Watch, issued a report, *Losing Humanity*, authored by Bonnie Docherty from Harvard Law School's International Human Rights Clinic in late 2012. *Losing Humanity* established the terms of the debate across the specific principles of IHL, the challenges for accountability posed by such weapons, discussed human-machine interactions in terms of in-the-loop requirements, and explicitly calls for a preemptive ban on fully autonomous weapons through a legally binding international instrument.[331] This document gained considerable notoriety in the popular press across the international community and prompted a response among military thinkers.[332] Soon after, in early 2013, a coalition of established norm advocates—including Human Rights Watch and Amnesty International—

[331] Bonnie Lynn Docherty, "Losing Humanity: The Case Against Killer Robots."

[332] For example, see: Michael Schmitt, "Autonomous Weapon Systems and International Humanitarian Law: A Reply to the Critics," *Harvard National Security Journal* 4 (2013): 1–37.

founded the Campaign to Stop Killer Robots. As a preemptory step, *Losing Humanity* concludes:

> "Fully autonomous weapons have the potential to increase harm to civilians during armed conflict. They would be unable to meet basic principles of international humanitarian law, they would undercut other, non-legal safeguards that protect civilians, and they would present obstacles to accountability for any casualties that occur. Although fully autonomous weapons do not exist yet, technology is rapidly moving in that direction. These types of weaponized robots could become feasible within decades, and militaries are becoming increasingly invested in their successful development. Before it becomes even more challenging to change course, therefore, states and scientists should take urgent steps to review and regulate the development of technology related to robot autonomy. In particular, states should prohibit the creation of weapons that have full autonomy to decide when to apply lethal force."[333]

These calls for action by activists were bolsters within the UN system with the second canonical text, the Heyns' report. Under the rubric of human rights, the UN Special Rapporteur on extrajudicial executions, Philip Alston, submitted a detailed report on the international controversy of targeting killings by the U.S. during the Global War on Terror. In particular, he focused on the use of drones in airstrikes across non-declared areas of conflict. In a surprising move, the Special Rapporteur highlighted the problem of "new technologies" in warfare, summarizing the concerns of further autonomy in these weapons and marrying the two contentious subjects together.[334] While this official document within the UN system preceded *Losing Humanity*, it did not explicitly call on member states or other actors to take steps towards arms control. Taking over the role of the Special Rapporteur, South African diplomat Christopher Heyns followed up with his report in early 2013

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[333] Docherty, "Losing Humanity" pp. 46.

[334] Philip Alston, "Interim Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions" (New York: United Nations General Assembly, August 23, 2010).

calling for action. In addition to codifying the concerns within the international community over the U.S. drone strike program, Heyns officially highlighted the concerns raised in *Losing Humanity* and formally called on members of the international community to institute a moratorium on developing autonomous weapons.[335] The report had the effect of substantiating concerns about the prospect of these weapons into this global forum injected the issue of AWS into the UN system by way of objections to America's use of drone strikes. The First Committee then referred the matter to the Convention on Certain Conventional Weapons hosted by the UN in Geneva, starting the second phase of the discourse. It was in this forum that the debate among international actors took shape with contestation over norms.

Unlike the United Nations, the CCW is not technically an intergovernmental organization in and of itself. Instead, the Convention is a type of international treaty where member states have agreed to frequently revisit an international issue to clarify norms and instantiate rules within the structure of the convention treaty. As such, the CCW has a standing process to review the technical details about new conventional arms and allow member states to evaluate their individual position on a weapons technology. The Framework Convention of the CCW is similar to other international agreements in that it operates under the

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[335] Christof Heyns, "Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, Twenty-Third Session Agenda Item 3" (United Nations General Assembly, Human Rights Council, April 9, 2013).

principle of consensus, only moving forward with international laws if all parties to the convention consent. High contracting parties to the Convention meet periodically for Review Conferences where new categories of weapons—introduced through the CCW or via the wider UN system—are identified for negotiation, and progress updates are reported. Successful negotiations of additional arms control instruments are added to the CCW via annex Protocols to the original treaty. To examine the technical aspects of weapon improvements and emerging types of arms, the convention typically convenes testimony from specialists put forward by member states in various meetings. This type of meeting is designated as a Group of Governmental Experts (GGE).[336] In the case of autonomous weapons, the annual Meeting of High Contracting Parties in 2013 initiated the preliminary step of an *informal* meeting of experts on autonomous weapons rather than the typical GGE. Consequently, this initial phase focused on testimony from technical experts, representatives of NGOs, and military practitioners rather than a diplomatic debate between state delegations and their designated experts. What is vital about phase one of the discourse—as the issue moved from the UN to the CCW and then into its separate channel of discussion—is that these initial discussions set the broad outlines of the later political debate and negotiation.

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[336] Stephanie Carvin, "Conventional Thinking? The 1980 Convention on Certain Conventional Weapons and the Politics of Legal Restraints on Weapons during the Cold War," *Journal of Cold War Studies* 19, no. 1 (January 1, 2017): 38–69.

The informal, information-gathering phase of the AWS discourse gained wider notoriety through a second canonical text that originated outside the confines of the discussions amongst states. Established in 2014 by concerned computer scientists across Silicon Valley, the Future of Life Institute made a remarkable entrance by issuing an open letter from AI and robotics researchers opposing the development of autonomous weapons. What made the Open Letter noteworthy across the media, within the broader public, and sent aftershocks across the international community were its signatories. Endorsed by over 4500 computer scientists and engineers, the inclusion of notable luminaries such as entrepreneur Elon Musk, world-famous physicist Stephen Hawking, and Apple computer co-founder Steve Wozniak, the letter introduced the concept of "meaningful human control" as the prime concern regarding this emerging technology.[337] It also highlighted the internal political issue roiling through the field of AI with some proponents for the use of the emerging technology in weapon systems within the field and a vocal group of computer scientists who vehemently opposed killer robots. Some of the same scientists—on both sides of the issue—provided testimony to the CCW during this phase as technical experts.[338]

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[337] Future of Life Institute, "Open Letter on Autonomous Weapons," Future of Life Institute, 2015, https://futureoflife.org/open-letter-autonomous-weapons/. "Starting a military AI arms race is a bad idea, and should be prevented by a ban on offensive autonomous weapons beyond meaningful human control."

[338] For example, see Ronald C. Arkin, "The Case for Ethical Autonomy in Unmanned Systems," *Journal of Military Ethics* 9, no. 4 (December 1, 2010): 332–41 who presented to the CCW in 2014, 2015 and 2019 versus Noel Sharkey, "Saying 'No!' To Lethal Autonomous Targeting,"

Having initiated the discussion over "killer robots" and successfully moved the discourse into a forum where global actors could conceivably take action to reign in these weapons, the community of international NGO activists was riding high. Indeed, the FLI's Open Letter focused public attention on the issue and boosted the profile of AWS opponents. Certainly, norm entrepreneurs set the agenda during this second phase, attacking the technology from several different angles. At first, critics relied on the Martens Clause of the CCW's founding document to justify steps to ban the technology. This concept instantiated in international law under the 1899 Hague Convention allows for banning new categories of arms that, on their face, are an affront to the "laws of humanity and the requirement of the public conscience."[339] Armed with this stipulation, NGOs contracted public polling across different countries to demonstrate how public opinion was arrayed against killer robots.[340] From a different angle, activists declared that weapons that made decisions to take life without human oversite were intrinsically a violation of human dignity and, therefore, human rights.[341] Added to these initial attacks were the more

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Journal of Military Ethics 9, no. 4 (December 1, 2010): 369–83 who presented to the CCW in 2014 and founded the International Committee for Robot Arms Control in 2009.

[339] Rupert Ticehurst, "The Martens Clause and the Laws of Armed Conflict," *International Review of the Red Cross* 317 (April 1997): 125–34.

[340] Michael C Horowitz, "Public Opinion and the Politics of the Killer Robots Debate," *Research & Politics* 3, no. 1 (March 2016): 1–8.

[341] Published later, HRW follow up report to *Losing Humanity* succinctly sums up this argument. See: "Heed the Call: A Moral and Legal Imperative to Ban Killer Robots" (New York, NY: Human Rights Watch, August 21, 2018), https://www.hrw.org/sites/default/files/report_pdf/arms0818_web.pdf.

concrete compliance issues with IHL. To comply with the law of war, the operation of these weapons would have to adhere to the principles of distinction (only attacking enemy combatants while avoiding unnecessary harm to civilians), proportionality (using only as much violence than is appropriate against an enemy), and military necessity (avoiding wanton destruction.) Activists declared that even the most advanced AI could not adhere to these principles. The early, informal discussions within the CCW also focused on defining the parameters of what systems would qualify as "autonomous" and fall under the review of the CCW. In these discussions, activists were generally successful in broadening the scope of weapons considered.

The third phase of the discourse took place between 2017 and 2019, marking the cumulation of contention at the global level over autonomous weapons, and illustrates how a technical issue of innovation is fundamentally grounded in political questions. Here, the discussion shifted from an informal, information-gathering exercise to a negotiation over the ramifications of the emerging technology, what principles international actors applied to autonomous weapons, and debates over how the international community should respond to the prospect of lethal robotics. As the focus of the discourse shifted, so did the relative weight of different actors within the debate. The resulting contention would inform the bifurcated outcome of the negotiation process where a norm emerged relatively quickly but with no consensus on how to enforce it. Indeed, the positions of different member states solidified around distinct blocs as activists attempted to cajole state representatives towards a preferred outcome—a binding preemptive ban on AWS before they were fully developed and used in warfare. It is at this stage where the norm shared across the international community solidifies but the consensus about how to enforce the norm breaks down between blocs. Across the advocacy network that opposes these weapons from a humanitarian arms control perspective, the distinction between a successfully established norm and the desire for a binding international treaty to ban these weapons breaks down. Key to understanding the dynamics of this most politicized phase is the structure of the CCW itself. That the CCW took up the issue of killer robots in a separate forum is a marker of how salient the issue became across the international community. But like many other international conventions, the CCW operates under the principle of consensus to ensure the legitimacy of all agreements made under its auspices. The emphasis on consensus added a structural aspect to the discourse that norm entrepreneurs regarded as a barrier to their goals, fueling their increasing frustration with continuing negotiations without the legal instrument they sought. This dynamic also highlighted the shift of power from actors more focused on agenda setting (NGO norm entrepreneurs) to the state actors (in the form of state delegations) who could actually institute change through treaty instruments or other political moves. Indeed, the structure of this particular discourse that emphasizes both consensus and the implicit aim of negotiations to reach some kind of settlement empowered state actors in this phase.

The subsequent three canonical texts within the discourse mark out political positions on these weapons, demarcating the conceptual limits on AWS arms control. The first document typifies the formal resistance to the ban treaty. Presented during the opening of the 2017 meeting of the GGE by the U.S. delegation as a working paper on “Autonomy in Weapon Systems,” this lengthy document systematically addresses the points of contention advanced by NGO activists, insisting that autonomous weapons can adhere to the laws of war opting for a functional definition of autonomy (see above) that concentrates on how the weapon is wielded rather than categorizing these weapons according to their design. In fact, the U.S. asserted in this text the possibility that autonomous weapons would potentially adhere to IHL better than current military technologies because of greater precisions. While this “precision” argument was advanced by earlier experts, after this official U.S. articulation, many other like-minded actors emphasized this theme in the subsequent negotiations. While emphasizing the current processes of the CCW and other forums across the international community to assign legal responsibility in warfare, the U.S. insisted that the existing structure of IHL was more than adequate to bring AWS into the fold. Of note, the position staked out by the U.S. was not as obstructionist as it could have been. Instead of resorting to the ultimate argument of military necessity that would trump all humanitarian qualms about this new technology, the American position expressly promotes Article 36 weapons reviews and a commitment to continue negotiations within the CCW.[342]

Representing the middle ground, a joint statement by the French and German delegations to the Group of Governmental Experts suggested a different stance. Acknowledging the growing consensus around the need for meaningful human control, this statement by two states that were both active within the CCW to organize this separate track of talks specifically on autonomous weapons calls for a measured step towards arms regulation. While seconding the U.S. idea of using current processes within the CCW to address this new class of weapons, the French-German position advocates for a political declaration across member states to address the issues of AWS.[343] While this proposal certainly fell short of a pre-emptive ban advocated by global civil society, it did go further than the U.S. status quo position of business as usual.

A set of other statements by regional organizations like the Non-Aligned Movement (NAM) and the African Group represent a position on the opposite side of the debate. The formal opening remarks by the Non-Aligned Movement (NAM)

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[342] U.S., "Autonomy in Weapon Systems," Working paper (Geneva: United Nations Convention on Certain Conventional Weapons, Group of Governmental Experts on Lethal Autonomous Weapons Systems, November 10, 2017), https://www.reachingcriticalwill.org/images/documents/Disarmament-fora/ccw/2017/gge/documents/WP6.pdf.

[343] France and Germany, "For Consideration by the Group of Governmental Experts on Lethal Autonomous Weapons Systems (LAWS)" (Geneva: United Nations Convention on Certain Conventional Weapons, Group of Governmental Experts on Lethal Autonomous Weapons Systems, November 13, 2017), https://undocs.org/en/CCW/GGE.1/2017/WP.4.

in 2018 staked out a position that supported NGO activists. Interestingly, the non-aligned countries based their objections to killer robots on their intrinsic characteristics as *mala in se* eschewing any reference to either the Martens Clause or human dignity—references put forth by the NGO norm entrepreneur community. The declaration by the African Group in the same year was even more strident, repeatedly basing their collective opposition to killer robots on the imperative that human control over the use of force must be retained to comply with the laws of arm conflict.[344] While representatives of the European Union also presented anodyne statements in diplomatic language that did not commit its members to a position, the NAM and African Group statements tied many states to the cause of a preemptive ban.[345] While many European states would begin their individual statements with a reference to the EU position, those statements simply reaffirmed

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[344] African Group, "Statement by the African Group" (Geneva: United Nations Convention on Certain Conventional Weapons, Group of Governmental Experts on Lethal Autonomous Weapons Systems, 2018), http://reachingcriticalwill.org/images/documents/Disarmament-fora/ccw/2018/gge/statements/9April_African-Group.pdf;

[345] The Bolivarian Republic of Venezuela on behalf of the Non-Aligned Movement (NAM), and Other States Parties, "General Principles on Lethal Autonomous Weapons Systems" (Geneva: United Nations Convention on Certain Conventional Weapons, Group of Governmental Experts on Lethal Autonomous Weapons Systems, April 9, 2018), https://undocs.org/en/CCW/GGE.1/2018/WP.1. "Regarding different proposals on a political declaration, code of conduct and other voluntary measures, including weapons review process, as well as the establishment of a Committee of Experts, NAM believes that these measures cannot be a substitute for the objective of concluding a legally binding instrument…. In this regard, pending the conclusion of a legally binding instrument, NAM calls upon all States to declare moratoria on the further development and use of LAWS." pp. 2.

the appropriateness of the CCW process and outlined the questions under debate instead of illustrating a set position on the issues.[346]

The last canonical text marking the conclusion of this phase is the 2018 Report of the GGE on Lethal Autonomous Weapons Systems. Representing a nascent consensus across all the involved actors within the CCW, this document issued by the Chair goes beyond a mere summary of the work of the formal discussion. Instead, the text details eleven principles that, taken collectively, represent the emerging international norm on AWS technology (see Figure 4.1). To reiterate, a global norm is a collectively held expectation of appropriate behavior specific to actors of a given identity.[347] Unsurprisingly, this communique emphasizes the primacy of International Humanitarian Law and the responsibility of a state to adhere to it even in the design of weapon systems. Critical to understanding how these principles suggest the emerging norm are the prevalent themes of responsibility, obligation, and accountability. In addition, the preoccupation with risk and mitigating risk in systems designed to act autonomously to some extent is

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[346] For example, compare the 2018 statement by the EU to that of the African Group. EU Delegation, "European Union Opening Statement," in *2018 Session, CCW Meeting of Experts on LAWS* (Geneva, 2018), https://docs-library.unoda.org/Convention_on_Certain_Conventional_Weapons_-_Group_of_Governmental_Experts_(2018)/2018_LAWSGeneralExchange_EU.pdf.; and African Group, "Statement by the African Group."

[347] See Martha Finnemore and Kathryn Sikkink. "International Norm Dynamics and Political Change." *International Organization* 52, no. 4 (ed 1998): 887–917; and Katzenstein, Peter J. *The Culture of National Security: Norms and Identity in World Politics*. New York: Columbia University Press, 1996. The kernel of norms as a concept is also found in James G. March and Johan P. Olsen, "The Institutional Dynamics of International Political Orders," *International Organization* 52, no. 4 (ed 1998): 943–69.

evident in the eleven principles. While there is no declared definition of autonomous in weapon systems, the reference to “human-machine interaction” suggests a definitional framework that revolves around the command-and-control framework that focuses on the relationship between human operators and their weapon systems regardless of the sophistication or function of those systems. It is essential to consider that this political statement was produced under the rubric of consensus, and every state party to the CCW involved agreed to this diplomatic language. Taken together, all of these considerations point towards the emergence of a norm: that law-abiding states are expected to maintain meaningful human control over autonomous weapons.

Figure 4.1: Shared Principles on AWS [348]

As a result of the CCW process, by 2019 the international community explicitly settled on the following principles enumerated in the CCW GGE Final reports of 2018 and 2019:

- International humanitarian law continues to apply fully to all weapons systems, including the potential development and use of lethal autonomous weapons systems.
- Human responsibility for decisions on the use of weapons systems must be retained since accountability cannot be transferred to machines. This should be considered across the entire life cycle of the weapons system.
- Accountability for developing, deploying and using any emerging weapons system in the framework of the CCW must be ensured in accordance with applicable international law, including through the operation of such systems within a responsible chain of human command and control.
- In accordance with States' obligations under international law, in the study, development, acquisition, or adoption of a new weapon, means or method of warfare, determination must be made whether its employment would, in some or all circumstances, be prohibited by international law.
- When developing or acquiring new weapons systems based on emerging technologies in the area of lethal autonomous weapons systems, physical security, appropriate non-physical safeguards (including cyber-security against hacking or data spoofing), the risk of acquisition by terrorist groups and the risk of proliferation should be considered.
- Risk assessments and mitigation measures should be part of the design, development, testing and deployment cycle of emerging technologies in any weapons systems.
- Consideration should be given to the use of emerging technologies in the area of lethal autonomous weapons systems in upholding compliance with IHL and other applicable international legal obligations.
- In crafting potential policy measures, emerging technologies in the area of lethal autonomous weapons systems should not be anthropomorphized.
- Discussions and any potential policy measures taken within the context of the CCW should not hamper progress in or access to peaceful uses of intelligent autonomous technologies.
- The CCW offers an appropriate framework for dealing with the issue of emerging technologies in the area of lethal autonomous weapons systems within the context of the objectives and purposes of the Convention, which seeks to strike a balance between military necessity and humanitarian considerations.
- Human-machine interaction, which may take various forms and be implemented at various stages of the life cycle of a weapon, should ensure that the potential use of weapons systems based on emerging technologies in the area of lethal autonomous weapons systems is in compliance with applicable international law, in particular International Humanitarian Law (IHL). In determining the quality and extent of human-machine interaction, a range of factors should be considered including the operational context, and the characteristics and capabilities of the weapons system as a whole.

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[348] See United Nations, Group of Governmental Experts of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects (Geneva, 2018), https://undocs.org/en/CCW/GGE.1/2018/3.

The establishment of a norm as a collectively held idea across political actors is separate from the means of enforcing the norm itself. Again, because collectively held ideas are beyond direct observation, the concrete methods of enforcing them and the relative success of those attempting to enforce a norm are often taken as proxy measures of the norm itself. In the case of autonomous weapons, we have a relatively straightforward and transparent process laid out in the CCW debates that produce an explicit enumeration of the norm but with a host of different positions laid out around the question of how to enforce that norm.

Contention and Consensus: Layering the Discourse

To understand the outcome of this discourse, it is necessary to identify different strains of thought that emerge, consider the particular actors that shift into different cohorts, and the dominant view that eventually emerges from the discussion. This step of the methodology is layering or sifting through the textual data to find patterns where collective ideas coalesce. In the case of the AWS debates on the international stage, these patterns are organized around differences concerning how to enforce a norm. In subtle ways, these competing views help to shape the emerging norm that we see in the eleven principles.

Table 4.3: Competing Views on the Question: How to enforce the AWS Norm?

Bloc	Proposed solution	Narrative	Actors
Taboo Advocates	Ban on development and fielding of killer robots through a new binding treaty	Nightmarish future of warfare where militarized states and non-state kill civilians intentionally or unintentionally with robots	- 30 state parties - Large majority of civil society groups involved in talks - UN Secretary-General Guterres
Alternative Advocates	Restrictions on <u>use</u> of AWS through new binding treaty	Advanced militaries will eventually develop this class of weapons and arms control can and should restrict when, where, how, and on what targets AWS is used	- 44 state parties - ICRC and some IGO representatives
Foundationalists	Build upon consensus with non-binding steps first, later moving on to treaty solutions	Projections are focused on the diplomatic realm, mapping out how to eventually institute the norm into law	- 11 state parties - European Union
Accommodationists	Use existing mechanisms within the CCW (Article 36 reviews) to encourage best practices across militaries	Suggests AWS may make warfare more humane through dispassionate precision and that adequately professionalized militaries will avoid any pitfalls	- 11 state parties - U.S. national security NGOs (CFR, CNAS)
Status Quo	See no benefit in new international agreements or procedures without clear definitions and disagreements settled via negotiation	Emphasizes the benefits of new weapons technologies to make future warfare more in line with IHL	- 6 state parties - A few individual technical experts

The development of different factions across actors within this discourse centered on what action should be taken on the question of AWS even while discussions took place over a host of other related issues. For example, consideration over all three phases was given to defining autonomy, what weapons to categorize as AWS, and to what extent autonomous weapons would mark a change in warfare. However, the question about what steps should the international community take related to the emergence of this technology was the key driver of contention between actors. Positions on this question range from the insistence of new international law enshrined in a novel treaty banning killer robots to a more obstinate position that seeks to close discussion and rests on the primacy of military necessity for these future weapons.[349]

The first prominent cohort within the discourse is a group of actors I typify as *Taboo Advocates*. Pushed by global NGOs, this group is the most vocal about the declared need for a preemptive ban enshrined in hard international law. Taboo Advocates posit that current international law is simply not up to the task of incorporating fully autonomous weapons as it is currently formulated. Indeed, this perspective views AWS as inherently in violation of the Laws of Armed Combat at base. From this perspective, future AWS (both in the near and far future) are intrinsically in violation of current IHL in the forms envisioned by the leading military powers. The emphasis here is on the humanitarian aspects of IHL and the fundamental inhumanity of weapons that kill on their own. Therefore, this group

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[349] The process of dividing up positions across actors into notional blocs is guided by two sources of inspiration. The first is Betsill and Fiske's taxonomy of international negotiating positions across actors concerned with climate change. See: Michele Betsill and Desiree Fiske. "International Climate Change Policy: Toward the Multilevel Governance of Global Warming." In *The Global Environment: Institutions, Law and Policy*, edited by Regina Axelrod, Stacy VanDeveer, and David Leonard Downie, Fifth edition:271–304. Washington, DC: CQ Press, 2020. The second is map positions across the continuum suggested by Bloomfield and Scott in their work on what they call norm antipreneurs. See: Alan Bloomfield, "Norm Antipreneurs and Theorizing Resistance to Normative Change," *Review of International Studies* 42, no. 2 (April 2016): 310–33; Alan Bloomfield and Shirley V. Scott, eds., *Norm Antipreneurs and the Politics of Resistance to Global Normative Change* (New York, Routledge, 2016).

seeks to bar the creation of these weapons pre-emptively. Under this position, a treaty codification of a prohibition of developing, let alone fielding this emerging weapons technology, should take the form of a binding treaty instrument to restrict the research, development, production, or use of AWS. *Taboo Advocates* self-consciously inhabit the role of norm entrepreneurs highlighted in the academic literature on international norms.[350] The composition of this cohort includes 30 state actors, the majority of NGOs involved in the CCW discussions, many key technical experts, and many representatives of intergovernmental organizations.[351] Indeed, the current Secretary-General of the United Nations, António Guterres, is a vocal critic of autonomous weapons and an outspoken advocate for international arms control over the technology. His advocacy from the bully pulpit skews towards an outright ban on this technology. A number of intergovernmental groupings like the Non-Aligned Movement and the African Union are also significant in bolstering this position. Individuals within the community of

[350] See Margaret E. Keck and Kathryn Sikkink, *Activists beyond Borders: Advocacy Networks in International Politics* (Ithaca: Cornell University Press, 2014); and Bloomfield and Scott, eds., *Norm Antipreneurs.*

[351] The most vocal states of this bloc are Austria, Brazil, Chile, Mexico, Venezuela, and Cuba. Certainly, *Taboo Advocate* countries hail primarily from the global south including the states of Algeria, Argentina, Bolivia, Colombia, Costa Rica, Djibouti, Ecuador, Egypt, El Salvador, Ghana, Guatemala, Iraq, Jordan, Morocco, Namibia, Nicaragua, Pakistan, Panama, Peru, State of Palestine, Uganda, and Zimbabwe. Included in this group are the Holy See, and Iceland rounding out some representation from Europe. Non-state actors are overrepresented in this group, counting the major NGOs organized under the Campaign to Stop Killer Robots (including Human Rights Watch, Amnesty International, PAX, ICRAC, Women's International League for Peace & Freedom, Article 36, the Nobel Women's Initiative, Mines Action Canada, and the International Panel on the Regulation of Autonomous Weapons. Additionally, several academics that testified as experts during the informal phase of the discourse expressed this taboo position and are counted as supporters of the Campaign.

experts—especially the ethicists who have testified to the CCW during the informal meetings—advocate for this view.

Projecting the future of warfare that includes these weapons, the narrative spun by *Taboo Advocates* is quite robust and intricate. The early internal discussion within this faction revolved around meaningful human control. The emphasis on this concept stemmed from worst-case scenario projections where an arms race between leading military powers to develop autonomous weapons would lead to unfettered proliferation, their use by either non-state terrorist groups or by authoritarian leaders to kill political critics.[352] These are explicit narratives about the future projected by academics, computer science experts, and transnational humanitarian arms control activists. In these narratives, innocent civilians are cast as the tragic protagonists and advanced military powers playing the role of either villainous repressors or inadvertent handmaidens to out-of-control technology. Indeed, the initial move to use the term "killer robots" itself is a narrative choice, drawing upon popular culture and dystopian scenarios ready-made to motivate the international public even when campaign advocates seek to downplay these

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[352] See Stewart Sugg, *Slaughterbots* (Space Digital, 2017), https://www.youtube.com/watch?v=9CO6M2HsoIA.

and Stuart Russell, "AI and Lethal Autonomous Weapons Systems" (Meeting of Experts on LAWS, Geneva, November 13, 2017), https://docs-library.unoda.org/Convention_on_Certain_Conventional_Weapons_-_Group_of_Governmental_Experts_(2017)/2017_GGE%2BLAWS_Statement_StuartRussel.pdf.

theatrics.[353] Regarding identifying protagonists or antagonists within the narrative, *Taboo Advocates* tend to identify humanity writ large as the central character in the struggle against killer robots. This figure is almost always represented as an innocent civilian trapped in conflict. In these projected visions of future war where these weapons are let loose, this central figure is typically elderly, a family unit or a child hunted down by an autonomous weapon. Interestingly, the antagonist in these futuristic scenarios is cast as the weapons themselves as agentic figures. In order to emphasize the problems they anticipate with this technology, *Taboo Advocates* do not focus on commanders or military personnel that deploy these weapons except for once there is a confusing discussion after the violation of IHL concerning the mutability of assigning responsibility for a war crime. In terms of motivations of the actors in their narrative, protagonists range from civilians simply seeking to survive to young university students targeted by shadowy figures for their implied political activism. These fictionalized themes drive the narrative where the powerful misuse this technology towards nefarious ends or simply elide their moral and legal responsibilities to humanity. The resolution of the Taboo Advocate narrative is markedly dystopian with a world where technology is out of control or is only employed for political repression. This cohort strategically deploys this narrative to emphasize the urgency of addressing the controversy over

[353] Again, see the excellent work by Carpenter, "Rethinking the Political / -Science- / Fiction Nexus."

AWS with the maximalist step of explicitly restraining the technology through a legally binding international ban treaty.

I label the second group within the CCW discourse the *Alternative Advocates*. This conglomeration of actors considers the technological development of autonomous weapons as a direct challenge to IHL and the law of war as they stand. However, this perspective considers pandora's box as already open with the technology clearly feasible and a ban on AWS enshrined in a treaty as quixotic. Instead, this cohort supports a binding treaty instrument to regulate the proliferation of and use of AWS in warfare short of a ban. While this distinction may seem academic, the policy prescriptions stemming from the differentiation are significant. A treaty that insists on an outright ban faces considerable opposition from powerful states in the international system with advanced military capabilities. While violations do not automatically negate international laws, there are serious concerns about enforcing an outright prohibition on this technology. There are also concerns that a ban would inhibit the promotion of dual-use AI technologies, especially in the developing world that would be barred from economic benefits. Instead, a treaty that regulates the spread and use of the technology is not only thought of as more feasible but one that could court the support of advanced military powers. The logic for this support from those states already developing AWS technology is that they could enjoy the promise of “locking in” their strategic advantage while also writing new rules of the road to rein in these weapons for others. In Bloomfield’s taxonomy, *Alternative Advocates* fit in the category of competitor entrepreneurs who "agree on the need for change but differ on the exact scope and content of the new norm."[354] While a few international NGOs (like the International Committee of the Red Cross) fall into this category, the *Alternative Advocates* faction is well represented across state parties with 44 different countries adhering to this view.[355] Importantly, this perspective holds meaningful human control as the primary concern across the debates concerning autonomous weapons and advocates for new international laws enshrined in legal instruments to ensure that control but falls short of attempting to sweep away military technology by treaty.

While *Alternative Advocates* share many of the fundamental concerns as those put forward by *Taboo Advocates*, a less dramatic or extensive narrative shapes their prescriptive outlook. Still, the possibility of unfettered robotic warfare without human intervention is envisioned in many of the texts and statements produced by this group. Uniformly, this outcome is regarded as nightmarish and beyond the pale of civilized behavior across the actors that make up *Alternative Advocates*. The protagonists, antagonists, and narrative motivations do not deviate markedly from

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[354] Bloomfield, "Norm Antipreneurs and Theorizing Resistance to Normative Change," pp. 329-331.

[355] The states that comprise this bloc are eclectic hailing from across the geographic, political, and developmental spectrums: Bangladesh, Belarus, Benin, Bhutan, Brunei, Burkina Faso, Cameroon, Cote d'Ivoire, Croatia, Cyprus, Dominican Republic, Gabon, Honduras, India, Iran, Kazakhstan, Kuwait, Laos, Latvia, Lebanon, Lesotho, Libya, Liechtenstein, Madagascar, Malaysia, Mauritius, Mongolia, Mozambique, Myanmar, Oman, Philippines, Qatar, Senegal, Sierra Leone, Singapore, Slovenia, South Africa, Sri Lanka, Thailand, Togo, Tunisia, UAE, Yemen, and Zambia. Most significantly, China inhabits this position with its call in 2018 to restrict or regulate the *use* of AWS with no restriction on the development of such weapons.

the projections of *Taboo Advocates* except for the addition of the collective "international community" as an additional protagonist. However, the terms of what is possible in a resolution of the action in their narrative is more limited given what they expect is feasible. Importantly, *Alternative Advocates* represent an updated version of the more forceful *Taboo* position in the sense that they suggest the technology has advanced to the point where a total ban on AWS would be retroactive by the time it came into force. They share the same level of concern over the prospects of killer robots, but they shift their attention from reprehensible motivations on the part of antagonist actors to the collective interests of managing the ramifications of autonomous technology. Hence, while the contention over the issue drives the narrative, alternative advocates envision a slightly different resolution in the future that is less rigid than *Taboo Advocates'* insistence on a ban or bust.

Located very much in the middle of the spectrum of action on autonomous weapons are a small number of actors identified as *Foundationalists*. Essentially, this view is conservative regarding creating international law and falls back on an evolutionary perspective that first consensus should be built step by step with non-binding, political actions across state parties. Instead of jumping straight ahead to the hard law of an international treaty, soft international law should be established. Multinational efforts like joint declarations, memorandum of understanding, and final communique that serve as the initial building blocks of general principles are needed first, with the formal and binding treaty law coming later. In this instance, these declarations are considered the basis for future customary laws restricting AWS without constraining current state sovereignty, but at least such steps address the urgent need to "do something" without committing to controversial action. From the *Foundationalists'* perspective, IHL might not be robust enough to incorporate autonomous weapons. Still, this position argues that incremental steps are necessary to clarify norms and settle definitions through the diplomatic process.

In an echo of functionalist logic, the suggested non-binding instruments are thought to spur ever greater technical cooperation between lower-level experts and non-state actors, producing a foundation of understanding that would effectuate the later development of binding law. This position advocates for a statement of shared principles, effectively sidestepping the issue of defining autonomy in weapon systems across diverse state views. Indeed, *Foundationalists* explicitly stake out a middle ground position. In terms of Bloomfield's norm dynamics roles-spectrum, they skew towards Alternative Advocates' "entrepreneurial competitor" role, but without the shared sense of urgency.[356] France and Germany took the lead with this position in their joint working paper in 2017 and have gained a few other state party adherents comprised of 11 countries.[357] The European Union's position on the issue of how to approach autonomous weapons also fits within this category, given its

[356] Bloomfield, "Norm Antipreneurs and Theorizing Resistance to Normative Change," pp. 329-331.

[357] Other state members of the *Foundationalist* bloc include: Belgium, Bosnia and Herzegovina, Bulgaria, Cambodia, Greece, Finland, Japan, North Macedonia, Norway, and Sweden. The European Union also occupies this

traditionally diplomatic and measured approach. The foreign ministries of France and Germany have advanced this approach even further with the establishment of the Alliance for Multilateralism starting in 2018. This informal network of countries that share a commitment to the rules-based, multilateral world order where one of the main pillars is arms control with autonomous weapons as a focus of this effort.[358] Again, actors who ascribe to this position consider international law and norms an evolutionary process that must proceed with particular steps to gain legitimacy. Thus, while they agree that "something must be done" about the concerns surrounding autonomous weapons (and responding to domestic political pressures from voices across their own constituencies), the interim step of a non-binding, political declaration is considered a stepping stone to more robust international instruments later.

The narrative across the *Foundationalists* camp is one of concern but with the caveat that international law should be amended to accommodate this new weapons technology. Ultimately, the *Foundationalists* stress the legal review process and the methodical nature of technical reviews. Across their portion of the discourse, this narrative identifies more collective actors (the international community as a protagonist and violators as a collective category of actors) rather than identifying civilians or individuals as protagonists in a future scenario. Indeed, much of the

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[358] See German Foreign Ministry and French Foreign Ministry, "The Alliance," The Alliance for Multilateralism, accessed November 19, 2021, https://multilateralism.org/the-alliance/

projected outcomes within this group are confined to negotiation between parties and distinctly in the realm of multinational negotiations rather than cast on the future battlefields of tomorrow. In this sense, the figure of the autonomous weapon itself is typified as the antagonist. In this sense, the diplomats within the international systems struggle to control the technology rather than be controlled by it. Such a framing lends itself to the theme of IHL needing to win the footrace against technological development. This theme animates *Foundationalists'* actions where the motives of the international community are assumed to be in good faith. In this view, contention might exist between sovereign actors in the realm of military security, but their relations are ultimately grounded in shared interests that skew towards cooperation. Again, in the *Foundationalist* narrative, state parties are conflicted by their innate interest to preserve their freedom of action. However, the potential consequences of algorithmic warfare outpacing international law drive actors ultimately towards compromise and the systematic building of international law.

A subtle shift in perspective separates *Foundationalist* from the next group, what I term the *Accommodationist* camp. This group considered existing IHL and the organs of the CCW up to the task of regulating killer robots with no need for a new binding or even non-binding instrument. Instead, the focus of this group is to widen the use of Article 36 weapons reviews where each member state submits legal reviews of new weapon systems to the CCW as a form of confidence-building through transparency.[359] *Accommodationists* seek to establish a "best practices" model grounding regulations over AWS in the administrative procedures of member states' military institutions and their respective governments rather than creating new international law. *Accommodationists* are conceptualized as creative resisters in terms of how this group fits in the spectrum of norm actors. In other words, they seek to maintain the overall status quo of no direct or binding arms control over this emerging technology, but they do concede minimal changes in how the existing mechanisms of the CCW can apply to autonomous weapons.[360] This bloc consists of eleven states that are parties to the CCW, a few experts, and U.S.-based, mainstream NGOs.[361] Importantly, this viewpoint does not rule out some restrictions over the emerging autonomous technology but instead seeks to

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[359] In the interest of clarity, Article 36 weapons reviews referrers to the 1977 Additional Protocols I to the Geneva Conventions. The international NGO "Article 36" takes its name from this particular section of the venerated treaty. The article states: "In the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party." See: "Additional Protocol (I) to the Geneva Conventions" (International Committee of the Red Cross, June 8, 1977), https://ihl-databases.icrc.org/applic/ihl/ihl.nsf/Article.xsp?action=openDocument&documentId=FEB84E9C01DDC926C12563CD0051DAF7.

[360] Bloomfield, "Norm Antipreneurs and Theorizing Resistance to Normative Change," pp. 329-331. As Bloomfield notes, this is also close to Acharya's concept of how some states act in norm subsidiarity roles. See: Amitav Acharya, 'Norm subsidiarity and regional orders: Sovereignty, regionalism, and rule-making in the Third World', International Studies Quarterly, 55:1 (2011), pp. 96–7.

[361] These included Australia, Canada, Denmark, Estonia, Ireland, Italy, Luxembourg, Netherlands, Spain, Switzerland, United Kingdom, and (initially) the U.S. Many experts that espouse this view hail either from within advanced military institutions or within academia. Based on their expert input, the Council on Foreign Relations and the Center for a New American Security are emblematic of the NGOs that fit within this camp.

incorporate those new weapons into the existing arms control frameworks and existing instruments with a pragmatic aim of reigning in any misuse of the technology and mitigating its proliferation. Prominent voices within this perspective are Australia and the U.S.

Accommodationists spin a very distinct tale of the future at variance from other blocs. They characterize state actors as motivated to responsibly develop defensive weapon systems within the constraints of IHL as the primary protagonists in a projected future with AWS. In concrete terms, *Accommodationists* regard the development of autonomous technology as inevitable and beyond the control of political actors. Thus, accounts from this group have a distinct sense of technological determinism, placing the driver of action in their narratives squarely on the technology itself. Strikingly, there is also a strong thread of techno-optimism across this camp with the repeated suggestion that once developed, these weapons will make warfare <u>more</u> humane with fewer incidences of IHL violations based on the supposition that greater precision reduces unintended civilian casualties. The *Accommodationist* perspective views actors who develop AWS technology in the near future without any transparency or professional ethics to adhere to IHL as uncivilized and beyond the pale. Indeed, the vision of this cohort is infused with the ethos of professional military practitioners who rely on internalized practice, established processes, and clear standards to ensure compliance with international norms. From this perspective, creating new IHL to address autonomous weapons is unnecessary as long as professionalization enshrines best practices across advanced militaries. Thus, the antagonist in the narrative of future warfare are those state actors that irresponsibly develop autonomous weapons without any ethical guardrails and non-state actors that may use the emerging technology towards nefarious ends. The animating conflict in the *Accommodationist* narrative follows the international community's struggle to incorporate AWS into responsible states' arsenals while avoiding the proliferation of these dangerous technologies to terrorists or their misuse in warfare. In this narrative, the resolution of the issues surrounding this emerging technology is the successful management of outcomes with some level of cooperation between states along established channels and procedures. A relatively benign and technocratic finale to the controversy.

A small group of actors that I label the *Status Quo* bloc is at the far end of the multinational debate over killer robots. What sets this position apart from all the others is their consistent resistance to any steps in the direction of arms control or regulation of autonomous weapons. This takes the form of disassembling or obstructionist negotiation tactics, open hostility regarding proposed bans on AWS, and privileging state sovereignty over IHL concerns. A particular tactic of this group is to cast doubt on shared definitions surrounding the problem of autonomous weapons, only then to turn around and harp on the lack of consensus on these definitions. The timing on this *Status Quo* actors emphasized this second rhetorical step, especially once all the other stakeholders moved towards consensus around meaningful human control. The diplomatic tactics of this cohort include multiple suggestions of concern over AWS while implacably resisting incremental steps towards arms control and seeking to increase the scope of discussion while calling for limitations on the timeframe of negotiations. Again, all of these obstructionist tactics aim to grind down the debate and act as a bulwark against any changes to international law that would impede the development of this new weapons technology. The position of *Status Quo* actors exhibit traits of "anitpreneures" as detailed by Bloomfield: they resist any arms control changes—either formal treaty changes or voluntary enhancements of existing mechanisms like Article 36 reviews—that would inhibit the development of these weapons.[362] This group consists of a few actors in the discourse: six countries based on their stated position regarding AWS and only a handful of individual experts—primarily military practitioners or weapons engineers—who adhere to the view of the *Status Quo* bloc.[363]

This group's internal narrative about the future is curious. The projected outcomes for this obstructionist cohort partially mirrors that of the *Foundationalists.* Their narrative is narrowed to the diplomatic field of negotiations. But the *Status Quo* narrative also borrows liberally from an

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[362] Bloomfield, "Norm Antipreneurs and Theorizing Resistance to Normative Change," pp. 314-333.

[363] States include Israel, Poland, Republic of Korea, and (above all) the Russian Federation. The U.S. stance over the course of the Trump administration also drifted towards this position with State Department officials openly questioning the concept of meaningful human control. See: Ford, Christopher, "Al, Human-Machine Interaction, and Autonomous Weapons: Thinking Carefully About Taking 'Killer Robots' Seriously," *Arms Control and International Security Papers* 1, no. 2 (April 20, 2020), https://www.state.gov/wp-content/uploads/2020/06/T-Paper-Series-2-LAWS-FINAL-508.pdf.

Accommodationist projection of a perfectible method of waging war with the aid of technology. In particular, this means that the *Status Quo* account of the future suggests that advanced military states, as protagonists, are developing this weapons technology out of a concern to 1) adequately defend their territory and 2) make warfare more humane, avoiding civilian casualties through greater accuracy. The conflict driving this storyline pits unreasonable and meddling advocates for a ban on potentially beneficial technology that does not yet exist against responsible advanced military powers who seek realistic uses of defensive technologies. This narrative step paints diplomacy as an obstacle to be overcome rather than a collective effort to find solutions. *Status Quo* advocates also emphasize the potential civilian uses of AI in the future to advance economic development that would be hindered by a preemptive ban on military uses of computer autonomy. Their narratives also accentuate speculation that autonomous weapons would ultimately perform more ethically in battle than human equivalents. This projection follows from the logic that AI-enabled weapons would not act out of emotion and notionally would perceive the differences between combatants and civilians more precisely than the young recruits that composed the majority of military forces across the globe. This notion builds on the theme of perfectible warfare in the future that avoids ethical pitfalls through the application of precision.[364]

[364] Here I should add that conceptualization of "perfecting" warfare and making it more humane through new weapons was prevalent in at the dawn of several technologies that came before: high explosives, bomber airplanes, nuclear weapons, smart bombs and chemical weapons. In some cases, their inventors surmised that these weapons were so destructive that it would render military

A bevy of actors remain uncommitted to any of these positions but were involved in the discourse. These actors fall into two actor categories: state parties to the convention and individuals involved in the diplomatic discourse. Many states have circulated in and out of negotiations throughout the CCW process. Several made circumspect statements on their respective positions, eliding a commitment about what should be done on the issue. A few high contracting parties to the CCW have attended most of the meetings on autonomous weapons and simply have remained silent (e.g., Serbia and Slovakia). In these cases, many of the states in question highlighted the need for meaningful human control in their otherwise anodyne diplomatic statements. Other states are active members of the broader Convention but did not participate in the testimony or negotiations within the separate GGE process. However, some of these countries have made statements in other UN forums (e.g., the annual Meeting of Parties to the CCW, the 2016 CCW Review Conference, or under within the UN General Assembly's 1st Committee meetings) where they did reiterate commitments to meaningful human control. The other category of non-committed actors within the discourse are individuals who, by a function of their self-perceived role, simply did not weigh in on what actions the international community should take. Such a position is certainly understandable given that many of these specialists contributed through testimony to the international body from the fields of computer science, weapons design, as

conflict impossible. In others, the logic was that the proper application of their surgical design would cripple an enemy nation's will to fight.

military practitioners, as legal experts, or scholars on ethics. As such, many saw their role in the discourse as providing context and guiding the other participants rather than taking a position on how states should proceed in their negotiations. That being said, not all individual experts were agnostic on how the CCW should proceed, and some specialists did fit into the different coalitions noted above.

Despite these various camps within the discourse, there is agreement across actors on some fundamental shared values. In these commonalities, we see the growth of a norm concerning this category of weapons, if not a consensus on enforcing that norm. The eleven principles produced by the CCW discourse by 2019 reflect many different elements from the positions enumerated above. The desire not to inhibit the potential for AI to lead towards economic prosperity in developing nations is clearly reflecting the positions of *Accommodationist* and *Status Quo* blocs. Emphasizing the application of International Humanitarian Law and states' obligations to comply with existing CCW procedures gestures towards static maintenance of international instruments as they stand expressed by different blocs. However, the multiple references to state parties' obligations, their inherent accountability across all points of the weapon system process, and especially the emphasis on human responsibility for lethal decisions grounds the discourse in the concept of meaningful human control over the use of force. It should be emphasized: over the course of the debate within the CCW, nearly every actor at some point alludes to the overarching need to maintain human control or appropriate levels of human responsibility over these future weapon systems.[365] Even the most obstinate *Status Quo* actors recognize the need for meaningful human control in their working papers and statements within the GGE.[366] Thus, the Bloomfield designation of “norm antiprenure” does not exactly fit this position, given that they are not opposed to the emerging norm but are opposed to actions suggested by others to enforce it.

Convergence across the discourse was not limited to the importance of meaningful human control. Concern over the ramifications of autonomous weapons was near-universally expressed even when those statements of apprehension were rather vague. That is to say, throughout the CCW discussions, it is difficult to find any actor who was sanguine about the prospect of weapons with unfettered autonomy, roaming future battlefields killing at will with no human intervention. The reoccurring expressions of concern across the diversity of actors demonstrate the AWS issue's salience within the broader community of arms control

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[365] Combing through the statements of 124 high contracting parties to the Convention (states) only 4 do not allude to the principle of meaningful human control or a variation over the six years of discourse. This sentiment is nearly universal regardless of positions taken over amending IHL or not. Across non-state actors in the discourse, meaningful human control is also prominent with only individual experts sometimes not alluding to the concept in their capacities as experts giving testimony in other areas of concern.

[366] For example, even the Russian delegation conceded that meaningful human control over autonomous weapons is necessary element to maintain IHL even as they are the only state to gesture towards the trump card of “military necessity” that might override arms control efforts. See: Russian Delegation, “Potential Opportunities and Limitations of Military Uses of Lethal Autonomous Weapons Systems,” Working paper (Geneva: United Nations Convention on Certain Conventional Weapons, Group of Governmental Experts on Lethal Autonomous Weapons Systems, March 15, 2019), https://documents-dds-ny.un.org/doc/UNDOC/GEN/G19/067/67/pdf/G1906767.pdf?OpenElement.

negotiations and across military practitioners worldwide. While some of the divergent positions detailed above floated functional definitions of autonomy that rested on the use of weapons technologies rather than their inherent design, there was wide consensus across the discourse to define autonomy in terms of the relationship between human operators and their tools of warfare. It must be emphasized: the dominant premise that materialized from the political discourse over lethal autonomous robots is that humans must remain in control over the use of force and that it is up to civilized states to uphold this principle in order to maintain the laws of warfare.

The Paradox of American Global Leadership: Technological and Intellectual

The singular position of the U.S. within this discourse deserves particular attention. By any measure, the United States remains the preeminent military power on the global stage in its ability to project power geographically and in terms of the advanced technological edge it still maintains against any other military.[367] How the U.S. state rationalizes its motivations towards developing advanced weapons technologies sets the tone for other states. In turn, other advanced powers pursue similar policies on their part under the expectation that all states operate under a *prima facie* duty to take all available steps to advance the defense of their national

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[367] Eugene Gholz and Harvey M. Sapolsky, "The Defense Innovation Machine: Why the U.S. Will Remain on the Cutting Edge," *Journal of Strategic Studies* 0, no. 0 (June 24, 2021): 1–19.

interests. In terms of the discourse at hand, the U.S. delegation was one of the most active participants in the CCW negotiations and across the international community.[368] However, the position of the United States is an odd one that straddles multiple facets and has evolved into a less coherent position than other actors in the discourse. This erratic stance results from the collision of norms internal to the U.S. military that I will explore in the proceeding chapters.

To be clear, the American position on emerging AWS technology is not wholly divergent from the rest of the international community. Throughout delegates' statements on the global stage, American diplomats and military practitioners acknowledge that the emergence of this type of weapons technology could constitute a watershed moment in how warfare is conducted. Many of the official American statements articulate the shared concerns over these developments. However, as negotiations moved from the informal to the formal stage of a GGE, the U.S. position on the core concept of meaningful human control shifted to a position unique among actors towards a standard of "appropriate levels of human judgment" over the use of force.[369] This rhetorical sleight of hand is not

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[368] In terms of volume, only statements by representatives of global civil society actors like the Campaign to Stop Killer Robots outnumber the number of statements made by the U.S. delegation over the course of these deliberations. The next highest participant in terms of individual texts is Germany.

[369] U.S. Delegation and Karl Chang, "U.S. Statement Consideration of the Human Element in the Use of Lethal Force," in *2019 Session, Meeting of the Group of Governmental Experts of the High Contracting Parties to the CCW on LAWS* (Geneva: U.S. Mission to International Organizations, 2019), https://geneva.usmission.gov/2019/03/27/convention-on-certain-conventional-weapons-consideration-of-the-human-element-in-the-use-of-lethal-force/?_ga=2.175987746.1474179935.1644866600-1641784686.1644866600.

shocking given that diplomacy is generally an artform of equivocation over shared language to gain the greatest advantage for one's country. But there is very little substantive distance between the norm of "meaningful human control" and the suggested U.S. standard of "appropriate levels of human judgment." Indeed, the U.S. position is quite easily folded into the widely accepted norm, given that a norm is fundamentally about appropriate behavior. However, the U.S. position shifted—especially towards the end of the Trump administration—questioning the shared definition of meaningful human control, much like the early dissembling practice of questioning the shared definition of autonomy.[370]

In attempting to gain the greatest freedom of movement within the confines of the emerging norm, U.S. statements also exhibit a vacillating stance on how the U.S. defined autonomy internally. The U.S. definition initially expressed in its oft-cited Department of Defense Directive 3000.09 skewed toward the human-machine interaction framework noted above. However, in later statements that questioned the viability of meaningful human control as a shared standard, U.S. representatives fell back on a functional definition of autonomy in weapon systems. Here they suggested that different strategic or tactical circumstances would allow for greater

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370 While it took some time for the Trump Administration to fully root-out diplomacy from the State Department, the ascent of Christopher Ford to the position of Assistant Secretary of State for International Security and Nonproliferation put Trump's stamp on arms control negotiations with the U.S. openly questioning the efficacy of the emerging global norm on AWS. See: Christopher Ford, "Al, Human-Machine Interaction, and Autonomous Weapons: Thinking Carefully About Taking 'Killer Robots' Seriously," *U.S. State Department: Arms Control and International Security Papers,* Office of the Under Secretary of State for Arms Control and International Security, 1, no. 2 (April 20, 2020): https://2017-2021.state.gov/wp-content/uploads/2020/06/T-Paper-Series-2-LAWS-FINAL-508.pdf

autonomy in using force that would not violate IHL while other circumstances might be outside the bounds of acceptable behavior. Throughout this push for greater leeway to develop autonomous weapons, American statements projected a vision of future warfare wherein greater autonomy would seamlessly lead to ever greater precision in weapon systems and, thus, translate into more humane uses of force.

The U.S. divergence from the emerging global norm regarding autonomous weapons is the core issue informing the research puzzle informing this project. This anomaly warrants consideration of three broad factors at play that renders this position paradoxical. First, the CCW itself was a product of a post-war architecture of interlocking intergovernmental institutions that make up the international community.[371] The primary architect of this rules-based global order was the United States at the end of World War II, with later additions of arms control agreements over the course of the Cold War.[372] A variety of perspectives across international relations, from realist scholars to neoliberal theorists and post-colonial

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[371] William H. Boothby, *Weapons and the Law of Armed Conflict*, (Oxford: Oxford University Press, 2016) pp. 92-102.

[372] On the rules based international order see: Michael Barnett and Martha Finnemore, *Rules for the World: International Organizations in Global Politics* (Ithaca: Cornell University Press, 2004); Andrew Hurrell, *On Global Order: Power, Values, and the Constitution of International Society* (New York: Oxford University Press, 2008). In terms of the U.S. role of ushering in arms control see: Thomas C. Schelling and Morton H. Halperin, *Strategy and Arms Control* (New York: Twentieth Century Fund, 1961); Hedley Bull, *The Control of the Arms Race: Disarmament and Arms Control in the Missile Age* (New York: Praeger, 1965); Robert Ehrlich, *Waging Nuclear Peace: The Technology and Politics of Nuclear Weapons* (SUNY Press, 1985); and Keith Krause, "Leashing the Dogs of War: Arms Control from Sovereignty to Governmentality*," *Contemporary Security Policy* 32, no. 1 (April 1, 2011): 20–39.

thinkers, generally agree that the structure of the international system built by the U.S. neatly coincides with broad American national interests.

Second, the expansion of the rules-based, global order upon the collapse of the Soviet Union also ushered in a host of new actors into global politics. Indeed, the post-Cold War era of the newly-minted liberal international order was led by American example and was powered by American liberal concepts of human rights, the rule of (international) law, open society, and the peaceful management of competition.[373] While Non-governmental organizations (NGOs) certainly existed before the era, their role in global politics took center stage in this era. The exponential growth of NGOs, their increased coordination transnationally in various areas of international politics, and the newly established capacity for non-state actors to set agendas on the international stage were all features of an emerging global civil society within the liberal international order.[374]

Third, it should also be noted that the center of gravity for globally active NGOs is decidedly located in Western Europe and America, emphasizing liberal

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[373] For the bookends of the liberal international order see: Daniel Deudney and G. John Ikenberry, "The Nature and Sources of Liberal International Order," *Review of International Studies* 25, no. 2 (April 1999): 179–96; and G. John Ikenberry, "The End of Liberal International Order?," *International Affairs* 94, no. 1 (January 1, 2018): 7–23.

[374] Regarding the rise of NGOs and global civil society see: Ahmed Shamima and David M. Potter, *NGOs in International Politics* (Boulder: Lynne Rienner Publishers, 2006); and Ronnie D. Lipschutz, *Civil Societies and Social Movements: Domestic, Transnational, Global* (Hampshire: Ashgate, 2006). Here I will dispense with the alphabet soup of differentiating NGOs from INGOs (international NGOs,) and GONGOs (government-organized NGOs) for the sake of parsimony.

democratic responses to global challenges.[375] Indeed, the vast majority of influential NGOs that coordinate at the global level are based in the West. All of these factors (the global architecture of rules-based international organizations, managed competition, and the entry of liberal norm entrepreneurs in the form of transnational NGOs) were a product of American primacy. They bolstered the overarching goals of American foreign policy. Once transnational activist networks waded into the realm of security politics and arms control, one would assume that the relationship between cosmopolitan norm entrepreneurs and the U.S. national security practitioners would become antagonistic.[376] While the positions between humanitarian arms control activists and the interests of American security institutions are not complimentary, the outcomes are more complicated instead of Manichean.[377] In essential ways, transnational activism has served the arms control interests of Western states and the U.S. in particular while the official stances of

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[375] Kim D. Reimann, "A View from the Top: International Politics, Norms and the Worldwide Growth of NGOs," *International Studies Quarterly* 50, no. 1 (March 1, 2006): 45–67; and Sidney Tarrow, "Transnational Politics: Contention and Institutions in International Politics," *Annual Review of Political Science* 4 (June 2001): 1–20.

[376] Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Cornell University Press, 2002); Neil Cooper, "Humanitarian Arms Control and Processes of Securitization: Moving Weapons along the Security Continuum," *Contemporary Security Policy* 32, no. 1 (April 1, 2011): 134–58; and Richard Price, "Reversing the Gun Sights: Transnational Civil Society Targets Land Mines," *International Organization* 52, no. 3 (1998): 613–44.

[377] See Keith Krause, "Transnational Civil Society Activism and International Security Politics: From Landmines to Global Zero," *Global Policy* 5, no. 2 (2014): 229–34 and Harald Müller and Carmen Wunderlich, *Norm Dynamics in Multilateral Arms Control: Interests, Conflicts, and Justice* (Athens: University of Georgia Press, 2013).

these states remained moderate, extending restraint on the world's most abhorrent weapons to non-democratic states.

The eventual stance of American negotiators towards autonomous weapons marks a distinct shift in the dynamic between transnational activists and the U.S. as the leading global military power. The deviation between the U.S. position on "meaningful human control" and the majority of states that regard this principle as the core of an emerging norm is remarkable. But the U.S. position in the discourse is distinct in other ways. In previous instances where attempted arms control of new weapons technology failed, this was typically due to sovereign states arguing that the technology at hand provided a tactical advantage and "military necessity" superseded any normative qualms.[378] However, in the case of autonomous weapons, the U.S. position opposing a ban and resisting the norm of meaningful human control is premised on an entirely different logic. Instead of relying on the trump card of "military necessity," the U.S. delegation attempted to persuade the international community of its vision of a perfectible type of warfare. The argument in favor of developing autonomous weapons leaned heavily on a projection of how these weapons would ethically outperform human operators, conflated precision

[378] Price's work on chemical weapons and the development of the taboo around them is a case in point: at first, states flirted with banning the technology before it was weaponized during the Hague convention in 1899 but the argument for military necessity overcame the objections to their use in World War I. After the horrific results of chemical warfare were apparent for all to see, a taboo grew around this weapons technology and they were eventually regulated by the Geneva Protocols in 1925 and banned under the Chemical Weapons Convention of 1997. See: Richard Price, "A Genealogy of the Chemical Weapons Taboo," *International Organization* 49, no. 1 (1995): 73–103.

with distinction, and suggested that ever greater technological sophistication in weapons naturally resulted in more humane forms of warfare.

This stance is emblematic of overall political contention over autonomous weapons as it played out on the global stage over the last eight years. Fundamentally, the contemporary dispute is over visions of the future, how different organized political actors extrapolate the impacts of emerging military technologies and the divergence between these imaginaries of the future. Considering the divergence of the U.S. position in this debate and its disorderly evolution on the world stage, the following two chapters consider the sources of the American military's perspective that places ever greater faith in technological solutions to the quandary of making warfare humane.

The Stalemate Over Autonomous Weapons

By 2019, the debate with the international community over action on the issue of autonomous weapons was at an impasse. Flummoxed transnational activists openly questioned if the CCW was capable of reigning in this emerging and nightmarish weapons technology. The international laggards in the discussion, with various positions that fell short of a new treaty banning AWS development, varied from those states with active programs to those that simply sought international action short of a ban. The resulting findings from discourse analysis suggest the following.

First, a norm concerning autonomous weapons was established across the majority of the international community that insisted that meaningful human control over these weapons ought to be maintained for them to comport with established international humanitarian law. How intractable divergence over how to implement or enforce this norm emerged is the second finding of this analysis. The pull of military competition among state actors who also participated in the debate derailed consensus over how to act on the norm. It also left this shared idea about appropriate behavior on unsteady ground, planting the seeds for a future test of the norm.

The origins of this competing, parallel set of shared ideas that collided with the *meaningful human control* norm are the subjects of the next two chapters.

Chapter 5 U.S. Weapons Innovations: An Institutional Historiography

Introduction

In order to apprehend the countervailing *innovation imperative* norm in global security culture, it is necessary to engage with its chief proponent—the U.S. military—and the sources of this dominant, shared ethos. A key analytic concept introduced in this study is the strategic imaginary and its function in producing emergent weapon technologies. Again, advanced military powers are compelled to envision how they will sustain the security of their nations in an indefinite future security environment. To simplify, the strategic imaginary is a shared conception across national security institutions about a desired secure future that entails the necessary steps in the present in order to achieve that end state.

To understand how strategic imaginaries work, one must first consider the historical context of U.S. weapons development in order to appreciate how this background influences military practitioners today. Indeed, there are ingrained perspectives within the U.S. military, civilian policymakers, and the defense industry that inform initiatives to create new weapons technologies. Today's debates over the relative novelty, impact, and prospects of controlling the spread of autonomous weapon systems have historical parallels to the earlier discussions about weapon technologies. For instance, the debate over nuclear weapons, the prospects of creating conventional weapons that could have strategic effects with the addition of precision-guided munitions (PGM), and discussions about the relative novelty of unmanned aerial vehicles.

Drawing from and augmenting the internal historiography within the U.S. national security establishment are three threads traced in this chapter that are embedded in the history of American military innovation:

- The distinct phases of military innovation within the U.S. from 1945 to the present that exhibit different characteristics.
- The origin and evolution of the "Offset Strategy" that informs the present American military innovation.
- The parallels and distinctions between nuclear and conventional technologies.

Indeed, the dual notions of an "Offset Strategy" and the underlying faith in technological solutions to strategic security challenges are embedded in this historical memory since the end of the Second World War. This distinct telling of "official history" undergirds the logic of strategic overmatch through innovation that marks current efforts within the defense enterprise to create AWS even in the face of international norms that initially would suggest their prohibition.

To capture the influence of history upon the contemporary discourse over military innovation, I take a number of steps in this chapter. This chapter draws on Lustick, Landes, and Tilly's understandings of historiography as a subject of study apart from ground history itself.[379] My perspective on this owes a great debt to both Gourevich's *Second Image Reversed* and Schmidt's discursive institutionalism. I regard the telling of history as part of indoctrinating individuals into their role in national security is eminently important to how those individuals cohere in a

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[379] Lustick "History, Historiography, and Political Science"; Tilly and Landes. *History as Social Science*.

collective. To paraphrase Schmidt, institutions are discursively shaped by how they tell their history.[380] The inclusion of this theoretical prism suggests that American national security practitioners incorporated global events into their existing narratives about international relations colored by their socially appropriate roles and the shared internal norms of the U.S. military. This discourse was then translated into institutional changes within the national security apparatus and the production of new military technology.

Four themes predominate over the course of this historiography. First, there is an evident tension between techno-optimism—a belief in clear technological solutions to national security challenges) and techno-pessimism, expressed as disbelief in the utility of ever more advanced weaponry. Second is the consistent reference and appeal to previous military technological achievements that are called upon to accelerate new innovation initiatives and frame expectations about feasibility. This is evident when reference is made to "moonshots" or "Manhattan projects" needed for any given security challenge. The third theme that follows is the repeated misapplication of historical analogy and the conflation of nuclear strategic logic to conventional contexts. Lastly, a fourth general theme is the recurring motif of the impending technological inferiority of the American military

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[380] See: Peter Gourevitch, "The Second Image Reversed: The International Sources of Domestic Politics." *International Organization* 32, no. 4 (1978): 881–912; Viven Schmidt, "Taking Ideas and Discourse Seriously: Explaining Change through Discursive Institutionalism as the Fourth 'New Institutionalism.'" *European Political Science Review* 2, no. 1 (2010): 1–25'; and Vivien Schmidt "Discursive Institutionalism: The Explanatory Power of Ideas and Discourse." *Annual Review of Political Science* 11, no. 1 (2008): 303–26.

regardless of the proportion of resources dedicated to weapons innovation or clear empirical evidence of U.S. technological overmatch.

This chapter is organized into six sections following the periodization in American R&D narratives punctuated by international events. In each, I pay attention to the historical narrative of American weapons development, the changes in institutions within the national security enterprise charged with military innovation, and the international factors that informed these events. The history presented here should not be regarded as the definitive history of U.S. military innovation. The purpose of this historical survey is not to adjudicate between actual history and mythology. Rather, this is a sketch of the narrative—the historiography—that informs recent efforts by the DoD to launch the Third Offset Strategy centered around technological innovation and, therefore, reflects the particular viewpoint of this strategic imaginary. For these purposes, this narrative draws heavily on several different sources: the official history as produced by the Historical Office within the Office of the Secretary of Defense; monographs from the historical offices of the military branches, articles from service magazines and academic journals; and the literature required in recent syllabi of strategy or military innovation courses at the service academies. These sources are relied upon to reflect current military thinking about the past. Using the method of periodization, I consider the "exogenous shocks" interpreted by military practitioners and the subsequent shifts in focus, strategy, and shaping of institutions within the military establishment.

In American political development, we have observed the commitment of time and resources to establish new institutions out of whole cloth in response to exogenous shocks of international politics. In some instances, this dynamic is evident even without any specific technical innovation. For example, the expansion of national security institutions during the Truman administration, codified in National Security Council Report 68, was in response to perceived communist expansion prior to the development of an atomic bomb by the Soviets. We have also witnessed the reassertion of the US military and the creation of public-private organizations in the fields of science, research, and technological development in response to unforeseen challenges in the global political system. Historical examples include the Manhattan Project to produce the atomic bomb in a race against the Axis powers of Germany and Japan that sought the same weapons and the massive investment in science by the federal government in response to the Soviet Union's Sputnik launch. There are also similar dynamics at play with the Strategic Defense Initiative but without a specific exogenous, international shock; simply a desire by Ronald Regan to innovate his way out of the nuclear stalemate presented by the Cold War. More recently, the War on Terror is marked by the American propensity to rely on technology to address security challenges using drone warfare to prosecute both counterinsurgency and counterterrorism strategies. In the contemporary moment, the focus of debates surrounding drone warfare is shifting from the consequences of drone strikes towards the more amorphous prospects of autonomous weapons systems and the military potential of Artificial

Intelligence (AI). Again, the political drive to develop autonomy is emblematic of the emphasis on technology to offset potential strategic threats.

These examples all point towards technoscientific responses to the vagaries of international security politics by the US as a superpower in the post-WWII era and beyond. In the context of this study, the claims that drone and autonomous technologies are potentially as transformative to the global security system as nuclear weapons were upon their introduction over 70 years ago feeds a whole host of other controversies and debates surrounding military innovation. Indeed, there are several concurrent and related debates considered in the previous chapter. Today it is the latest technology—autonomy and artificial intelligence (AI)—that is the most contentious as leading technologists like Elon Musk express their concern over the possible development of AI. It is in the midst of this debate across the international community over future autonomous weapons that many have made explicit comparisons between AWS and nuclear weapons.[381] This public expression of concern is taking place in the context of a multi-pronged effort within the US Department of Defense (DoD) to reinvigorate the technological capabilities of U.S. forces and maintain military dominance in the future through a "Third Offset Strategy." In military parlance, defense leadership should seek to shape the strategic environment to their advantage by emphasizing and improving their own

[381] Paul Scharre, *Army of None: Autonomous Weapons and the Future of War* (New York: W. W. Norton & Company, 2018) pp. 6-8; Toby Walsh, "Open Letter on Autonomous Weapons," Future of Life Institute, 2015, https://futureoflife.org/open-letter-autonomous-weapons/. Accessed August 12, 2017.

advantages aimed against a potential adversary's perceived weakness to "offset" their advantage. The U.S. has often relied on its prowess in high tech weaponry as a counterweight to rivals that had a numerical advantage in troops and equipment. The current version of this strategy invests heavily in the development of UAV and AI technologies.[382] Indeed, integral to all of these technological developments is the fundamental concept of the offset strategy that weaves its way throughout the post-World War II American security state. Because the echo of previous offset strategies informs these official commitments to research and develop autonomous systems, the following chapter considers the historical narrative and patterns of technoscience in the US defense sphere to understand the concept of the offset strategy and how this logic is applied today. The narrative presented here should not be regarded as the definitive history of weapons development during the Cold War and after. Instead, this is a sketch of the historical narrative that informs recent efforts by the DoD to launch a technological innovation strategy and, therefore, reflects the particular viewpoint of this strategic imaginary.

Before delving into the specific periods of American weapon, innovations let us first consider two important details regarding the division of labor within the national security establishment and the nature of norms within this context. First, there were tensions between initiatives to separate the research and development

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[382] See Robert Work, *Remarks by Deputy Secretary Work on Third Offset Strategy*, Brussels, Belgium, April 28, 2016: https://www.defense.gov/News/Speeches/Speech-View/Article/753482/remarks-by-d%20eputy-secretary-work-on-third-offset-strategy/ Accessed August 30, 2017.

(R&D) process from the broader endeavors of production and procurement within the U.S. military. Here R&D is considered the act of discovering new scientific avenues and applying them to technologies incorporated into new weapons. On the other hand, production and procurement is the activity of mass-producing and delivering weapons to service members. During the two world wars, production and R&D were highly integrated, with innovations in the manufacturing process. This took place within the arsenal system in the case of the U.S. Army. In the case of the U.S. Navy, a system of bureaus and shipyards produced new conventional weapons technology. After World War II, there was a concerted effort to disentangle these steps with the expectation that technological innovation would flourish when separated from the shorter-term production concerns. The interim measures between R&D and production were testing and evaluation to determine the viability of new weapons technologies via prototyping and technological demonstration models prior to large-scale production. However, at certain points in the post-war period, the distinction between purely R&D functions on the one hand and production of weapon systems on the other have oscillated between integration and separation.[383]

The Atomic Period 1939-1957: The Big Science Model

[383] Thomas C. Lassman, *Sources of Weapon Systems Innovation in the Department of Defense: The Role of Research and Development, 1945-2000,* Defense Acquisition History Series (Washington, D.C.: Center of Military History United State Army, 2008).

The development of the atomic bomb not only marked the turning point in the US status as an emerging superpower, but it also ushered in a new role for science and technology in national security. The Manhattan Project provided the seminal model of leveraging technoscience during times of national emergency to develop transformative weapons that ultimately precipitated military victory. Indeed, the Manhattan Project looms large in the history of American weapons development and is euphemistically (sometimes mythologically) evoked in calls for ever greater innovation in military technology.

Hence, before delving into the specific historical narrative of this period, let us first consider the following general characteristics of this innovation model. The state was unequivocally the primary driver of scientific innovation and applying scientific discoveries to weapons technologies. This process took place via the existing military apparatus, enlisting established scientists and technologists already working on the cutting edge of their fields within academia and industry. The pattern of this model organized civilian science under the direct management of the military, sequestering science and scientist physically (within military facilities) and intellectually (via classifications of scientific output). Again, the wholesale creation of government-run plants and industries, again under the direct and secretive control of the national security apparatus, mobilized civil manufacturing capacity toward the herculean aims of producing a transformative weapon. The pattern of discovery, innovation, and applying new technologies was typified by large-scale, breakthrough developments of specific weapon types. This period also saw the expansion of state-sponsored innovation-oriented institutions, organizations, and sub-units primarily within the military. Later there was a proliferation of R&D in new, hybrid forms of public-private organizations through the federal contracting process. Also prevalent in the Manhattan model was intense inter-service rivalry in military innovation centered around delivery systems and atomic warfighting. During this period, the first "offset" strategy was formulated, articulated, and implemented, seeking to capitalize on US technological advantage to overmatch Soviet numerical advantage. During this period, defense R&D both increases in total amounts and took up more of the overall defense budget, all while the entire defense budget expanded. Specifically, between 1949 and 1956, spending on R&D rose from $5.8 billion to $12.6 billion. However, this spending represented a decreased emphasis on R&D spending as a percentage of the total defense budget, falling from 5.79% to 4.46% by the end of the period.[384]

The Manhattan model represents an unprecedented mobilization of science during a time of total war and motivated by the prospects of a currently engaged enemy nation gaining the technological upper hand. This model produced a technological artifact (the atomic bomb) that influenced global politics thereafter, and this approach had distinct characteristics. For example, much of the knowledge

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[384] See Tables 5.1, 5.2, and 5.3 below. Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, https://www.whitehouse.gov/omb/historical-tables/. Specifically Tables 9.7 "Summary of Outlays for the Conduct of Research and Development: 1949–2021 (In Current Dollars, as Percentages of Total Outlays, as Percentages of GDP, and in Constant (FY 2012) Dollars)" and Tables 9.8 "Composition of Outlays for the Conduct of Research and Development: 1949–2021"

that went into this technological development preexisted for decades but was primarily theoretical. Much of the scientific know-how was imported into the US and then pressed into service in a secretive manner, removed from the wider society, and held under tight military supervision. As early as 1939, the concerns over Germany's scientific acumen in atomic research were warranted given that German chemist Otto Hahn and Fritz Strassman discovered nuclear fission. This development prompted a letter from physicists Leo Szilárd, and Albert Einstein addressed directly to President Roosevelt, urging national attention on the issue and proposed a crash US program to develop a national program of nuclear development.[385] Acting on these recommendations, the US Army Corps of Engineers ultimately initiated the Manhattan project in 1942 under Lt. General Leslie Groves leading to an unprecedented project for the American state, costing upwards of $2 billion. While many popular historical accounts focus on the secretly sequestered scientific minds at the Los Alamos laboratory-produced and the "gadget," less attention is paid to the herculean achievement of creating whole industries of uranium and plutonium production, refinement, and nuclear power in places like Hanford, Washington and Oak Ridge, Tennessee.[386]

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[385] Albert Einstein and Leo Szilard, "The Einstein-Szilard Letter," August 2, 1939, https://www.atomicheritage.org/key-documents/einstein-szilard-letter.

[386] Richard Rhodes, *The Making of the Atomic Bomb* (New York: Simon & Schuster, 1986); Leslie R. Groves, *Now It Can Be Told: The Story Of The Manhattan Project*, Revised edition (New York, N.Y: Da Capo Press, 1983); and J. E. Baggott and J. E. Baggott, *The First War of Physics: The Secret History of the Atom Bomb, 1939-1949*, First Pegasus Books trade paperback edition (New York: Pegasus Books, 2011).

Of course, the initial external shock that propelled the US government to action was the feared technological prowess of Nazi Germany. Indeed, the ability of Germany to leverage several existing weapons technologies from the First World War (submarines, manned aircraft, mechanized infantry, and tanks) was a function of that state's organizational innovation rather than the brute technology itself. In other words, *Blitzkrieg* was effective not because they invented these technologies but rather that they organized their force structure and tactics around these innovations[387] to produce a superior combine arms doctrine. World War II also gives us other examples of innovation strategies during a conflict that sought to gain strategic overmatch, often fueled by a technological arms race among the combatants. Examples of "super weapons" –especially the burgeoning technologies of jet propulsion and rocketry– signaled that it was realistic to anticipate that atomic weapons technology was within the grasp of Germany and even Japan.[388] The emphasis of the Third Reich on the quality of their arms over quantity and the emergence of vengeance weapons such as the V-1 and V-2 rockets heightened these fears.[389] The use of these terror weapons explicitly on civilians signaled that a Nazi atom bomb was extremely dangerous and would tilt the strategic balance in their

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[387] Williamson Murray and Allan R. Millett, eds., *Military Innovation in the Interwar Period*, Revised ed. edition (Cambridge: Cambridge University Press, 1998) and Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars*, N/A edition (Ithaca: Cornell University Press, 1986).

[388] Rhodes, *The Making of the Atomic Bomb*.

[389] Max Boot, *War Made New: Technology, Warfare, and the Course of History, 1500 to Today* (New York: Gotham Books, 2006) pp. 205-240.

favor. Ultimately, the US overcame many of the conventional military challenges on the battlefield by matching German over-engineering with America over-production (e.g., the quality of German tanks versus the quantity of lighter US tanks). But concerning the miracle weapon of the atomic bomb, the ultimate outcome was an arms race over who would produce such a spectacular weapon first. Here the Manhattan model suggested the need to seek out, mobilize, and employ the best scientific minds towards a specific technical goal.

The impact of the Manhattan Project on the relationship between science and the state was immense and heralded a new era of "Big Science" where scientific knowledge was essentially nationalized. Under the Manhattan model, technological development with the aim of producing a transformative category of weaponry simply involved executing a formula: add scientific genius to massive resources, remove the process from society in general, apply pressure, and maintain high levels of secrecy through censorship and restriction while reducing normal bureaucratic channels for military procurement. This seemingly straightforward formula would inform the relationship between the national security state and the scientific community throughout the Cold War. In essence, the result of Manhattan was to weaponize science as never before and place the responsibility for technoscientific development within the realm of national security.[390] Given the

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[390] Wolfe, Audra J. *Competing with the Soviets: Science, Technology, and the State in Cold War America*, Johns Hopkins Introductory Series in the History of Science (Baltimore: Johns Hopkins University Press, 2013) pp. 7-14. This is not to say that prior to Manhattan there were no weapons technologies that, once developed, proved transformative to the conduct of war. To consider the example of naval warfare, there was a definitive shift from a focus on capital ships —with the

context of how the atomic bomb was used to subdue Imperial Japan (with an end to the war in Europe with Nazi capitulation by May of 1945), the historical narrative that proceeded was that the Manhattan Project essentially won World War II for the Allies through this process of strategic innovation.

The immediate aftermath of the war cast the US as the preeminent economic, scientific, and military power in no small part due to its monopoly in atomic weapons. Consequently, the post-war American state saw significant institutional innovation with the wholesale creation of new national security organs and arrangements that straddled the traditional divisions between public, private, military, industrial, and academic divides. For example, the Atomic Energy

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battle ship as the marker of preponderant naval power— to an emphasis on the aircraft carrier as a dominant platform. The technological innovations behind this particular shift took place during the interwar years within many competing naval powers. Thus, from the outset this technology was diffused and –much like strategic air power– was embraces by the military establishment in some states while resisted in others as a revolutionary innovation. Traditional navies relied on ever-larger battleships to deliver firepower while the proponents of naval aviation often had to couch their development of technology and tactics into institutionally acceptable logic. Hence, the aircraft carrier was surreptitiously billed as a weapons platform that would defend the capital ships of a battleship-centric navy in the instance of the US navy. This was an argument that did not hold water in the instance of the British navy, and was deemed unnecessary in the case of the Japanese military. Nevertheless, the successful air-based attack on Pearl Harbor and the subsequent Battle of Midway both marked the radical shift from battleship navies as the primary source of naval dominance to the preponderance of naval air power as a means of projecting sea power. The resulting naval balance was subsequently upended with the UK ignoring carrier warfare in favor of the traditional battleship, the US embracing carrier centric naval warfare after the formative example of the Japanese navy demonstrating the general shift in naval doctrine. The distinction between revolutionary weapons technology like the aircraft carrier and nuclear weapons is one not only proportion and scope, but also of the relationship between states and their uses of violence in the name of security. These differences are also imprinted on the institutions of the national security state. Where innovation takes hold in more conventional weapons systems, we see previously established institutions adjust internally in order to accommodate a new reality. In the example above, the US navy quickly shifted doctrine and internal focus towards the aircraft carrier group model. See Geoffrey Till, "Adopting the Aircraft Carrier: The British, American, and Japanese Case Studies," in *Military Innovation in the Interwar Period*, ed. Williamson Murray and Allan R. Millett, Revised ed. edition (Cambridge: Cambridge University Press, 1998), 191–226.

Commission (AEC) was established to develop and control nuclear technology in domesticated and military forms. Henceforth, the development of nuclear weapons was driven by this hybrid organization with the military acting as an adjunct, but under a level of secrecy and the patina of national security that distinguished the AEC from other non-military institutions. This institutional expansion was also evident in the arena of military innovation. Each service shifted from their traditional innovation arrangements with R&D formally ensconced in research units—the Office of Naval Research and the Service, Supply, and Procurement Division within the U.S. Army. In addition, there was exponential growth in hybrid public-private partnerships known as "federally funded research and development centers" or FFRDCs.[391] This era also saw the establishment of the Air Force as a separate branch via the National Security Act and the establishment of many related national security institutions like the Central Intelligence Agency.[392] Parallel to the

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[391] Lassman, *Sources of Weapon Systems Innovation in the Department of Defense*

[392] The most prominent addition the national security apparatus in the US after World War II was the establishment of the US Air Force as a separate military branch where it was previously organized as an adjunct service of the US Army (named the US Army Air Forces). Certainly, the dawn of airpower as a viable mode of warfare during WW I saw many calls for separate, independent air forces during the interwar period based on the proposition that aircraft as a new technology changed the strategic calculus for all states. Throughout the World War II, USAAF commanders made the argument that the ability of aircraft to penetrate the adversary's defenses would produce strategic victory while leadership within the US Army placed a higher value on utilizing fighters as tactical support for ground operations. The goal of strategic bombing proved elusive throughout the conflict, where victory by air power alone appeared to be a fever dream of strategic theorists like Douhet as allied bombers dropped several thousand pounds of conventional bombs on Axis countries well behind the front lines without decisive effect. However, with the advent and demonstration of atomic weapons at the end of WW II, air power enthusiast now had a firm basis to argue for the strategic potential of a separate service. In short, nuclear weapons provided the rationale for a separate air branch of the military. See: Thomas G. Mahnken, *Technology and the American Way of War* (New York: Columbia University Press, 2008) pp. 28-29; Giulio Douhet, *The Command of the Air*, ed. Joseph Patrick Harahan and Richard H. Kohn,

foundation of the Air Force was the establishment of one particular FFRDC—the RAND Corporation—employed via contract to produce studies requested by the new service. Indeed, Rand represented the first "think tank" employing many of the same scientists who had been integral to the Manhattan Project within this hybrid public-private organization.[393]

Less appreciated in the standard history of the first atomic weapons are the innovations in auxiliary technologies that made the use of "the bomb" possible. For example, the development of the B-29 Superfortress airframe for high altitude bombing, the Norden bombsight, the techniques of high-altitude firebombing, and the requisite air reconnaissance coupled with targeting techniques are all lost in the mainstream tale of the miracle at Alamogordo.[394] Indeed, this accumulation of parallel technologies would be evident in future models of weapons development. Throughout the late 1940s and into the 1950s, improvements to jet-powered flight, anti-aircraft defense, rocketry, solid-state electronics, radar, and material science were made by various organizations within and associated with the US military. For example, the establishment of the Office of Naval Research (ONR) in 1947

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trans. Dino Ferrari, (Tuscaloosa, AL: University Alabama Press, 2009); and Michael S. Sherry, *The Rise of American Air Power: The Creation of Armageddon*, Book, Whole (New Haven: Yale University Press, 1987).

[393] Fred M Kaplan, *The Wizards of Armageddon* (New York: Simon and Schuster, 1983).

[394] Campbell, R. H. and Paul W. Tibbets, *The Silverplate Bombers: A History and Registry of the Enola Gay and Other B-29s Configured to Carry* (Jefferson, N.C: McFarland & Company, 2005); Wesley Frank Craven and Cate, eds., *The Army Air Forces In World War II: Volume Five: The Pacific: Matterhorn to Nagasaki June 1944 to August 1945.*, vol. 5 (Washington, D.C.: Office of Air Force History, 1983) pp 703-756; and Stephen McFarland and Richard Hallion, *America's Pursuit of Precision Bombing, 1910-1945* (Washington, DC: Smithsonian Institution Press, 1995).

coordinated the work of various already existing Naval labs. It expanded the reach of federal R&D via extensive contracting out to academia, industry, and FFRDCs. Indeed, the ONR set the pace and pattern of military R&D, accounting for nearly 70% of all federal investment in research in the late 1940s.395

For a brief period, from 1945 until the first Berlin blockade in 1948, it was an open question if the former allies would cooperate in world affairs through new international institutions like the recently founded United Nations or if they would come into open conflict both politically and militarily. While Kennan's Long Telegram on Soviet expansionism suggested that the USSR and US were too ideologically divergent to cooperate on the international stage meaningfully, several of the great minds instrumental to the development of nuclear weapons suggested that there was no other option but deeper cooperation. Certainly, much of American intelligentsia concluded that nuclear conflagration would be inevitable without supranational control over atomic energy and even a world government.[396] While not as ambitious to suggest an end to state sovereignty, the Baruch Plan put forward by the United States at the UN in 1946 echoed this normative perspective to limit and manage the new technology under the auspices of the international

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395 Wolfe, *Competing with the Soviets*, pp. 23-27.

[396] For example see: Albert Einstein, "Atomic War or Peace," The Atlantic, November 1, 1947, https://www.theatlantic.com/magazine/archive/1947/11/atomic-war-or-peace/305443/; Norman Moss, *Men Who Play God ; the Story of the H-Bomb and How the World Came to Live with It*. (New York: Harper & Row, 1968); and Bernard Brodie et al., *The Absolute Weapon: Atomic Power and World Order* (New York: Harcourt, Brace and Company, 1946). Indeed, these sentiments fueled the establishment of *The Bulletin of the Atomic Scientist* in particular.

community. Ultimately rejected by the Soviet Union as it would limit their development of nuclear capabilities without removing the American monopoly in atomic weapons, this effort nonetheless marked a high point for restrictive norms during this era.[397] In short, the Brauch Plan was ambitious in its scope and vision to manage international competition in nuclear weapons and prevent nuclear conflict.

The Soviet testing of their atomic bomb, nearly five years earlier than the estimates US intelligence professionals, definitively put to rest the notion of an invasive international regime that would manage the nuclear competition. Indeed, this test in August of 1949 precipitated a debate within the grown defense establishment of how to counter Soviet atomic ambitions. Early on, discussions revolved around the prospects of developing a fusion of hydrogen weapons that had been theorized early on during the Manhattan Project. The leading proponent of this method was physicist Edward Teller. Along with Stanislaw Ulam, he developed a two-stage process of producing a thermonuclear explosion that would fuse nuclear fuel with a primary fission trigger. Theoretically, this design would utilize readily available fissile material much more efficiently and create weapons with incredible destructive power with fewer technical limits. The General Advisory Committee to the US Atomic Energy Commission advised the Truman administration to augment their already existing fission arsenal and explicitly

[397] Joseph Preston Baratta, "Was the Baruch Plan a Proposal of World Government?," *The International History Review* 7, no. 4 (1985): 592–621.

against the development of the H-bomb. The rationale of the GAC was both technical and political, given that the development of such weapons would accelerate the nascent arms race.[398] After the submission of this report, members of the RAND Corporation—particularly Bernard Brodie, one of the first strategists of nuclear deterrence—advised the Truman administration that the Soviet Union would most likely develop fusion weapons technology on their own. A quick succession of international events swayed the debate decidedly in favor of a crash program to build a US H-bomb: the arrest of Los Alamos physicist Klaus Fuchs in 1950 and revelation that he was a Soviet spy, the victory of the Communist Party in the Chinese Civil war in 1949 and the subsequent issuing of National Security Council paper 68 (NSC-68) that essentially militarized the Truman Doctrine of communist containment.[399]

What dawned on early nuclear strategists like Brodie was that a conflict between nuclear-armed states would be like no other before. The combination of air delivery systems (either by jet plane on ICBM) and the immense destructive power of even early atomic weapons made it impossible to innovate mid-stream during a conflict.[400] In this context, the Truman administration embarked on a crash

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[398] J. Robert Oppenhimer and David Lilienthal, "General Advisory Committee's Majority and Minority Reports on Building the H-Bomb" (Washington, D.C.: US Atomic Energy Commission, October 30, 1949), http://www.atomicarchive.com/Docs/Hydrogen/GACReport.shtml#Introduction.

[399] Herbert F. York, *Arms and the Physicist*, (Woodbury, NY: American Institute of Physics, 1995) pp. 11-12.

[400] "From 1945 to 1958 (and arguably to the present), nothing influenced acquisition policy, organization, or process more than the pursuit of advanced technology. World War II had

program to develop the hydrogen bomb before the Soviets under the Manhattan model of innovation. In quick succession, the communist invasion of South Korea and American involvement in that conflict via the UN in 1950 significantly increased US defense spending (see Table 2.3 below) and heightened the sense of urgency in the burgeoning global competition. The suggestion by General Douglas MacArthur to utilize America's limited arsenal of atomic weapons once Communist China intervened on behalf of their North Korean allies in late 1950 led to two revelations. The first was that in the nuclear era, localized conflicts had the potential to draw in the primary superpower rivals very rapidly, and MacArthur's intransigence in the face of civilian authority with concerns over this prospect ultimately led to his downfall. Second, this incident highlighted the growing distinction between conventional and nuclear weapons that many within the services sought to resist, given that they wanted access to every military means available. However, due to their destructive potential, Truman realized that the escalation to the use of any nuclear weapons would effectively declare World War III. In the meantime, the development of the hydrogen weapon continued apace. By

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produced remarkable weapons— radar, proximity fuses, very long-range and jet aircraft, guided missiles, and the atomic bomb. American civilian and military leaders believed that the next war would begin with a sudden attack carried out with the most advanced and destructive of weapons of this kind. There would be little time to prepare and the oceans would no longer be effective barriers. The nation would have to fight with the weapons it had on hand. Advanced technology, it appeared, would be the arbiter of future warfare, and maintaining superiority in this area would be essential to assure national security." Elliott V. Converse III, "Into the Cold War: An Overview of Acquisition in the Department of Defense, 1945, 1958," in *Providing the Means of War: Historical Perspectives on Defense Acquisition 1945-2000*, ed. Shannon Brown (Washington, DC: United States Army Center of Military History and Industrial College of the Armed Forces, 2005) pp. 27-28.

November 1952, the United States successfully detonated a thermonuclear device with the "Ivy Mike" test in the South Pacific, an explosion that dwarfed the Hiroshima bomb by a factor of 700.[401]

On a parallel track, nuclear weapons designers also created a class of smaller, tactical nuclear weapons envisioned to add destructive power to future combat but with a lower yield than the larger thermonuclear weapons. This division of nuclear weapons into two categories -large strategic weapons and smaller tactical variants-highlighted a growing tension between nuclear strategies already anticipated by Brodie. The scale of destructive power now available impelled a countervalue targeting strategy of targeting whole cities to deter an adversary. But smaller nuclear weapons suggested a counterforce strategy that only targeted an adversary's military forces, requiring much more destructive nuance than nuclear weapons seemed to poses. This tension would echo throughout the Cold War, but in the immediate aftermath of Eisenhower's election to the White House, the countervalue strategy dominated. Indeed, the 1950s proved a tumultuous time in US national security marked by rapid technological change and dramatic shifts in strategy to fulfill national security interest.

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[401] Norman Moss, *Men Who Play God*: *the Story of the H-Bomb and How the World Came to Live with It*. (New York: Harper & Row, 1968); Herbert F. York, *Arms and the Physicist*, *Masters of Modern Physics*. (Woodbury, NY: American Institute of Physics, 1995); Richard Rhodes, *Dark Sun : The Making of the Hydrogen Bomb. - University of California, Santa Cruz* (New York: Simon & Schuster, 1995); Edward Teller, *Memoirs: A Twentieth-Century Journey in Science and Politics* (Cambridge, Mass: Perseus Pub, 2001); Peter Goodchild, *Edward Teller: The Real Dr. Strangelove* (Cambridge, Mass: Harvard University Press, 2004).

Entering office in January 1953, the new Eisenhower administration faced several conundrums, both political and strategic. Stalin's death in March of that year raised the prospect of a shift in superpower relations. Also committed to a policy of fiscal responsibility, Eisenhower sought to reduce defense expenditures and wind down US involvement in the Korean War. In this, the new president was animated both by the political bent of his chosen political bedfellows (as Eisenhower was the first Republican to occupy the White House in two decades) and his genuine fear of the U.S. becoming a "garrison state" forced to fundamentally alter its society to militarily compete with a totalitarian, communist state.[402] Having demobilized US troops from Europe after World War II, then partially remobilized to fight the Korean War, the new president was loath to match the numbers of Soviet conventional forces placed in Eastern Europe to bolster Western Europe. In order to avoid this fate and placate the various strains of anti-communist sentiment within his administration, Eisenhower convened a month's prolonged strategic exercise dubbed Project Solarium. This policy process divided up the principles within his administration into four different teams, each charged with an overarching strategy in how to deal with the Soviet Union going forward (status quo political management, a harder-line of nuclear threats, a "roll-back" of Soviet influence in Eastern Europe with military force, and an ultimatum strategy that would reset relations by fiat or face a more open conflict.) Taking a wide-

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[402] Aaron L. Friedberg, "Why Didn't the United States Become a Garrison State?," *International Security* 16, no. 4 (1992): pp. 123-130.

ranging view of the global environment, each team evaluated the goals and means required for each strategy and presented each option to the wider group overseen by the President. Ultimately, Project Solarium produced a mixed strategy that relied on the political maintenance of the NATO alliance and acceptance of the status quo in Soviet-dominated Eastern Europe, but with an overarching strategy of nuclear threat to shore up West European allies without committing more troops and personnel.[403]

In essence, this strategy (christened the "New Look") utilized the existing asymmetry in American military technology—its advantage in nuclear weapons—to "offset" or counter the Soviet advantage in conventional numbers. US Secretary of State John Foster Dulles would enumerate this policy as one of massive retaliation in a speech to the Council on Foreign Relations.[404] The US policy was to deter any further communist expansion and avoid protracted police actions like the Korean War by threatening to escalate any regional war into a general nuclear war. Eventually, this approach was regarded within the US defense enterprise as the "first offset strategy."[405] Given the subsequent Soviet advances with their own

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[403] Raymond Millen, "Eisenhower and US Grand Strategy," *US Army War College Quarterly: Parameters* 44, no. 2 (Summer 2014): 35–47; Michael J. Gallagher, "Intelligence and National Security Strategy: Reexamining Project Solarium," *Intelligence and National Security* 30, no. 4 (July 4, 2015): 461–85; Edward Kaplan, *To Kill Nations: American Strategy in the Air-Atomic Age and the Rise of Mutually Assured Destruction* (Cornell University Press, 2015).

[404] John Foster Dulles, "The Strategy of Massive Retaliation: Speech of Secretary of State" (January 12, 1954). See also John Foster Dulles quoted in Bernard Brodie, *Strategy in the Missile Age*, (Princeton, NJ: Princeton University Press, 1959): p. 248.

[405] Henceforth I refer to the First Offset, the New Look, and Massive Retaliation interchangeably. The term "First Offset" was coined later as a historical reference to Eisenhower's strategy and for

testing of a hydrogen bomb in late 1953, the world faced a new reality of mutually assured destruction: a situation where two superpowers now possessed the means to destroy each other's society entirely rapidly with the rest of the world suffering the consequences along with the two antagonists sparked by any minor conflict.

The First Offset also markedly increased competition for scarce resources between the military branches and proved consequential internally for the different military services in terms of innovation. A feature of weapons acquisitions during the early Cold War period was the feudal nature of weapons development as each service was in charge of its armament. While the National Security Act of 1947 established the Department of Defense, the central authority of the Secretary of Defense was relatively weak compared to the traditional mores of each service. Consequently, each military branch was in stark competition with each other for resources even during times of military expansion. The funding for research and development of new weapons was subject to the same constraints. This was acutely felt upon Eisenhower's assentation to office. Reducing military expenditure overall was the stated policy of the Eisenhower campaign, and he made good on this promise. The primary casualty of the cuts was the US Army. By 1957 the Army was cut by nearly 40% from a high of 1.5 million personnel.

Indeed, the revolution of nuclear warfare rendered large, concentrated formations of combat forces like armor divisions simply larger targets for

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the sake of historical continuity the our primary concern over its later iterations, the "Offset" formulation is favored here.

thermonuclear weapons. The army attempted to adjust to the new reality imposed by the New Look strategy, initiating a period of tactical experimentation with smaller, more diffused forces. Naming this new approach “the Pentomic Army,” service leaders struggled to make ground forces relevant to the future's projected nuclear battlefield.[406] Despite making strides in electronic communication and revamping the structure of command into smaller, more independent units, the Pentomic Army experiment fell flat. No amount of maneuver, protective gear, shielding, or sheltering would render the army a viable fighting force during large-scale nuclear warfare. The New Look relied on the ability to deliver nuclear weapons quickly and effectively, and the Army simply was not the service branch with the delivery systems. In the area of anti-aircraft defense, the Army had some success in creating new weapons. But here, they also had a natural competitor in the newly formed Air Force. Hence, the more technologically reliant services, the Navy and the Air Force enjoyed more favor (and research funding) under the new strategy.

Initially, the Navy entered the post-war nuclear age at a marked disadvantage. Winding down from a peak in fleet numbers during World War II, the US Navy, as the ultimate symbol of American power projection, faced stiff competition from the nascent flying service armed with atomic bombs. To demonstrate the continued

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[406] See A.J. Bacevich, *The Pentomic Era: The US Army Between Korean and Vietnam* (Washington, D.C.: National Defense University Press, 1986) and Mahnken, *Technology and the American Way of War*.

prowess of the surface fleet in the face of nuclear combat, the Navy arranged for *Operation Crossroads*1946 at Bikini Atoll: an elaborate series of nuclear weapons tests featuring over 90 decommissioned vessels. The results against massed surface ships were not favorable. Many were not sunk immediately but were all irrevocably irradiated to the point that no vessel could be safely crewed afterward. The development of thermonuclear weapons and the Offset Strategy further put the service at a disadvantage, given that the delivery systems favored the emphasis on threatening to use nuclear weapons and delivering them. For the US Admirals, the writing was on the wall: they had to retool their service to be relevant after the nuclear revolution as they just had during the war shifting from a battleship-centric fleet to one that revolved around aircraft carriers and naval aviation. In one sense, the Navy had an advantage in that their infrastructure for R&D was robust (e.g., the Office of Naval Research served as a model for the other services.) Thus, the First Offset prompted the seafaring branch to invest heavily in developing nuclear propulsion for ships and advancing submarine technology to serve as a viable delivery vehicle for nuclear missiles. The Navy also further develop the air wing towards a nuclear mission and electronic communications technologies to operate a much more dispersed fleet.[407] The Naval budget still shrank during this period,

[407] Dave Oliver and Dave Oliver Jr, *Against the Tide: Rickover's Leadership Principles and the Rise of the Nuclear Navy* (Annapolis, MD: Naval Institute Press, 2014) and Mahnken, *Technology and the American Way of War.* Pp. 40-46.

but its leadership utilized R&D and its innovation base to position itself better for future inter-service rivalry.

Of the three primary military services, the Air Force was the primary beneficiary of the New Look strategy even in an era of budgetary constraints.[408] In particular, the long-range bombing contingent SAC (Strategic Air Command) enjoyed enormous growth. It reflected the focus of Air Force leadership on manned bombers as the pillar of the first offset strategy. Indeed, between 1954 and 1957, the USAF received 47% of overall defense expenditures, with the lion's share going towards SAC.[409] Some R&D on missile technologies and especially air-breathing cruise missiles bore some fruit at this time within the USAF. However, the general culture and focus of the nascent flying branch generally favored the pilots that ran the service and eschewed technologies that took pilots out of the fighting. Indeed, the technological rationale for early Air Force R&D initiatives was planted early on by aerospace engineer Theodore von Karman in his 1944 report *Towards a New Horizon: Science the Key to Air Supremacy,* which foresaw jet propulsion as the critical determinant of strategic airpower. Von Karman lobbied for a fully

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[408] Full apologies to the US Marine Corps for not including this service. Certainly, during WWII and after this service was at the forefront of innovations in amphibious and helicopter tactics. However, during this and other periods the Marines tended to rely on the Naval branch for R&D innovations and the traditional culture of this service has focused on training at the individual level and maneuver warfare rather than seeking technical solutions to strategic challenges. See Terry Pierce, *Warfighting and Disruptive Technologies: Disguising Innovation*, 1 edition (London; New York: Routledge, 2005); and Timothy Moy, *War Machines: Transforming Technologies in the U.S. Military, 1920-1940* (Texas A&M University Press, 2001).

[409] Peter Grier, "The First Offset," *Air Force Magazine*, June 2016, pp. 56-60. http://www.airforcemag.com/MagazineArchive/Pages/Default.aspx?Year=2016.

supersonic air force to quickly and effectively cover the vast distances to strike at the USSR. This framework, along with the expansion of SAC under the First Offset, drove research into the fields of supersonic flight for nuclear bombers and attack aircraft that would survive via speed, low-level flight to avoid radar, and high-altitude flight for reconnaissance. Indeed, this framework also emphasized air-to-air and surface-to-air combat technologies and countermeasure that led to the development of the first air-launched, homing missiles and pitted the Air Force against the Army in a turf war with over strategic air defense.[410] The need to test and evaluate jet-powered combat technologies also led to the development of target drones at this time and laid the groundwork for future developments in UAVs.[411] Within the youngest service branch, there was much less institutional capacity for R&D internally compared with the Army and especially the Navy. Hence, the Air Force tended to contract out much of its R&D to private industry and hybrid FFRDCs via its laboratories rather than taking up internal development of basic research. This structure tended to marry R&D to immediate production concerns and contributed to the myopic focus on manned bombers as the primary delivery system for nuclear weapons. Ultimately, this focus would be upended by Soviet technical achievements in a short time and saw the competition between the

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[410] Lassman, *Sources of Weapon Systems Innovation in the Department of Defense.* Pp. 76-80; and Theodore Von Karman, “Towards a New Horizon: Science the Key to Air Supremacy” (US Army Air Force Scientific Advisory Group, November 7, 1944), https://apps.dtic.mil/dtic/tr/fulltext/u2/a801593.pdf.

[411] Thomas P. Ehrhard, *Air Force UAVs The Secret History,* (Arlington, VA: the Mitchell Institute for Airpower Studies, July 2010), https://apps.dtic.mil/dtic/tr/fulltext/u2/a525674.pdf.

superpowers fuel changes to innovation institutions in the national security enterprise writ large.

During this time, there was some movement towards reining in nuclear weapons, but it was furtive at best. After the failure of the Brauch Plan at the UN, along with the acceleration of atmospheric nuclear tests by the US, USSR, and UK, several middle powers, including India and Canada, pushed for a nuclear test ban treaty within the framework of the UN. This new impetus found some adherents within the scientific community and within the publics of the major powers. However, military and political minds were less inclined to agree to a binding treaty. Instead, both the US and USSR eventually announced unilateral moratoriums on testing. A treaty establishing a norm restricting technological advance would have to wait.[412] In a related vein, Eisenhower did propose his vision of an "Open Skies" initiative in 1955 that would enable each superpower to observe each other's nuclear developments by air reconnaissance. The US had already developed the high-altitude U-2 spy plane, and the CIA was clandestinely flying over Soviet territory to assess the Soviet nuclear progress. Eisenhower saw the value in this intelligence to reduce the prospects of accidental escalation and proposed an international agreement to allow for unhindered overflights by the US

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[412] Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Cornell University Press, 2002); Nelson W. Polsby, *Political Innovation in America: The Politics of Policy Initiation* (Yale University Press, 1985); and Julia M. Macdonald, "Eisenhower's Scientists: Policy Entrepreneurs and the Test-Ban Debate 1954–1958," *Foreign Policy Analysis* 11, no. 1 (January 1, 2015): 1–21.

and USSR over each other's territories. Proposed at the Geneva Summit in 1955, this initiative did not find a receptive audience with Stalin's successors in the Politburo, given their relatively weak position in the burgeoning arms race. As such a treaty would have acted as a normative break to the open development of nuclear technologies, its demise marked a low point in efforts to rein in the technological competition between the superpowers.

Expanding Competition 1957-1962: Sputnik Model

The US was shocked by the successful launch of the world's first satellite, Sputnik, by the Soviet Union in late 1957. This achievement caught American intelligence and military intuitions by surprise, and the demonstration of a Soviet ICBM (intercontinental ballistic missile) rendered all of the continental United States vulnerable. The Sputnik model lasted a much shorter time than the other post-war periods of innovation in US military technology. Still, its general characteristics had a significant impact on what was to follow. While international rivalry was a feature in the early Cold War, the competition expanded beyond the politico-military arena into nearly every aspect of society.[413] The state was still the primary driver of innovation, but the approach was now a whole of government if not a whole of society effort. Instead of relying on existing scientific know-how internally or imported from other nations, policymakers were immensely concerned with the production and rate of scientific knowledge. Education was thus

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[413] For example, international sport competition, chess, culture, political influence in the "third world," and the penultimate competition for the conquest of space.

securitized, and investments were made to the national structure of knowledge production. Investment in R&D via established, service-based labs increased initially, with a large amount of this funding channeled to external entities by contract. The inter-service competition was a distinct characteristic during this period of technological innovation. Built on top of the organizational innovations of NSC 68 and the permanent war footing of the U.S. during the Cold War, the "military-industrial complex" that Eisenhower warned of in his farewell speech mushroomed.[414] However, this dynamic was tempered by the proliferation of institutions and placement of transformative technology outside the auspices of any particular service. Thus, this period saw the centralization of innovation efforts and the establishment of new, Pentagon-wide organizations with the Department of Defense Reorganization Act of 1958.

The era of expanded competition was also marked by the rising stature of civilian defense intellectuals—academic experts versed in the logic of nuclear strategy, game theory, and systems engineering—installed in the Office of the Secretary of Defense.[415] While advances were made in nuclear weapons design, the focus in this period was decidedly on delivery systems, countermeasures, and reconnaissance of the rival power's efforts in the arms race. Certainly, this period

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[414] See both Harold D. Lasswell, "The Garrison State," *American Journal of Sociology* 46, no. 4 (1941): 455–68, https://www.jstor.org/stable/2769918; Aaron L. Friedberg, "Why Didn't the United States Become a Garrison State?," *International Security* 16, no. 4 (1992): 109–42.

[415] Kaplan, *The Wizards of Armageddon.*

saw the rivalry between the superpowers reach such a fever pitch that it severely tested the limits of the First Offset Strategy. In terms of arms control, the arguments for technological acceleration in the face of perceived national security threats drowned out nearly all calls for restraint. This era of unfettered competition saw spending on R&D balloon from $13.6 billion to a staggering $45.1 billion per annum. The share of R&D within the defense budget increased dramatically from 4.7% to 14.4% of total defense outlays. Notably, during this era there is an interesting dynamic play out where the overall federal budgets remained generally flat while the ratio of R&D to total spending peaked in 1961 at 7.1%, whereas the median percentage was 2.7 from 1950 to 2016.[416]

While the Manhattan Project is often credited with ushering in the atomic age, the impact of fusion (thermonuclear) weapons is often overlooked. Because of their monumental increase of already unimaginable destructive power, thermonuclear weapons relaxed guidance and precision requirements for potential delivery systems. Suddenly the problems of inertial guidance for ballistic missiles were greatly reduced. The further refinement of nuclear weapon designs reduced the size and weight of payloads and brought the technical requirements for a truly intercontinental missile within reach.[417] The fact that the Soviet Union reached this

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[416] Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, https://www.whitehouse.gov/omb/historical-tables/

[417] James R. Shepley, *The Hydrogen Bomb: The Men, the Menace, the Mechanism.* (New York: DMcKay Co, 1954); York, *Arms and the Physicist*; Mahnken, *Technology and the American Way*

milestone in technological development with Sputnik and the first truly intercontinental missile in 1957 sent a shockwave through American society and shook the Eisenhower administration.418 In short order, the Advanced Research Projects Agency (with the addition of Defense later resulted in DARPA) was established under the auspices of the DoD with the explicit mission to push the limits of American science and technology so that the US would always be at the forefront of strategic surprise rather than the victim.[419] The Air Force and SAC shifted focus from their jet-powered bomber fleet to developing reliable and effective ballistic missiles from a variety of different ranges. During this period, the ICBM became the primary weapon of deterrence via mutually assured destruction, and the first viable Atlas missile was deployed by late 1958.[420] Not to be outdone, the Navy followed suit with their development of a submarine-launched ballistic weapon (SLBM) in the form of the Polaris fielded in 1960. While not as accurate as of the ground-based models, the Polaris did give the US a second-strike

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of War, pp. 26; and Donald A. MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*, (Cambridge, Mass.: MIT Press, 2001).

[418] See: Yanek Mieczkowski, *Eisenhower's Sputnik Moment: The Race for Space and World Prestige* (Ithaca: Cornell University Press, 2013); Sean Kay, "America's Sputnik Moments," *Survival* 55, no. 2 (May 5, 2013): 123–46; and Asif A. Siddiqi, *Sputnik and the Soviet Space Challenge* (Gainesville: University Press of Florida, 2003); Paarlberg, Robert L. "Knowledge as Power: Science, Military Dominance, and US Security," *International Security* 29, no. 1 (Summer 2004): 123-124 and Fred Block, "Innovation and the Invisible Hand of Government," in *State of Innovation: the US Governments Role in Technology Development.* eds. Fred Block and Matthew Keller (Boulder, CO: Paradigm Publishers, 2011): 1-26 and Lawrence Freedman, *The Evolution of Nuclear Strategy.* 3rd ed. (New York, NY: Palgrave Macmillian, 2003): 131-161.

[419] Annie Jacobsen, *The Pentagon's Brain: An Uncensored History of DARPA, America's Top-Secret Military Research Agency*, Reprint edition (New York, NY: Back Bay Books, 2016).

[420] Mahnken, *Technology and the American Way of War*, pp. 33-39.

capability because of the stealth afforded by its delivery system. In other words, if the Soviet Union attempted a knock-out strike using all their weapons against American missile silos and air bases, the US would be able to respond with the SLBMs at sea, still assuring mutual destruction.[421] In this way, via the logic of deterrence strategy and a healthy dose of inter-service rivalry, the nuclear trident of bombers, ICBMs, and SLBMs was born.

The shock of Soviet technological prowess was consequential well beyond the confines of the Pentagon. The expansion of Cold War competition to nearly all aspects of society (economics, the Olympics, culture, and the space race) also marked the military technologies that emerged from this period and the institutions that produced them. In his 1958 State of the Union address, Eisenhower conceded that the Soviet Union was committed to mobilizing every aspect of their society in the Cold War competition, including economic, scientific, and educational efforts.[422] Indeed, there was a general worry that the USSR would surpass America in the scientific realm, paving the way for economic, military, and ideological dominance in the Cold War.[423] Eisenhower's policy response massively reshaped U.S. education at all levels with the promulgation of the National Defense

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421 Graham Spinardi, *From Polaris to Trident: The Development of US Fleet Ballistic Missile Technology* (New York: Cambridge University Press, 1994).

422 Dwight Eisenhower, "Annual Message the Congress on the State of the Union," January 9, 1958, Eisenhower Presidential Archives, https://www.eisenhower.archives.gov/all_about_ike/speeches/1958_state_of_the_union.pdf;

423 Harold Barnett, "Research and Development, Economic Growth, and National Security," *Annals of the American Academy of Political and Social Science* 327, Perspectives on Government and Science (Jan. 1960): 36-49.

Education Act pumping federal funds into local school systems, establishing student loan programs, increasing funding for graduate-level programs, promoting area studies for national security, and prioritizing the hard sciences.[424] This marked a fundamental shift in the American government's relationship with knowledge production: instead of relying on the latent knowledge base or importing the best scientific minds from abroad, the state would play an active role in building the academic base that notionally created scientific breakthroughs and the resulting military technology. Again, the international pressure of Cold War competition shaped domestic policy responses and, ultimately, the military technologies that would emerge from those policies.

In a more direct response to the Sputnik challenge, the U.S. government also redoubled its efforts in the space race with the establishment of the National Aeronautics and Space Administration (NASA) in 1958 to double US efforts in the new space race, creating a secretive but civilian program of rocket development. In shifting the focus of the space race to a civilian-run scientific agency, the U.S. hoped to leverage the potential of the private sector instead of attempting to compete with the Soviets along purely military lines. At the same time, there was

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[424] Roger Geiger, "What Happened after Sputnik? Shaping University Research in the United States," *Minerva* 35, no. 4 (1997): 349–367; Paarlberg, Robert L. "Knowledge as Power: Science, Military Dominance, and US Security," *International Security* 29, no. 1 (Summer 2004): 123-124 and Fred Block, "Innovation and the Invisible Hand of Government," in *State of Innovation: the US Governments Role in Technology Development.* eds. Fred Block and Matthew Keller (Boulder, CO: Paradigm Publishers, 2011): 1-26 and Lawrence Freedman, *The Evolution of Nuclear Strategy.* 3rd ed. (New York, NY: Palgrave Macmillian, 2003): 131-161.

significant interoperability between NASA technology with existing missile programs within the different branches that could now focus on military applications in space rather than be distracted by the very public international competition over milestones in space travel.

Funding flowed to both NASA, the Air Force, the Navy, and the Army for missile development spurring inter-service competition and an increase in ballistic missile capability. While NASA concentrated on meeting the Soviets in manned orbits around the Earth and unmanned probes to the moon, the new division of labor allowed the U.S. military to concentrate on other space-based programs. Indeed, this period saw a growing focus on developing ballistic missile technologies for the delivery of nuclear weapons within the military across the major services, often in competition with each other.[425] The resulting systems marked a shift from the Army's shorter-range systems (Jupiter and Redstone rockets) to the Air Force and Navy programs that emphasized range or submarine launch capabilities (e.g., Atlas, Thor, Viking, and Polaris rockets.)

The alarm over the opacity of Soviet technological advances with little warning from the U.S. intelligence community spanned the Eisenhower and Kennedy administrations. This worry over a "missile gap" to the advantage of the

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[425] Elliott Converse III, *Rearming for the Cold War 1945-1960*, vol. I, History of Acquisition in the Department of Defense (Washington, DC: Historical Office, Office of the Secretary of Defense, 2012); Robert J. Watson, *Into the Misile Age 1956-1960*, vol. IV, Secretaries of Defense Historical Series (Washington, DC: Historical Office, Office of the Secretary of Defense, 1997); and Brown, ed., *Providing the Means of War*.

USSR festered in the absence of reliable information on the Soviet ICBM program and spurred the development of manned reconnaissance aircraft, unmanned drone aircraft, and the newer technology of spy satellites.[426] The downing of an American U-2 spy plane over the USSR and the subsequent propaganda coup with the capture of the U.S. pilot Gary Powers in 1960 put an end to unfettered U-2 overflights. In order to address the gap in intelligence gathering, the National Reconnaissance Office was established with the mission to pull back the veil on the Soviet programs. The nuclear arms race highlighted a need for robust surveillance needs, and the NRO initially pushed for rapid technical development along two different trajectories: spy satellites for unencumbered overflights of the USSR and expendable unmanned reconnaissance aircraft based on existing target drone technologies. While many UAV systems were advanced during this period, this technology was quickly eclipsed by its rival with the successful launch of the CORONA spy satellite.[427] In its doctrinal response to the new nuclear warfighting realities, the U.S. Navy also required new technologies to navigate, communicate, and coordinate dispersed actions with a new emphasis on submarine warfare for its leg of the nuclear triad. These requirements were soon met with the initiation of the

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[426] It should be noted that Kennedy also deftly leveraged concerns over the "missile gap" to his advantage during the 1960 presidential election despite the fact that the gap itself was unsubstantiated by evidence.

[427] Kevin Ruffner, "CORONA: America's First Satellite Program" (Center for the Study of Intelligence, Central Intelligence Agency, 1995), and Thomas P. Ehrhard, *Air Force UAVs The Secret History*, (Arlington, VA: the Mitchell Institute for Airpower Studies, July 2010).

NAVSTAR program -the precursor to the Global Positioning System- with the launch of the Transit 1B satellite in 1960.[428]

The start of the Kennedy administration also marked the ascent of a new type of actor, the defense intellectual, thought the national security establishment and most markedly within the Department of Defense. The prominence of civilian academics versed in security policy, systems analysis, and modern business management resulted in changes to the processes of R&D and innovation within the DoD. Under the newly installed Secretary of Defense, Robert McNamara, power within the DoD shifted from the service branches to the centralized Office of the Secretary of Defense (OSC) in what is dubbed the management revolution. For the R&D process within the military, this shift resulted in a consolidation of multiple labs, and more centralized civilian control under the OSC as McNamara's defense intellectuals found various redundancies in efforts to respond to the Sputnik challenge. What resulted was a paradoxical situation where military R&D efforts were consolidated while spending in both absolute and relative terms soared, concentrating more resources and power into centralized units. External to the DoD and the service laboratories, contracts with external FFRDCs (exemplified by RAND and MITRE) increased, further increasing the number and influence of defense intellectuals over military technologies. This contraction, consolidation,

[428] Thomas A. Stansell, "The TRANSIT Navigation Satellite System" (Magnavox Advanced Products and Systems Company, June 1983).

and simultaneous increase in funding created a dispersed landscape of military innovation that the DoD worked mightily to rationalize for years to come.[429]

This relatively short period of the Cold War was marked not only by institutional flux but also by the relative lack of norms restraining military technologies. Practically every interaction between the superpowers during this period was competitive rather than cooperative. This political dynamic accelerated technological innovation primarily in the areas of delivery systems for nuclear arms, countermeasures, geospatial intelligence, and signals intelligence. While the launch of Sputnik did not negate the First Offset Strategy, it did plant the seed of its demise. After Sputnik, many of the achievements in military technology were driven by the necessity to shore up the increasingly shaky pillars of the First Offset. The alarm within the U.S. national security enterprise and the subsequent scramble to catch up in the science, missile, and space races were all prompted by the need to maintain a dominant technological edge. As Soviet nuclear capabilities advanced, the policy of Massive Retaliation—where the U.S. deterred Soviet actions—shifted decidedly towards Mutually Assured Destruction.

Indeed, the limits of the First Offset were severely tested by the Cuban Missile crisis. The logic of the strategy dictated the launching of a general thermonuclear war, given the provocation of Soviet missiles and military forces in

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[429] Lassman, *Sources of Weapon Systems Innovation in the Department of Defense*, pp. 7-19; and James E. Hewes, *From Root to McNamara: Army Organization and Administration, 1900–1963* (Washington, D.C.: U.S. Army Center of Military History, 1975).

Cuba. The fact that President Kennedy avoided this outcome is typically heralded as the exemplar of crisis management, but the flexibility needed to avoid nuclear armageddon in 1962 ran counter to the intransigence required for the First Offset strategy.[430] The lack of restraint in the Cold War competition during this period coupled with little to no new norms mitigating the development of military technologies contributed to bringing the world to the brink of total nuclear war. Coupled with the assertion of civilian control over the DoD, the alarm at the prospects of nuclear war shifted the political drivers of weapons development into a different phase where the management of conflict and the resurgence of norms become a hallmark.

The Era of Managed Competition 1963-1979: The Jason's Model

As a much longer span, this epoch of military technological development was initiated with a flurry of institutional developments, then settled into a pattern of formalized innovation that would be reshaped by international events. During this era, the state was still a major player in driving military innovation, but the hybrid character of the national security innovation continued to place the center of gravity for R&D outside of the research labs associated with each service branch. In their place, an expanding network of defense companies, FFRDCs, and academic institutions took on a larger role in creating military technologies. Reliance on

[430] Graham Allison and Philip Zelikow, *Essence of Decision: Explaining the Cuban Missile Crisis*, 2 edition (New York: Pearson, 1999); Robert F. Kennedy and Arthur Meier Schlesinger, *Thirteen Days: A Memoir of the Cuban Missile Crisis*, 59419th edition (Princeton, N.J.: W. W. Norton & Company, 1999); Richard M. Pious, "The Cuban Missile Crisis and the Limits of Crisis Management," *Political Science Quarterly* 116, no. 1 (2001): 81–105.

external, hybrid organizations brought a certain amount of creativity and improvisation to high profile military R&D, all while the traditional service laboratories took on the more prosaic concerns of incremental improvements in weapon technologies and focused on foundational, basic science for future breakthroughs.[431] The assertion of civilian control over the military in general and the R&D enterprise specifically increased during this period with a marked period of consolidation of innovation institutions within the DoD in the Office of the Secretary of Defense. The explosion of arms control agreements played a much larger role during this period, evolving from steps aimed at de-escalation of nuclear confrontations after the Cuban Missile Crisis to numerical limits to weapon stockpiles and more robust limitations on the development of military technologies generally. The competitive nature of the Cold War in very concrete military terms still remained. However, the arms race (and subsequently the development of new weapon systems) was expressed in very different ways. For example, the competition took place via proxy conflicts, espionage, forms of foreign aid, and limited wars as both superpowers sought to avoid direct confrontation and possibly nuclear war. Thus, while many subsequent events during this time impacted the emerging military technologies, what unifies this long era in weapons development was how unbridled competition of the early Cold War was eschewed in favor of managed antagonism. The U.S. government spending on R&D settled into an

[431] Lassman, *Sources of Weapon Systems Innovation in the Department of Defense*.

equilibrium ranging from $45.1 billion in 1962 to $31.8 billion in 1979. This represented a relatively stable percentage of the Defense budget allocated towards weapons innovations, only fluctuating from 14.4% to 10.4% by 1979.[432]

Given these conditions, the focus of innovations in U.S. military technologies during this period shifted from nuclear weapons to conventional weapons and warfighting, especially in the service of counterinsurgency. There was also a greater distinction between nuclear forces and conventional weapons during this period with the continued separation of these military functions within the institutions that make up the national security enterprise. Thus, while the logic of the First Offset was generally eschewed by the Kennedy and Johnson administrations in favor of their own, new doctrine, the logic of mutually assured destruction survived within the institutional confines of "strategic forces." Eventually, the First Offset would collapse in the face of nuclear parity and be replaced during this period with the Second Offset initiated by the Carter Administration. The domestic political consequences of the Vietnam War would also loom large over the military technologies developed for the Second Offset. During this era, defense R&D spending dropped from $43 to $30.3 billion per year (1964-1979 in constant 2009 dollars.) Relative to other outlays, R&D also

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[432] Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, https://www.whitehouse.gov/omb/historical-tables/

constituted a smaller portion of overall defense spending, dropping from 6.6% to 2.4% by the end of the 1970s.[433]

During his campaign for president and early on in his administration, Kennedy expressed frustration with the precepts of Massive Retaliation and sought to reformulate U.S. strategy away from the maximalist dictates of this doctrine. The Cuban missile crisis and the U.S. military's standard operating procedures that nearly pushed the superpowers into nuclear Armageddon only reinforced the Kennedy administration's inclination to revamp America's Cold War strategy. The resultant doctrine branded "Flexible Response" sought to match Soviet military encroachment proportionally. As such, it favored developing military hardware and weapons that would proportionally match Soviet forces rather than simply overwhelm them with destructive firepower.[434] This shift benefited the Army generally, reversing the funding declines for that service branch under the First Offset Strategy and focused military innovation toward conventional arms. Flexible Response also shifted the U.S. military's attention towards limited warfare and proxy conflicts in the "Third World," opposing the spread of communism in the name of containment. Two factors loomed large in the reformulation of Flexible

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[433] Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, https://www.whitehouse.gov/omb/historical-tables/.

[434] Mahnken, *Technology and the American Way of War*, pp. 62-63; and Robert R Tomes, *U.S. Defense Strategy from Vietnam to Operation Iraqi Freedom: Military Innovation and the New American Way of War, 1973- 2003* (Milton Park, Abington, Oxon; New York, NY: Routledge, 2007) pp. 44-49.

Response and the approach to limiting the use of force and managing any escalation towards nuclear war.[435] The first factor was the U.S. experience of the Korean War and MacArthur's push to expand the conflict to communist China with the use of nuclear weapons that potentially would have precipitated another world war. The architects of Flexible Response abhorred this type of unrestrained escalation and sought to rein in the propensity of the U.S. military -when faced with military confrontation- to utilize maximum firepower emblematic of the Single Integrated Operation Plan (SIOP) developed under the First Offset. A second factor was the profile of the planners themselves: with the assertion of civilian control over the national security enterprise, those in charge of developing military technologies were now of a different ilk, hailing from academia and think tanks rather than from the service ranks. The ascension of defense intellectuals was accelerated with the infusion of money and resources into academia during the Sputnik era coupled with the managerial revolution in the DoD under Secretary McNamara. The result was a dispersion of responsibility for weapon innovation out into academia, defense contractors, and among the non-profit, hybrid institutions.

It is difficult to overstate the impact that Robert McNamara's tenure as Secretary of Defense had on the national security enterprise. Plucked from his position of president of Ford Motor Company, Secretary McNamara's experience running a large, heterogeneous, and bureaucratic organization was immediately felt

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[435] Peter F. Witteried, "A Strategy of Flexible Response," *Parameters* II, no. 1 (1972): 2–16.

as the incoming Kennedy administration sought to make dramatic changes to the Pentagon. The experience during the Cuban Missile Crisis only reinforced the young president's resolve to wrestle power over the military from the services and assert civilian control over the DoD. McNamara pursued the task of reorganizing and establishing the Office of the Secretary of Defense as the central authority for military issues. Utilizing his considerable skills in managing large organizations, McNamara reigned in power from the services through centralization of the budgeting process and the expansion of DoD bureaucracy. He did this by instituting the Planning, Programming, and Budgeting System, or PPBS, as a framework for acquisitions through statistically based systems analysis processes.436 The impact on military innovation was not only the centralization of R&D functions but also increased efficiencies of scale through cost-effective efforts. [437] One prime example of this was the development of the General Dynamics F-111 fighter bomber. McNamara's OSD (Office of the Secretary of Defense) identified two separate acquisition programs (one in the Air Force and a separate program in the Navy) for medium-sized fighter aircraft and consolidated them into one development program

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[436] Erin R. Mahan and Jeffery A. Larsen, *The Ascendancy of the Secretary of Defense: Robert McNamara 1961-1963*, Cold War Foreign Policy Series 4 (Washington, DC: Historical Office, Office of the Secretary of Defense, 2013); Lawrence S. Kaplan, Ronald D. Landa, and Edward J. Drea, *The McNamara Ascendancy 1961-1965*, vol. V, Secretaries of Defense Historical Series (Washington: Historical Office, Office of the Secretary of Defense, 1984);

[437] J. Ronald Fox, *Defense Acquisition Reform 1960-2009: An Elusive Goal* (Washington, D.C.: Center of Military History United State Army, 2011) pp. 35-38. Brown, ed., *Providing the Means of War*.

for both services.[438] The earlier trends that moved innovation responsibilities out of the service research labs and into the private sector accelerated as McNamara sought cost savings through consolidation of the labs.[439] By eliminating overlapping and duplicate new weapons programs, McNamara allowed for increasing levels of innovation without the excessive levels of spending seen during the reaction to Sputnik.

The development of strategic concepts and contingency planning underwent changes during this period as well. Much of this function migrated out of the White House and National Security Council in the mold of Project Solarium to the more technically oriented forms of RAND and groups of defense intellectuals. One prominent group, known as the "Jasons," consisted of former Manhattan Project alumni, younger theoretical physicists, and computer scientists recruited within academia. This group typically met during the university summer break to discuss in-depth a specific technical issue related to national security in an informal, collegial setting. This group was periodically sponsored by DARPA, the Institute for Defense Analyses, and the MITRE Corporation.[440] As such, it was somewhat

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[438] Lawrence R. Benson, *Acquisition Management in the United States Air Force and Its Predecessors* (Washington: Air Force History and Museums Program, 1997);

[439] Robert McNamra, "The Fiscal Year 1968-73 Defense Program and the 1969 Defense Budget" (Washington: Department of Defense, January 22, 1968); and Lassman, *Sources of Weapon Systems Innovation in the Department of Defense*.

[440] See "Institute for Defense Analyses," accessed March 8, 2019, https://www.ida.org/; and MITRE Corporation, "We Operate FFRDCs," June 14, 2013, https://www.mitre.org/centers/weI-operate-ffrdcs. For a journalistic history see: Ann Finkbeiner, *The Jasons: The Secret History of Science's Postwar Elite* (New York: Penguin Books, 2007).

removed from the more formal defense planning process. This created flexibility for the Jasons to suggest novel technical solutions to military and political problems. In one such arena, the Jasons echoed the advice of other defense intellectuals housed in similar think tanks on strategic options available to the U.S. beyond the straightjacket of mutually assured destruction.[441] Armed with the intellectual firepower of defense intellectuals, the Kennedy administration developed a different strategic posture, Flexible Response.

In terms of the divisions between conventional and nuclear weapons, the new Flexible Response strategy was paradoxical. On paper, this concept sought to integrate nuclear and non-nuclear forces into gradations of proportional response contra the disproportionate and maximalist stance demanded by the First Offset. However, in terms of the creation of new weapon systems, this new approach favored the modernization of conventional forces initially. The distinction between the two different categories impacted the technological development of both types of weaponry. On the conventional side, this modernization push led to the development of the M-16 rifle as a replacement to the pre-WW II small arms developed in the 1930s. In many ways, the late development of a main battle rifle for the U.S. Army was undertaken in order to match large-scale Soviet production

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[441] Annie Jacobsen, *The Pentagon's Brain: An Uncensored History of DARPA, America's Top-Secret Military Research Agency*, Reprint edition (New York, NY: Back Bay Books, 2016); Ann Finkbeiner, *The Jasons: The Secret History of Science's Postwar Elite*, Reprint edition (New York: Penguin Books, 2007).

of the AK-47.[442] Later, we will see how the launch of other U.S. conventional arms modernization programs was impacted by the Vietnam War.

On the other end of the spectrum, nuclear weapons technologies were also rolled out during the early 1960s under the rubric of Flexible Response. As suggested by defense intellectuals (especially from RAND), the Kennedy administration pursued the development of a "counterforce" nuclear strategy that would more precisely target Soviet military forces rather than population centers in an attempt to limit the scope of nuclear warfighting.[443] Again, this was driven by the attempt to infuse proportionality into the ladder of escalatory moves each superpower could potentially make. The technological outcomes in the nuclear realm of this strategy were a marked improvement in the inertial guidance systems within U.S. missile systems and the development of multiple independently targetable reentry vehicles or MIRVs that exponentially increased the offensive potential of each nuclear missile against opposition forces.[444] At the start of this period, the U.S. enjoyed a solid advantage in the nuclear arms race and given the rate of warhead production by both superpowers. The CIA did not anticipate that

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[442] Fallows, James, "The American Army and the M-16 Rifle," in *The Social Shaping of Technology: How the Refrigerator Got Its Hum*, ed. Donald A. MacKenzie and Judy Wajcman (Milton Keynes: Open University Press, 1985), 239–51.

[443] See Witteried, "A Strategy of Flexible Response" and Freedman, *The Evolution of Nuclear Strategy*. pp. 227-244.

[444] Donald A. MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*, (Cambridge, Mass.: MIT Press, 2001).

the USSR would reach nuclear parity within decades.[445] The subsequent focus of scientific efforts on the nuclear arms race (and doctrinal distinction) bifurcated weapons innovations in the nuclear and conventional realms leading to increasingly sophisticated yet "unusable" technologies in the nuclear realm –thereafter redefining the concept of strategic forces– and *ad hoc* innovation within the conventional realm of weapons technology often undertaken on the fly. This pattern of technoscientific development led to conventional weapons technologies that were often a conglomeration of existing technologies and were aspirational in their effects but perhaps underdeveloped because the technology had not matured.

The new weapons and warfighting concepts developed over the 1950s and early 1960s were soon put to the test with American involvement in the Vietnam war. Facing a mixture of high-tech integrated air defense systems in the north and a low-tech, rural insurgency in the south, the American military soon found itself stymied against a notionally inferior adversary. The USAF and Naval aviation built to deliver nuclear arms against a peer foe in a quick, unimaginably destructive nuclear war found itself waging a protracted conventional bombing campaign and combat air support under strict rules of engagement micromanaged from McNamara's brain trust to limit the escalation of the conflict.[446] What is more, Soviet-supplied advanced air defense missiles decimated American airpower flying

[445] Mahnken, *Technology and the American Way of War,* pp. 61-68.

[446] Earl Tilford Jr., *SETUP: What the Air Force Did in Vietnam and Why* (Maxwell Air Force Base, Ala.: Air University Press, 1991).

fighters and bombers ill-suited for such operations. U.S. ground forces comprised of drafted troops, equipped and organized around facing similarly mechanized armies in Central Europe within an integrated NATO framework, were poorly oriented towards fighting an elusive Viet Cong and North Vietnamese Army.[447]

The response across the DoD fit a familiar pattern. Brodie's obituary for technological adaptation in the midst of war appeared premature as the American defense establishment again sought technological solutions to tactical and political problems. For the Air Force and Navy pilots, a focus on electronic warfare to counter Vietnamese air defenses saw the employment of Ryan Model 147 drones in combat for the first time, acting as decoys to locate surface-to-air missile launchers and for photo-reconnaissance of the enemy's air defenses.[448] Over the course of the war, American bombers dropped an incredible amount of ordinance on the north to little strategic effect. One instance, in particular, the Dragon's Jaw or Thanh Hoa bridge linking north and south Vietnam, illustrated the futility of this approach. The bridge was targeted over a number of years with several sorties to no effect and at great loss of U.S. aircraft. In dramatic fashion, the USAF quickly worked with the defense industry to field the first laser-guided, precision-guided

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[447] Edward J. Drea, *McNamara, Clifford, and the Burdens of Vietnam 1965-1969*, vol. VI, Secretaries of Defense Historical Series (Washington: Historical Office, Office of the Secretary of Defense, 1984).

[448] Ehrhard, "Air Force UAVs The Secret History."

munition (or PGM) that finally destroyed the crossing.[449] The Army had two distinct responses to the challenges on the ground of quelling an insurrection. These approaches were emblematic of how the American way of war involved the application of technology. In order to conduct counterinsurgency operations, the U.S. Army developed airmobile tactics using helicopters and close air support to quickly locate and counter irregular troops.[450] North Vietnam famously supplied their communist allies in the South via the Ho Chi Minh trail, traversing technically neutral Laos and Cambodia. By 1967 the issue was deemed important enough for the Jason's group to consider the issue. They immediately dismissed an earlier idea floated to use tactical nuclear weapons to cut off the trail at key entry points. Instead, the Jason's made an ambitious proposal to place thousands of acoustic and seismic sensors across the mountainous borders of South Vietnam. These sensors would transmit any disturbance to a large data center set up at an Air Force base in Thailand that would analyze the information to direct airstrike interdictions against truck traffic on the trial.[451] The audacious plan was approved and what code-named Igloo White and was set up in rough jungle terrain across hundreds. Despite the cost and effort of Igloo White, the program had little effect on the flow of men and

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[449] Robert R Tomes, *U.S. Defense Strategy from Vietnam to Operation Iraqi Freedom: Military Innovation and the New American Way of War, 1973- 2003* (New York: Routledge, 2007).

[450] John J. Tolson, "Airmobility, 1961-1971," Vietnam Studies (Washington: U.S. Army Center of Military History, 1999); John H. Hay, Jr, "Tactical and Materiel Innovations - U.S. Army Center of Military History," Vietnam Studies (Washington: U.S. Army Center of Military History, 1974); and Mahnken, *Technology and the American Way of War*. Pp. 89-120

[451] Bernard C. Nalty, *The War Against Trucks: Aerial Interdiction in Southern Laos 1968-1972* (Washington: Air Force History and Museums Program, 2005);

material to aid the Viet Cong. However, the precedent of integrated surveillance, reconnaissance strike complex served as an early blueprint for later integrated combat command networks that would evolve into network-centric warfare.[452]

With the military establishment convulsed by the failures in Vietnam—laid bare by the Tet Offensive in early 1968—and American society torn apart by the anti-war movement, shifts internally and on the international stage had ramifications for American military innovation. On the domestic front, the failures in Vietnam shredded the reputation of Secretary McNamara and the defense intellectuals that insisted on quantitative management techniques that led to bureaucratic "body count" orders that papered over a futile war effort. As a result, McNamara's efforts to centralize military R&D and acquisitions foundered. As the different serviced undertook innovation through adaptation in the face of an adversary, the balance of power in the development of new weapons shifted back to oversight within the respective services. Changes were afoot on the international stage as well. The rift between the Soviet Union and Mao's China grew to the point of border conflict, and the enormous expense of the nuclear arms race signaled the strain of the Cold War on America's competitor. The social upheaval of 1968 was not confined to the U.S. or even contained within the West when the Prague Spring prompted Moscow to intervene in Czechoslovakia at great reputational and military

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[452] John D. Bergen, *Military Communications- A Test for Technology* (Washington: U.S. Army Center of Military History); William Westmorland, "The Electronic Battlefield," in *Addresses by General W. C. Westmoreland, Chief of Staff, United States Army, Volume IV, 3 July 1969 – 16 December 1969.* (Washington, 1969).

cost. Both sides in the superpower standoff warmed up to the logic of not only avoiding another Cuba-style crisis but go further and manage the arms race in a more rational manner.[453] Ongoing negotiations over several bilateral arms treaties cumulated in the Nuclear Non-Proliferation Treaty that opened up the management of these weapons to a multilateral forum. The easing of tensions between the superpowers bore the French moniker "détente," and a brief flurry of diplomatic efforts cumulated in a series of nuclear arms limitation agreements.[454] At the dawn of the 1970s, peaceful co-existence between the U.S. and Soviet Union seemed within reach.

The accent of Nixon to the presidency marked a new version of managed competition with more emphasis on cooperation and diplomacy. By this time the NASA's Apollo program successfully landed astronauts on the moon, thereby definitively ending the space race and that avenue of competitive innovation. Nixon had campaigned on ending the U.S. military's role in the Vietnam War, and he followed through with peace negotiations, albeit with the more freewheeling use of bombing campaigns. The strident anti-war movement had two indelible impacts on the U.S. military. First was the shattering of public approval of the military in general, whereby the end of the Vietnam War, the public trust in the armed services

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[453] Kaplan, *Melvin Laird and the Foundations of the Post-Vietnam Military 1969-1973*; and Raymond Garthoff, *Detente and Confrontation: American-Soviet Relations from Nixon to Reagan*, Revised edition (Washington: Brookings Institution Press, 1994).

[454] Office the Historian, U.S. Department of State, "Milestones: 1969–1976 - Office of the Historian," accessed April 9, 2021, https://history.state.gov/milestones/1969-1976/detente.

was at an all-time low, and there was little support for military spending. By 1973 the draft was ended, and the American military transitioned to a smaller, all-volunteer force. Second, the anti-war effort originated from the various universities that had grown from Sputnik era government largesse, and these social movements insisted that higher learning divest itself from war efforts.[455] This schism between academia and the defense establishment would have long-term ramifications, especially in the area of computer technology and the development of Silicon Valley. In an effort to revamp and professionalize the largest of the four service branches, the Army Training and Doctrine Command (TRADOC) was established. In the same year, the Yom Kippur War between Israel and the neighboring Arab states highlighted vulnerabilities of advanced jet fighters and armor to integrated air defense and smaller, infantry-based anti-tank weapons supplied by Moscow. [456] The impression left on the new leaders at TRADOC only reinforced the fundamental aims of Igloo White and its champion, General Westmoreland, that advances in sensor technologies and communications could be leveraged to improve combined arms tactics.

While diplomacy continued to bear fruit in the forms of strategic arms treaties, the superpowers were quickly pushing up against the limits of détente.

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[455] Edward J. Drea, *McNamara, Clifford, and the Burdens of Vietnam 1965-1969*; Lawrence S. Kaplan, *Melvin Laird and the Foundations of the Post-Vietnam Military 1969-1973*; Richard A. Hunt, *Melvin Laird and Nixon's Quest for a Post-Vietnam Foreign Policy 1969-1973*.

[456] Joseph S. Doyle, "The Yom Kippur War and the Shaping of the United States Air Force," Drew Papers (Maxwell Air Force Base, Ala.: Air University Press, 2016); and Tomes, *U.S. Defense Strategy from Vietnam to Operation Iraqi Freedom.* pp. 64-76.

While limits on the number of nuclear arms were agreed to, the development of new nuclear weapons technologies on both sides outpaced negotiations. In short, the Soviet Union was approaching nuclear parity. This would mean that they had enough nuclear weapons on enough delivery platforms to conceivably launch a first strike, absorb the counterattack, and then eliminate all remaining U.S. weapons in a second strike. Such a state of affairs would negate the U.S. advantage and the asymmetry underwriting both the First Offset Strategy and Flexible Response. An influential group of disaffected anti-communist conservatives within the U.S. soon organized to question the foundations of détente and push for the reassertion of American military power after the debacles of the Vietnam War and the Watergate scandal. Established as the Committee on Present Danger, this group of neoconservatives openly questioned the CIA estimate of Soviet military strength and put pressure on both the Ford and Carter administrations to turn away from arms control. With the specter of a resurgent Cold War foe, the U.S. was forced to contemplate competition with much larger Soviet conventional force in terms of numbers to defend Western Europe.[457]

In order to defend NATO countries from an overwhelming assault, U.S. forces would have to face a large conventional force of Soviet armor and infantry. The only way to effectively counter this conventional thread was to strike the

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[457] Walter S. Poole, *The Decline of Detente: Elliot Richardson, James Schlesinger, and Donald Rumsfeld*, Cold War Foreign Policy Series 7 (Washington: Historical Office, Office of the Secretary of Defense, 2015).

massed Soviet echelons held in reserve before they could reach the front line. Of course, these echelons were protected by increasingly effective air defense systems in Eastern Europe. The two seemingly obvious options—greater reliance on tactical nuclear weapons or increasing the number of American military personnel—were both politically impossible given the anti-nuclear movement in Western Europe and the change to an all-volunteer force by the U.S. after the debacle of the Vietnam War. 458 In addition, NATO's reliance on tactical nuclear weapons carried additional risks. The first is an unintended escalation to a general nuclear exchange, given that the distinction between tactical and strategic nuclear weapons was essentially academic at that point. Second, even if the U.S. avoided an escalation in a limited conflict in Central Europe, tactical nuclear weapons would still irradiate those territories they were deployed to defend. With the domestic pressure building from a vocal neoconservative movement at home and an aggressive Soviet build-up of conventional forces in Eastern Europe, the Carter administration found itself in a strategic bind.

President Carter's new Secretary of Defense, Harold Brown, confronted these challenges with a new version of an offset strategy. With the assistance of his Under Secretary of Defense for Research and Engineering (William Perry, who would later take over at DoD), Secretary Brown undertook a review of the emerging

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[458] Anne Chapman, *The Army's Training Revolution, 1973-1990: An Overview*, TRADOC Historical Series (Washington: Office of the Command Historian U.S. Army TRADOC, 1994); and Tomes, *U.S. Defense Strategy from Vietnam to Operation Iraqi Freedom*.

technologies within the domestic defense industrial base and identified areas where the U.S. still enjoyed an asymmetric advantage. In the areas of micro-processing, low observable aviation (stealth), satellite communications, battlefield sensors, and global positioning systems, the U.S. was leaps and bounds ahead of its superpower competitor. Making critical investments in these emerging technologies, the Second Offset Strategy would supplant the reliance on either the number of weapons/troops or tactical nuclear weapons by increasing the capabilities of these weapon platforms by leveraging these "force multiplier" technologies to get the effects of tactical nuclear weapons out of conventional forces. In essence, if each munition could be directed to each target (here Soviet armor), then American forces could avoid either the attrition of attempting carpet bombing (requiring a large number of aircraft) in a hotly contested air environment or the unpalatable escalation to tactical nuclear weapons that would spin out of control. The marriage of stealth aircraft, precision-guided munitions, cruise missiles, intelligence platforms that would find tank formations on the move, along with a network of command and control to coordinate air interdiction, would circumnavigate the problems facing American strategists.[459]

The results of the Second Offset were viewed as widely successful, paving the way for U.S. military dominance in an era of smaller but more effective forces.

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[459] The Second Offset is thus described in: Edward Keefer. *Harold Brown: Offsetting the Soviet Military Challenge 1977-1981*. Vol. IX. Secretaries of Defense Historical Series. Washington, DC: Historical Office, Office of the Secretary of Defense, 2017. Pp 575-600.

In 1978 the identified technologies came together in the system named Assault Breaker organized by DARPA to demonstrate the integration of these emerging technologies.[460] The relative success of this project led to the establishment of the AirLand Battle concept championed in doctrine by the Army and Air Force to integrate their forces in joint operations. In particular, TRADOC worked from 1977 to 1981 on the new doctrine in a concerted effort to project a vision of what a Soviet invasion would look like given their force structure and formulate a strategic response. This conceptual framework informed the development of these new weapons with an emphasis on electronic warfare, ISR, mobility, precision munitions, and countering air defense in order to establish dominance in the skies. The result, as envisioned by TRADOC and Secretary Brown, was to replicate the destructive power of tactical nuclear weapons through the concert of advanced conventional weapons.[461] These concepts were expressed specifically in the "Assault Breaker" demonstration program started in 1979 that would eventually lead to a number of high-tech weapon systems.[462]

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[460] Comptroller General. "Decisions to be Made in Charting Future of DoD's Assault Breaker." Washington, D.C.: General Accounting Office, February 1981.

[461] Rebecca Grant, "The Second Offset," *Air Force Magazine* 99, no. 7 (July 2016): 32–36; Edward Keefer, *Harold Brown: Offsetting the Soviet Military Challenge 1977-1981*, vol. IX, Secretaries of Defense Historical Series (Washington: Historical Office, Office of the Secretary of Defense, 2017); Linda Weiss, *America Inc.? Innovation and Enterprise in the National Security State,* (Ithaca: Cornel University Press, 2014) pp. 36-41.

[462] Edith Boldan, ed., *Department of the Army Historical Summary Fiscal Year 1979* (Washington: Center of Military History United States Army, 1982) pp. 170-196; and DARPA, "Assault Breaker," accessed April 26, 2021, https://www.darpa.mil/about-us/timeline/assault-breaker. The beginnings of the JSTAR airborne radar for tracking, targeting and coordinating ground forces, a

Ultimately, the Second Offset was regarded as (at the least) an elegant technical solution to a strategic problem and (at the extreme) as the progenitor of a set of transformational technologies that revolutionized warfare writ largely. It is worth considering a few general points about the Second Offset at this point. Unlike the First Offset Strategy, this iteration sought to foster and mature weapons technologies in order to meet a policy outcome. Also, the innovations initiated under Brown and Perry's guidance flowed through DARPA programs that worked hand in glove with defense contractors, sidestepping the broken link with academia. The Second Offset only came into its own in the later period of the Second Cold War consider below. Translating nascent technologies married to new doctrinal concepts only bore fruit within a defense establishment flush with funding.

The Second Cold War 1980-1991: Star Wars Model

The increase in defense spending during the Regan administration coupled with a muscular and confrontational approach to America's Soviet adversaries fueled research and development of new weapons. In this period, the center of gravity for weapons development shifted from the state to the private sector and the hybrid entities like FFRDCs. Defense contractors expanded in this period of government largesse, and *ad hoc* institutional arrangements proliferated in response to new priorities in military technology. By this point, the services were in the driver's seat for new weapons acquisitions, and they worked directly with defense contractors

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host of cluster munitions designed for attacking tank formations, the Hellfire missiles to be carried by Army attack helicopters, the F-117 Stealth Fighter, and especially precision munitions.

to create new technologies. In this environment, traditional research labs based within the separate services started consolidating and contracting their remit.[463] This blurred the distinction between the development of new weapons and the production of those weapons as never before, essentially privatizing the old arsenal system that existed prior to W.W. II. As a backlash to the Vietnam era anti-militarism within American society, national security think tanks, lobbyists, and security academics displayed a more prominent level of partisanship. This was evident in greater levels of advocacy for increases in nuclear and conventional arsenals to confront perceived Soviet numerical strength. Indeed, the entire prospect of military modernization became a political football as never before, and Reagan's aggressive spending on defense was couched in partisan terms domestically. As the nuclear arms race built up, new initiatives that caught the imagination of the president saw prominent increases in funding regardless of the maturity of the technology or the strategic need for such weapons. This dynamic was most on display with the various initiatives under the Strategic Defense Initiative (Star Wars) and with the push to develop more exotic nuclear arms like the neutrino bomb. Spending on R&D expanded in total terms during the "second Cold War" from $35.3 billion in 1980 to $64.8 billion by 1990. In the context of increased defense spending, this represented a generally flat level of prioritization

[463] Lassman, *Sources of Weapon Systems Innovation in the Department of Defense*. Pp. 7; National Research Council, *Defense Manufacturing in 2010 and Beyond: Meeting the Changing Needs of National Defense* (Washington: National Academy of Sciences, 1999).

on technological development with the share of the defense budget dedicated to R&D only fluctuating between 11% to 13.7% over the period, although federal spending for military R&D far outpaced similar spending on R&D overall.[464]

A number of factors coalesced during Reagan's two terms of office that set this period of military innovation apart. Cabinet positions and administrative appointments across the executive branch were filled with individuals either directly from the ranks of the Committee on Present Danger or related anti-communist organizations. While it is not out of the ordinary for a new administration to appoint like-minded officials, the worldview of Reagan appointees diverged significantly from the foreign policy consensus of the previous decade. In particular, the idea that the U.S. was currently at a military disadvantage and its defenses inferior to the USSR was a prominent view across the administration, feeding a sense of crisis that required extraordinary measures to overcome. This view manifested itself in Reagan's defense budgets during his first term. The staggering level of defense spending was unprecedented, cumulating in over $1 trillion over the first five years—a 54% increase in the defense budget.[465] The U.S. military expanded rapidly across the forces, but an emphasis was placed on massively increasing the nuclear arsenal and acquiring advanced weapon

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[464] Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, https://www.whitehouse.gov/omb/historical-tables/

[465] Daniel Wirls, *Buildup: The Politics of Defense in the Reagan Era* (Ithaca: Cornell University Press, 1992)

systems. Despite the enormity of this outlay, Secretary of Defense Weinberger habitually reiterated the theme of the American military falling behind the Soviet threat in terms of both quantity and quality.[466]

The defense spending binge was coupled with another tenant of neoliberal ideology: decentralization. Weinberger consciously devolved acquisition authority away from his office and down into the service branches where the Army, Navy, and Air Force now worked directly with defense contractors to develop new weapons.[467] The primary concern of the early Reagan Pentagon was with strategic forces, and the White House politically lobbied for the development of the new MX ICBM and the restart of a new strategic bomber program for the Air Force, the B-1 Lancer. While these priorities would normally create a backlash from the other branches, there was less consternation in this period. Awash in funding, the typical interservice rivalries subsided to an extent as each service had more than enough resources to develop their own pet project. The Navy halted a post-Vietnam contraction, approaching the 600-warship mark with the addition of three Nimitz class aircraft carriers, additional ballistic missile submarines, and the fielding of the advanced Aegis missile cruiser USS Ticonderoga that represented a new concept of networked naval operations through the use of precision missiles and the newly

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[466] For example: Caspar Weinberger, "Department of Defense Annual Report Fiscal Year 1983 to the Congress" (Washington: Department of Defense, February 8, 1982); and Caspar Weinberger, "Department of Defense Annual Report Fiscal Year 1984 to the Congress" (Washington: Department of Defense, February 1, 1983).

[467] J. Ronald Fox, *Defense Acquisition Reform, 1960-2009: An Elusive Goal* (Washington, D.C.: Center of Military History United State Army, 2011) pp. 98-114.

developed technology of GPS. In the case of the Army, the development and fielding of a new M1 Abrams main battle tank marked a high point in armor technology along with the Bradley armored personnel carrier for mechanized infantry that was plagued by cost overruns and expansive requirements. The Air Force was in the midst of reshaping its arsenal with the perils of the Vietnam experience in mind. Within the flying branch, power had shifted from the bomber force to the fighter pilots who now dominated the ranking general staff. As such, the USAF developed a “high-low strategy” for air superiority, fielding the heavily armed, advanced, fast, and expensive F-15 aircraft augmented by a lighter, more maneuverable, but less expensive F-16 fighter as inspired by the military reform movement described below.

While much of the groundwork for the military innovations of the 1980s and 1990s was laid earlier during the Second Offset, the Reagan buildup of the "second Cold War" flooded the coffers of these programs to bring them to fruition. However, all of these parallel funding tracts tended to silo each service into their own vision of future warfare. It also created an enormous amount of duplication and outright wasteful spending. Heightening these issues was Reagan’s public and largely unexpected announcement in 1983 of plans to rapidly develop a space-based system for defense against nuclear-armed ballistic missiles.[468] Officially named the

[468] Ronald Reagan, “Address to the Nation on Defense and National Security” (Washington, March 23, 1983), https://www.reaganlibrary.gov/archives/speech/address-nation-defense-and-national-security.

Strategic Defense Initiative (SDI), the press sarcastically dubbed the program "Star Wars" by the press. A number of fervent anti-communist neoconservatives in the White House's orbit—principally the famed father of the hydrogen bomb Edward Teller—convinced the president that the technology was within reach to develop high power lasers, particles beams, and orbiting missile platforms to effectively fend off a nuclear attack. In one sense, Reagan wanted to initiate the ultimate offset strategy, to render nuclear weapons obsolete through a technical solution in a moonshot, Manhattan project type effort to focus the best scientific minds on a strategic problem.[469] New institutions were stood up within the DoD to develop the associated technologies in coordination with the defense industry, but skepticism of the initiative was well placed. It was quickly apparent to laypeople and well-informed physicists alike that intercepting thousands of ICBM traveling over 15 times the speed of sound in a matter of minutes was well beyond the capabilities of even the most advanced technology at the time.[470]

The accumulation of excessive defense spending, the cost overruns on exquisite weapon systems, and billions of dollars spent on an unattainable defense against Soviet missiles prompted Congressional action that had a lasting impact on

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[469] Brown, ed., *Providing the Means of War*; and U.S. Government Accountability Office, "Strategic Defense Initiative Program: Expert's Views on DOD's Organizational Options and Plans for SDI Technical Support" (Washington: General Accounting Office, November 1986). An excellent analysis of SDI closer to my own approach is Columba Peoples, *Justifying Ballistic Missile Defense: Technology, Security and Culture* (Cambridge: Cambridge University Press, 2009).

[470] Arnold Kanter, "Whither SDI? Strategic Defense in the Next Administration," RAND Note (Santa Monica: RAND, September 1988).

military R&D. Critical views of DoD spending made for strange bedfellows by the mid-1980s. Early on in the Reagan administration, a handful of former acquisition managers and prominent retired military commanders offered a critique of “gold plated” military systems that accumulated requirements and cost overruns resulting in a small number of high-tech but fragile weapons. The framing of this argument was in the service of an alternative strategic vision suggesting a less expensive but more massed armed force.[471] These former DoD mavens were quickly dubbed the Military Reform Movement, reacting to the emphasis on technology. These objections were soon echoed by a vocal group of congressmen incensed by the Pentagon profligate spending on seemingly simple equipment. On a parallel track, the Reagan administration initiated the blue-ribbon Packard Commission early on during the administration with the aim of addressing the complicated defense bureaucracy that had built up after the McNamara era managerial revolution and exploded under increased budgets.[472] The result of these three parallel impulses for reform was the first reorganization of the Department of Defense since its inception in 1947 with the passage of the Goldwater-Nichols Act in 1986. Instead of shifting acquisition power from the branches of the military to the centralized Secretary of Defense, this legislation strengthened the role of the Joint Chiefs of Staff over the

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[471] John T. Correll, “The Reformers,” *Air Force Magazine*, February 1, 2008; and W. Bruce Grey, “The Implications of the Military Reform Movement for Army’s PPBES” (Carlisle: U.S. Army War College, May 15, 1986).

[472] “A Quest for Excellence: Final Report to the President” (Washington: President’s Blue-Ribbon Commission on Defense Management, June 30, 1986).

heads of each service. With an emphasis on "joint warfighting," Goldwater-Nichols sought to reduce waste, redundancy, and profligate spending while maintaining military effectiveness.[473] While it is debatable if this reorganization actually reduced waste across the defense establishment, it ironically accelerated concepts and technologies developed under the Second Offset Strategy because of the emphasis on coordination between branches of the military.[474] The result was a host of high-tech weapons designed around a highly coordinated version of combined arms combat. This renewed push for joint coordination also helped emphasize one technical aspect of the Second Offset program: the need for advanced communications and dissemination of information across the services. DoD investment in computer networking and information technology expanded with greater integration between traditional military roles.

At the turn of the decade, the scaffolding of the Cold War competition that was the impetus for these military innovations would collapse. In nearly the same instance, the efficacy of the Second Offset concept and the weapons technologies that flowed from it would prove decisive in an entirely different conflict. The disintegration of the Warsaw Pact after the fall of the Berlin Wall in 1998 eliminated the threat of Soviet military domination in Europe and the driver of Cold

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[473] Steven Rearden, *Council of War: A History of the Joint Chiefs of Staff 1942-1991* (Washington: Joint History Office, 2012) pp. 449-473.

[474] The concept of AirLand Battle was most fully articulated in Department of the Army, "Field Manual 100-5: Operations, 1982" (U.S. Army, 1982) and soon became feasible with the infusion of resources for advanced

War competition across the globe.[475] Suddenly, innovations in nuclear weapons, their delivery, and the quest for a space-based defense against hundreds of warheads was rendered moot. At the same time, the U.S. undertook military operations against the Iraqi invasion of its neighbor. The spectacularly decisive victory of coalition forces over a mechanized Iraqi army to drive them from Kuwait with the U.S. military in the lead vindicated the faith military planners had placed in weapons technologies developed under the Second Offset. That the U.S. military thoroughly routed such a large force, primarily fielding imported Soviet weaponry, via a combination of maneuver, coordination, and long-distance precision in a little over 40 days with minimal casualties ushered in a new era where American military power was dominant across the globe and a change in warfare itself.[476]

The Era of Retrenchment 1992-2000: The Big Safari Model

The 1990s was a paradoxical time for military innovation overall and for R&D institutions within the defense establishment. The unequivocal dominance of American high-tech forces in the Gulf War instigated an intellectual movement among military practitioners deemed the Revolution in Military Affairs. Suddenly, the U.S. found itself in a unipolar moment with no peer competitors and the sole

[475] Chairman of the Joint Chiefs of Staff, "National Military Strategy" (Washington: Joint Chiefs of Staff, January 1992).

[476] For official histories that detail the new approaches operationally and reflect on the ramifications of the U.S. military dominance in the Gulf War see: Frank N. Schubert and Theresa L. Kraus, *The Whirlwind War: The United States Army in Operations DESERT SHIELD and DESERT STORM* (Washington: Center of Military History United State Army, 1995); and Edward C. Mann III, *Thunder and Lightning: Desert Storm and the Airpower Debates*, vol. 2, 2 vols. (Maxwell AFB: Air University Press, 1995).

military force with the ability to project power across the globe. As such, there were no longer any space races or arms build-ups to focus the attention of science and technology towards. In fact, the spin-off technologies from the 40-plus years of Cold War competition like computer miniaturization, GPS, and the internet were quickly revolutionizing the civilian economy. The new industry of information technology continued to spur technical innovations quite removed from the defense industry. At the same time, there was domestic pressure to reduce defense expenditures dramatically, given that America had essentially won the Cold War. The subsequent contraction of military spending impacted the scope of defense innovation both across the services and with a number of defense contractors merging as demand dried up. This period of military innovation is characterized by a focus on incremental improvements to established technologies, the amalgamation of disparate improvements into new capabilities, and an emphasis on perfecting coordinated, joint operations between both the services and allied militaries. The United States spending on military R&D tapered from $57.7 to $52.6 billion, but this represented lower outlays for DoD overall rather than an abandonment of innovation considering that the percentage of the defense budget dedicated to R&D remained flat at 12.8% in 1992, ending up at 13.9% by 2000.[477]

[477] Figures presented are held in constant 2012 dollars. Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, https://www.whitehouse.gov/omb/historical-tables/

As alluded to above, the 1991 Gulf War was a watershed moment for military technology in a material sense and in terms of ideas about warfare. The dominance of an American lead professionally trained expeditionary force defeated a numerically superior adversary through maneuver, and precision strikes suggested a new paradigm for warfare. This spurred a debate over this purported Revolution in Military Affairs among security practitioners. The proponents of the RMA thesis—that warfare was fundamentally changed in the era of information technology—emphasized the effectiveness of airpower and highly coordinated, maneuverable ground forces would now dominate warfare, popularizing concepts like "network-centric warfare" and "effects-based operations" that emphasized further integration of computer technology into a smaller fighting force.[478] The prospect of maintaining global military preeminence with a smaller force structure and fewer risks to troops was an appealing concept to the Bush Sr. and Clinton administrations seeking to reduce defense spending. Vocal critics of the RMA thesis warned against drawing conclusions from the recent triumph with the worry that an emphasis on technological solutions would hollow out the U.S. military

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[478] See: John Warden III, "The Enemy as a System," *Airpower Journal* 9, no. 1 (Spring 1995): 40–55; Andrew F. Krepinevich Jr., "The Military-Technical Revolution: A Preliminary Assessment" (Washington: Center for Strategic and Budgetary Assessments, 2002); Arthur K. Cebrowski and John Garstka, "Network-Centric Warfare: Its Origin and Future," *Proceedings of the U.S. Naval Institute* 124, no. 1 (1998): 28–35; John Warden III, "The Enemy as a System," *Airpower Journal* 9, no. 1 (Spring 1995): 40–55; Andrew F. Krepinevich Jr., "The Military-Technical Revolution: A Preliminary Assessment" (Washington: Center for Strategic and Budgetary Assessments, 2002); and John Arquilla et al., eds., *In Athena's Camp: Preparing for Conflict in the Information Age*, MR (Series), MR-880-OSD/RC (Santa Monica: RAND Corporation, 1997).

from its traditional role as a fighting force.[479] But the proposition of the RMA movement prevailed across the defense establishment in the 1990s primarily because the RMA doubled down on the successes of the Second Offset Strategy: it offered technological solutions to deeply structural problems facing U.S. policymakers and military strategists.[480]

Events abroad and domestic politics would reshape American defense policy in ways that directly impact military R&D institutions. The Bush and the Clinton administrations were pulled in different directions with no consistent rationale to guide an overarching strategy. The U.S. found itself faced with a number of foreign policy challenges at the end of the Cold War stemming from internal strife across the world. From the former Yugoslavia to Somalia, Sierra Leone, and Haiti, the American military was embroiled in humanitarian interventions. Parallel to these operations, military planners at the DoD and within the Joint Chiefs organized around the concept of engaging in two separate regional

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[479] A small sampling of works surrounding the RMA debate include: Colin S. Gray, *Weapons Don't Make War: Policy, Strategy, and Military Technology*, Modern War Studies (Lawrence: University Press of Kansas, 1993); Eliot A. Cohen, "A Revolution in Warfare," *Foreign Affairs* 75, no. 2 (1996): 37–54; Robert A. Pape, "The Limits of Precision-guided Air Power," *Security Studies* 7, no. 2 (December 1, 1997): 93–114; and Stephen Biddle, *Military Power: Explaining Victory and Defeat in Modern Battle* (Princeton: Princeton University Press, 2006);

Harvey Sapolsky, *US Military Innovation since the Cold War: Creation Without Destruction* (Routledge, 2009); and John Arquilla, "The 'Velvet' Revolution in Military Affairs," *World Policy Journal* 14, no. 4 (1997): 32–43.

[480] Antulio J. Echevarria II, "Restoring the Primacy of Battle: U.S. Military Theory and the RMA," in *Contemporary Military Innovation*, ed. Dima Adamsky and Kjell Inge Bjerga (New York: Routledge, 2017), 51–62.

conflicts with "rogue states" like Iraq, Iran, or North Korea simultaneously.[481] This commitment to maintaining the capability to intervene globally saw a further restructuring of a smaller U.S. force around technology but resulted in a higher level of spending than initially anticipated from the "peace dividend."[482] Despite the resistance of the DoD bureaucracy, there were cuts to defense spending. The active combat forces were downsized by approximately one-third of their high point during the Second Cold War mark. The Navy shed over 270 active ships, the Army was reduced by 22%, and active armed forces personnel overall dropped from 2.1 million in 1991 to 1.4 million by 2000. The Air Force saw the loss of ten tactical air wings but fared much better than the other two primary services, given the new enthusiasm for air powers.[483] These reductions coupled with accelerating globalization resulted in the restructuring of the U.S. defense industrial base with the major consolidation through mergers into ever-larger prime contractors. One side effect of this contraction was that major defense companies became much less inclined to the risks of developing technologies internally without a guaranteed

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[481] Frank N. Schubert, *Other Than War: The American Military Experience and Operations in the Post-Cold War Decade* (Washington: Joint History Office, 2013).

[482] Daniel Wirls, *Irrational Security: The Politics of Defense from Reagan to Obama* (Baltimore: Johns Hopkins University Press, 2010).

[483] See: Naval History and Heritage Command, "US Ship Force Levels," accessed April 15, 2020, http://public1.nhhcaws.local/research/histories/ship-histories/us-ship-force-levels.html; International Institute for Strategic Studies, "United States," *The Military Balance* 100, no. 1 (January 1, 2000): 12–34; and International Institute for Strategic Studies, "The United States," *The Military Balance* 91, no. 1 (January 1, 1991): 12–29.

return on investment from the DoD.[484] As the military budget downsized, Congress initiated the Base Realignment and Closure (BRAC) process to eliminate redundant military installations in the absence of a superpower adversary. For weapons R&D, this had the effect of further consolidating the service research labs into smaller institutions with ever narrower previews.[485] The OSD attempted to address these constraints with an emphasis on identifying the most promising defense technologies through smaller, joint demonstration projects and then choosing amongst these likely candidates.[486] This process turned out to bear few actionable programs by the end of the decade. In addition to all of these dynamics, the Clinton administration also added the layer of encouraging defense contractors to build in "spin-off" applications into their R&D efforts so that the DoD would not be the sole potential customer for their products in the future.[487]

This slew of realignments and the drawdown at the Pentagon resulted in fewer new weapon innovations beyond either incremental improvements of established systems or the accretion of several improved technologies into a novel platform. The improvement of and dissemination across the DoD of precision

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[484] John Deutch, "Consolidation of the U.S. Defense Industrial Base," *Acquisition Review Quarterly*, Fall 2001, 137–50; and "The U.S. Defense Industrial Base: Trends and Current Issues" (Washington: Congressional Research Service, October 27, 2000).

[485] Thomas C. Lassman, *Sources of Weapon Systems Innovation in the Department of Defense*.

486 National Research Council, "Accelerating Technology Transition: Bridging the Valley of Death for Materials and Processes in Defense Systems" (Washington: National Academies Press, 2004).

[487] Linda Weiss, *America Inc.? Innovation and enterprise in the National Security State*, (Ithaca, NY: Cornel University Press, 2014): 129-132.

munitions is a prime example of the first category. While the use of "smart bombs" was featured in the media coverage of the Gulf War, they actually constituted a fraction of the munitions used in the conflict. More common were unguided "dumb" bombs and cluster munitions used against Iraqi armor. By the mid-1990s, they were more plentiful and prevalent in the use of airpower. While laser-guided munitions were developed earlier, they could only be used in clear weather. The solution was a relatively inexpensive kit added to the standard "dumb" bombs developed by McDonnell Douglas named the JDAM or Joint Direct Attack Munition. This was simply the addition of a new set of guidance fins retrofitted to the back of the bomb that used pre-programmed GPS coordinates to guide the munition to the target.[488] Of the many post-Cold War interventions undertaken by the U.S. military, the Kosovo conflict was the most emblematic of the new concepts coming out of the RMA debate and highlighted the use of precision munitions from great altitudes.[489]

The U.S. interventions in the Balkans also highlighted the second category of innovation during this era of combining several improved technologies into a new platform with the example of the Predator drone. UAV technology across the American defense establishment had improved over time but was relatively

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[488] Peter Grier, "The JDAM Revolution," *Air Force Magazine*, September 1, 2006.

[489] William Cohen and Henry Shelton, "Kosovo/Operation Allied Force After-Action Report," Report to Congress (Washington: Department of Defense, January 31, 2000); Michael W. Lamb, "Operation Allied Force: Golden Nuggets for Future Campaigns," Maxwell Paper (Maxwell AFB: Air University Press, August 2002); and Wesley K. Clark, *Waging Modern War: Bosnia, Kosovo, and the Future of Combat* (New York: Public Affairs, 2002).

underdeveloped since its combat debut in Vietnam. This was primarily because the sought-after mission capabilities were met by other technologies. For instance, the development and fielding of stealth technology shielded pilots from the danger of anti-aircraft defenses. The extensive use of satellites for ISR also circumvented the development of drone technology in the 1970s and 1980s by the services with a few joint demonstration programs executed and some development of UAVs by the surveillance arms of the national security community.[490] Conditions in the Bosnian and the Kosovo intervention precipitated the development of the Predator. Serbia upgraded their air defenses imported from their Russian allies. In fact, because the Serbs downed an F-117 stealth fighter, NATO air forces conducted all of their bombings from altitudes high enough to avoid these defenses. The GPS-guided JDAMs were effective at this height against stationary targets. However, for mobile targets, U.S. and allied forces needed real-time intelligence without endangering a pilot.[491]

The saga of the Predator's development is very different than previous "breakthrough" advances in weapons technology. Under the USAF Air Material Command, a unit known as Big Safari had been modifying existing airplanes with existing technology for immediate, special tactical needs since the late 1950s. With links to aerospace manufacturers, the National Reconnaissance Office, the CIA,

[490] Ehrhard, "Air Force UAVs The Secret History."

[491] At this point, Bosnian Serb and Serbian forces were well adept at hiding their equipment from American satellites that only passed over their territory at specific times of the day.

and the other services, Big Safari took on the problem in the Balkans with the rapid development of an unmanned platform that could find mobile targets on the ground and light them up with a laser designator.[492] Then a manned aircraft flying high above could use a laser-guided munition against those targets. The defense company General Atomics had recently expanded from their primary focus on nuclear weapon support services into the field of unmanned aircraft. Their chief designer, Abe Karem, was an Israeli immigrant with military experience during the Yom Kippur war who, through DARPA funding, had developed an unmanned reconnaissance aircraft that General Atomics now handed off to Big Safari for further enhancement.[493] The composite material that made the drone lightweight and increased its endurance was originally developed by NASA. The iconic sensor pod installed on the front of the drone was a modified sensor pod from Navy UH-1N helicopters. The data link that allows for an Air Force pilot to control the MQ-1 on the other side of the world is made possible by satellite uplink originally developed for command and control during the Second Offset. Once the CIA started searching for Osama bin Laden after the bombing of U.S. embassies in Tanzania and Kenya in 1998, the Predator was quickly armed with the smaller, laser-guided Hellfire missile originally developed as an anti-tank munition for the Army's

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[492] Bill Grimes and Colonel Bill Grimes USAF Retired, *The History of Big Safari*, First Edition (Archway Publishing, 2014); and Richard Whittle, *Predator: The Secret Origins of the Drone Revolution*, (New York, NY: Henry Holt and Company, 2015).

[493] Richard Whittle, *Predator: The Secret Origins of the Drone Revolution* (New York: Henry Holt and Co., 2015).

Apache attack helicopter.[494] Clearly, this literal cobbling together of parts from already existing aircraft and defense systems is a far cry from the Manhattan Project or even the strategic development of specific technologies under the Second Offset Strategy.

From the War on Terror to the Resurgence of Geopolitics 2001-2012: Adaptation versus Innovation

America's unipolar moment was quickly punctuated by the terrorist attacks of September 11, 2001, ushering in a different period of security innovations. What is distinct about this era was the expansion of the national security state into other areas of domestic and international life beyond the traditional realm of military politics. Being much closer to the contemporary moment, this history is still being written. But a number of broad characteristics are evident even without the clarity of complete hindsight. First, the belief in technological solutions to political and strategic challenges was a mainstay until events on the ground called this faith into question. Second, military budgets increased, but U.S. armed forces were strained by extensive deployments of a smaller fighting force overall coupled with a high operational tempo. Technological innovations took place within the security services most associated with surveillance: The National Security Administration, the CIA, and the newly minted Department of Homeland Security. Indeed, the emphasis on defense against terrorism shifted focus from inventing new weapons

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[494] *Ibid.* and Arthur Holland Michel, "How Rogue Techies Armed the Predator, Almost Stopped 9/11, and Accidentally Invented Remote War," *WIRED*, December 17, 2015.

to detecting specific threats. As defense outlays increased, spending on R&D rose from $55.3 billion in 2001 to $ 75.1 billion by 2012. The post-World War II defense investment in research peaked in 2009 at $86.9 billion, but this did not represent an overall emphasis on innovation *per se* given that R&D constituted 14.5% of total outlays in 2001 but dropped to 11.8% by 2012.[495] This period is marked by a mixture of adaptation under combat conditions, an attempted shift to concentrate on the expansion of the security state and, therefore, stretching the definition of military innovation.

The incoming George W. Bush administration entered office with the intention to accelerate the trends of the late 1990s and rein in the use of U.S. military power for international interventions. Secretary of Defense Rumsfeld signaled early on that he sought to transform the Pentagon into a leaner, more nimble fighting force by employing more technology. He initiated an aggressive reform program, shifting acquisition requirements away from addressing potential future adversaries towards specifying joint capabilities identified not by the services but by the combat commands fielding U.S. forces.[496] On another front, Secretary Rumsfeld sought to

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[495] Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, https://www.whitehouse.gov/omb/historical-tables/.

[496] Donald Rumsfeld, "Transformation Planning Guidance" (Washington: Department of Defense, April 2003); Keith L. Shimko, "The United States and the RMA: Revolutions Do Not Revolutionize Everything," in *Reassessing the Revolution in Military Affairs: Transformation, Evolution and Lessons Learnt,* ed. Jeffrey Collins and Andrew Futter, Initiatives in Strategic Studies: Issues and Policies (London: Palgrave Macmillan UK, 2015), 16–32; and Jeanne Godfroy et al., *The U.S. Army in the Iraq War – Volume 1: Invasion – Insurgency – Civil War, 2003-2006,* vol. 1, 2 vols. (Carlisle: U.S. Army War College Press, 2019) pp. 5-12.

increase the flexibility of American military power by promoting smaller, highly trained Special Operations Forces over the standard service cores that would respond more rapidly and integrate with air power in ways beyond the AirLand Battle conceptualizations of the 1980s.[497] This approach appeared to be vindicated after the September 11th terrorist attacks and the subsequent U.S. intervention in Afghanistan. With an incredibly light footprint, U.S. special operations forces on the ground embedded with Afghan Northern Alliance coordinated precision airstrikes toppled the Taliban regime in a matter of months.[498] Premised on the idea that the regime of Saddam Hussain was resuming its efforts to acquire weapons of mass destruction and supply these to Al-Qaeda, the U.S. initiated a second war against Iraq in 2003. While larger than the Afghanistan invasion, the initial number of U.S. ground forces was a fraction of the 1991 contingent use for more limited aims. Pressed by Rumsfeld's insistence, the American military utilized precision airstrikes, maneuverability, greater intelligence resources, along integrated command and control to route the Iraqi army and topple the Hussain regime in a matter of weeks.[499] Again, these successes on the battlefield upheld the conviction that technological advances had changed warfighting in the 21st century.

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[497] Donald H. Rumsfeld, "Transforming the Military," *Foreign Affairs* 81, no. 3 (2002): 20–32.

[498] Charles H. Briscoe et al., *Weapon of Choice ARSOF in Afghanistan* (Fort Leavenworth: Combat Studies Institute Press, 2003); and Richard W. Stewart, *Operation ENDURING FREEDOM: The United States Army in Afghanistan, October 2001-March 2002* (Washington: U.S. Army Center of Military History, 2004).

[499] Godfroy et al., *The U.S. Army in the Iraq War*

The American reaction to the Al-Qaeda attacks involved an expansion of the security apparatus domestically and internationally. This growth in the national security state would have implications for innovation as well. Established in 2002, the Department of Homeland Security was an amalgamation of over twenty previously separate federal departments and agencies. This mega-department would encompass border protection, defense against cyberattack, emergency response, protection against weapons of mass destruction, support for first responders, coordination of state-local emergency response, and analysis of homeland security intelligence.[500] For their part, the National Security Agency (NSA) concerned with electronic communications would expand its scope to include the screening of communications for possible terrorist planning.[501] These initiatives would result in technological innovations in the fields of big data analytics, cyberwarfare, improved sensors for border screening, and intelligence gathering. However, this took a good amount of R&D for national security out of the remit of the DoD. At the same time, the CIA was evolving towards paramilitary operations as it was highly involved in the initial invasions of Afghanistan and Iraq.[502] The U.S. spy agency also took the lead on counterterrorism operations

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[500] George W. Bush, "Proposal for the Department of Homeland Security" (Washington: The White House, June 2002).

[501] Department of Defense et al., "Unclassified Report on the President's Surveillance Program" (Washington: Offices of Inspector Generals, July 10, 2009).

[502] Winston T.H. Koh, "Terrorism and its impact on economic growth and technological innovation," *Technological Forecasting and Social Change* 74, no. 2 (Feb. 2007): 135.

outside of declared combat zones and drove the clandestine use of drone strikes in Pakistan, Yemen, and Somalia.

During this period of modernization, there were technical improvements to the deployed fleet of UAVs and innovations in autonomous drones. By 2007 General Atomics improved on their initial design of the Predator with the introduction of the larger MQ-9 Reaper for use by the USAF and CIA in their counterterrorism campaigns. The Reaper boasted greater range, loiter time, and capacity for munitions than its predecessor. Improvements to the sensors packages on each platform, including optical, infrared, and electronic tracking, enabled these fleets to collect incredible amounts of intelligence data, including thousands of hours of video and intercepts of mobile phone communications.[503] This data enabled the CIA to build a threat matrix or digital map of terror networks with individual targets associated with geolocated houses, specific cell phones, associated vehicles, and patterns of behavior that then informed future targeting decisions.[504] Taken individually, these military technologies were not unprecedented in and of themselves, but the fusion of them together captured the wider public's attention as a groundbreaking step in the future of warfare. More

[503] U.S. Air Force, "MQ-9 Reaper Fact Sheet," U.S. Air Force, accessed May 4, 2021; U.S. Air Force, "MQ-1B Predator Fact Sheet," U.S. Air Force, accessed May 4, 2021.

[504] Department of Defense, "Selected Acquisition Report: MQ-9 Reaper Unmanned Aircraft System" (Washington: Defense Acquisition Management and Information Retrieval, March 23, 2016).

"game-changing" innovations were taking place within the Pentagon behind the scenes.

There is a normal tension between technological *adaptation* for conflicts at hand and the model for innovation that structures R&D around *anticipated* threats. This tension was illustrated in the dynamics of the War on Terror period.[505] The mantra of joint operations and "jointness" spawned by Goldwater-Nichols reforms in the late 1980s and its resurgence under Rumsfeld's transformation initiatives were now extended to the development of new weapons. By the late 1990s, the DoD initiated a number of programs to create unmanned aircraft for high altitude surveillance and tactical purposes across the traditional boundaries of the services.[506] This was most evident in the Joint Unmanned Combat Air System (J-UCAS) that wedded the aspirations from the USAF and the Navy for an unmanned aircraft that could serve both intelligence and strike functions in more contested environments air environments than what was faced by Predators in the War on Terror. Organized by DARPA, this initiative produced a number of stealthy prototypes that operated autonomously. Meanwhile, the Air Force sought to modernize their fleet, replacing F-15 and F-16 fighters and B-1 bombers with a new suite of stealthy aircraft like the F-22 and F-35 joint strike fighter. For its part, the Army embarked on a modernization program of its own, anticipating a new

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[505] Adamsky and Inge Bjerga, *Contemporary Military Innovation.*

[506] Ehrhard, "Air Force UAVs The Secret History." pp. 46-57.

operating environment where manned and unmanned vehicles would coordinate in a highly networked battlespace. Under the moniker of the Future Combat System, new technologies were sought, and a host of interrelated technology development programs were launched under this new operating concept.

The wars in Iraq and Afghanistan had shifted from regime change to counterterrorism and counterinsurgency in the face of violent factionalism in both countries. This put an enormous strain on the smaller forces fielded by Rumsfeld's insistence on an RMA informed strategy. Certainly, the Iraq insurgency, in particular, embroiled the Army and Marines in a difficult and frustrating campaign. U.S. casualties rose as insurgents employed remote-controlled roadside bombs and other improvised explosive devices (IEDs).[507] In order to adapt, U.S. forces applied technology to their warfighting with a number of crash programs. The first added armor to their vehicles with the creation of MRAPS (mine-resistant, armored vehicles) quickly manufactured and deployed. The next was the effort to detect and counter IEDs under the aegis of the Joint Improvised Explosive Device Defeat Organization (JIEDDO) that fielded a plethora of counter-IED technologies. In order to regain the initiative in counterinsurgency operations, the Human Terrain System was initiated. This program embedded American sociologists and anthropologists with combat teams to integrate sociocultural data into

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[507] Geraint Hughes, "The Military's Role in Counterterrorism: Examples and Implications for Liberal Democracies," The Letort Papers (Carlisle: U.S. Army War College Strategic Studies Institute, May 1, 2011); and Godfroy et al., *The U.S. Army in the Iraq*.

counterinsurgency operations, infusing military intelligence systems with modern social sciences insights.[508] All of these efforts proved only marginally effective in overcoming the challenges of counterinsurgency and counterterrorism operations, only bolstering the growing disenchantment with the RMA thesis across the defense establishment.

As the Pentagon struggled to meet the challenges of two insurgencies and a continued worldwide counterterrorism campaign, influential strategists across the defense establishment grew concerned about the growing power of other states (primarily Russia and China) that could potentially match the U.S. military capabilities in the near future. This nascent concern over near-peer military competition spurred some continued technological developments. However, programs that sought to innovate to address anticipated these strategic challenges floundered in the 2000s as the War on Terror, the war in Iraq, and the insurgency in Afghanistan metastasized. The price tag of the adaptations detailed above, coupled with increasing costs of sending ever more troops into combat zones, crowded out other modernization programs. The J-UCAS and funding for a full contingent of expensive F-22 fighters to replace the USAF's aging fleet came under pressure. Congressional scrutiny of J-UCAS in the context of a stretched-thin

[508] Thomas B Smith and Marc Tranchemontagne, "The Enduring Value of Technical and Forensic Exploitation," *Joint Forces Quarterly* 75 (2014): 122–28; HASC Subcommittee on Oversight & Investigations, "The Joint Improvised Explosive Device Defeat Organization: DOD's Fight Against IEDs Today and Tomorrow" (Washington: U.S. House of Representatives, November 2008); and Brian R Price, "Human Terrain at the Crossroads," *Joint Forces Quarterly* 87 (2017): 69–75.

defense budget broke the program up into two separate endeavors under the Navy and the Air Force. The Navy continued their efforts given that the defense contractor Northrop Grumman had produced two successor prototypes, the X-47B.[509] As mentioned before, by 2015, this drone performed a number of technically difficult maneuvers completely autonomously. However, seeing the writing on the wall, the Navy demurred on going further with this program, anticipating no budgetary support from congress. Instead, U.S. naval airpower segued the technology into developing an unmanned air refueling platform.[510] In the case of the F-22, Rumsfeld's successor, Defense Secretary Gates, lambasted the high-tech and high-priced aircraft, cutting the number of fighters acquired to only one-fourth of the original number envisioned.[511] After six years under development, the Army's Future Combat Systems program had incurred a hefty price tag in the billions of dollars with little progress to show for it. This modernization program was unceremoniously axed by congress in 2009.[512]

Themes in the Historical Narrative

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[509] Northrop-Grumman, "X-47B UCAS Makes Aviation History…Again!," accessed September 20, 2017, https://www.northropgrumman.com/Capabilities/X47BUCAS/Pages/default.aspx; and John Tirpak, "Towards an Unmanned Bomber," *Air Force Magazine*, June 2005.

[510] Sandra I. Erwin, "Northrop Grumman's Naval Combat Drones Get Lifeline," *National Defense*, July 8, 2015.

[511] John A. Tirpak, "Gates versus the Air Force," *Air Force Magazine*, March 1, 2014.

[512] Andrew Feickert, "The Army's Future Combat System (FCS): Background and Issues for Congress" (Washington: Congressional Research Service, October 11, 2007).

This condensed historiography of innovation provides an overarching appreciation for the stability of ideas within the U.S. military about how technology ought to be conceived and generated in the interests of defending national interests. The historical context undergirding this expectation offers some insight into the contemporary rational behind the DoD development of autonomous weapons technologies. But before turning my focus to the contemporary instance of the *innovation imperative* in the next chapter, I will detail the common themes across these different eras of American military technology.

There are four general themes across the historical narrative detailed above that echo in the contemporary discussion about developing autonomous weapons within the U.S. defense enterprise. One overriding motif is that of techno-optimism. That is the conviction that American society can always rely on the invention of technological solutions to tricky tactical, strategic, and political problems. Some attribute this techno-optimism to American society and culture in general. However, the fact that the U.S. is a dominant military power is somewhat baked into the ontological security and self-imagery of the popular culture that feeds this tendency. While it is beyond the scope of this dissertation to determine if the wider American culture feeds the U.S. defense establishment's fielding of advanced technology or vice versa, it is sufficient to note that faith in technology as a solution to various challenges is a strikingly distinct feature of American military culture. It should be said, techno-optimism is not universal or always as pronounced in the U.S. military. For obvious reasons, the Navy and Air Force are two services with a foundation in technology to sustain their operations in their domains. In order to fight at sea, one has to develop maritime technologies. Similarly, with the advent of the airplane and subsequent improvements spurred by military demand, the Air Force is a service dependent on technology. Thus, strategists from these branches of the military are much more susceptible to enthusiasm for high-tech weaponry that officers from traditional soldiering backgrounds like the Army or Marines. Evident in the examples of Vietnam, Iraq, and Afghanistan the U.S. military's love affair with technological approaches to warfare can also slip into disillusion that varies by service.

The historical foundation for this belief is echoed in the second theme: appeals to a singular technical achievement in the past. To be specific, rhetorical appeals to emulate a "Manhattan Project" addressing a particular challenge or a "moonshot" effort to gain a specific capability are ubiquitous in much of the strategic discourse. What is interesting is that these allusions to particular examples in America's technological history are made in wildly different institutional contexts towards distinctly tailored ends.[513] While this pervasive idea feeds the first theme of techno-optimism, it is less utopian in its expression. It shares the sense that technological advance can be equated with social progress when the idea of progress is conflated with the success of America in the world. However, these

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[513] For example, the JIEDDO project referenced previously was referred to at the time as a "Manhattan Project" to develop technologies to protect troops in Iraq from IEDs. While this was an expensive effort in the midst of a counterinsurgency war, the scope, institutional remit, and strategic impact was well below the resources expended to develop the first atomic bomb.

evocations of previous achievements are typically deployed in the face of international political challenges. In order to overcome the dire consequences of nuclear escalation in Central Europe, the Defense Department needed a new "Manhattan Project" of the Second Offset strategy to develop new technological solutions around the problem. This relates to a trend consider below about the institutional trajectory within the security establishment.

This misapplication of historical analogies is mirrored in a third theme of applying the strategic logic of nuclear deterrence to very conventional circumstances. The logic behind pressing for ever more advanced weaponry is grounded in the technological overmatch thesis: that with qualitatively superior arms, the U.S. can avert open war through the plausible, often implicit threat of destruction. Such a logic is fundamentally based in deterrence theory developed during the early Cold War in the particular historical context where the exceptional features were the U.S. advantage in nuclear weapons and the fact that their destructive power rendered them unusable except as extreme threats. After the successes of the Second Offset and amplified by the triumph of the Gulf War, American strategy focused on *conventional deterrence* applying the same logic of threat to avoid conflict. But this necessitates the maintenance of technological supremacy over all potential rivals across all forms of warfighting with no rational exit ramp from this dynamic. Thus, military innovation becomes a strategic end in itself rather than a means to a strategic end. In theory, deterrence by punishment also involves clear communication or signaling between the possessor of overwhelming destructive capabilities and the target to be dissuaded from taking an unwanted action or use of military power. It seeks to constrain other states from taking actions that damage the national interests of the threatening party. The historical example of the U.S. defense establishment's crusade to maintain enough military power credibly across different regions of the globe is that the logic of deterrence is, in the first instance, an *internal* dialog. In other words, in order to build a military force in advance a future dynamic between potential belligerents. To answer pertinent questions like how much of a threat is enough to deter, the U.S.—even under the rubric of conventional deterrence—envisions a forecast of how a target state would respond. It may seem rudimentary to describe deterrence in this sense, but it is necessary to emphasize that in either its nuclear or conventional variants, deterrence is at base *hypothetical* as a projection into the future. Nuclear deterrence theorist recognized how this constraint leads national security practitioners to "mirror-image" anticipated adversary responses and miscalculate the technological capabilities needed to counter a nuclear competitor.[514] In the historiography, there is less reflection on these hazards while

[514] Robert Jervis, *Perception and Misperception in International Politics: New Edition*, Revised edition (Princeton, New Jersey: Princeton University Press, 2017) pp. 32-106 and 343-355; Robert Jervis, "Rational Deterrence: Theory and Evidence," *World Politics* 41, no. 2 (January 1989): 183–207; Jeffrey. Lantis, "Strategic Culture and Tailored Deterrence: Bridging the Gap between Theory and Practice," *Contemporary Security Policy* 30, no. 3 (December 1, 2009): 467–85; Peter Vincent Pry, "Ideology as a Factor in Deterrence," *Comparative Strategy* 31, no. 2 (April 1, 2012): 111–46; Anastasia Filippidou, "Deterrence: Concepts and Approaches for Current and Emerging Threats," in *Deterrence: Concepts and Approaches for Current and Emerging Threats*, ed. Anastasia Filippidou, Advanced Sciences and Technologies for Security Applications (Cham: Springer International Publishing, 2020), 1–18.

employing conventional deterrence by punishment. Indeed, the track record of conventional deterrence is mixed at best in the post-Cold War era.

A fourth theme evident from the historical narrative is a recurring vacillation between technological superiority on the one and the fear of catastrophic shortfall in capabilities on the other. This historical theme is a paradoxical combination of hubris that exquisitely designed weapons assure global military dominance of any contender and a perpetual sense of crisis that America is falling behind other previously backward powers in innovation. The historical pattern, at least in the official narrative, is one where the U.S. overcomes its disadvantages through ingenuity only to find itself stymied and playing the role of the underdog against a cunning adversary. This dynamic reinforces the drive towards more advanced weapons but, again never resolved into a satisfying equilibrium. There is always a pending crisis of falling behind as the potential underdog status despite the present technological preeminence.

Three trends, understood as concrete outcomes rather than habits of thought, are in some ways bolstered by these themes but also cut across the grain of these motifs in other instances. The re-emergence of great power competition in the contemporary moment demonstrates the American bias for framing warfare around high intensity conflicts where the belligerents are clearly delineated states engaging each other's military forces. When U.S. forces find themselves in low-intensity conflicts like counterinsurgency and even counterterrorism operations, the technological approach to warfare is marginally less effective. This observation is confirmed by the examples of Vietnam and Iraq where the American overconfidence in its high-tech approach was severely tested by insurgencies employing low-tech weaponry. This trend suggests that the mantra of maintaining technological superiority is sound advice for potential state versus state military engagements but technology will fall short in instances of non-traditional warfare.

Another trend across the historical record is the migration of technological development out of the hands of public defense institutions and into the preview of private defense contractors. The perennial question of how to divide the labor between R&D and production has settled into a form of government supported innovation wedded to the manufacturing process. In this way the innovation units of the Pentagon (DARPA, the Defense Innovation Unit, or the *ad hoc* programs like J-UCAS and JIEDDO) are adjuncts to defense companies contracted to do the actual innovation. The steady evolution from the proliferation of hybrid FFRDCs, the increasing truncation of the research labs, and the consolidation of the defense industrial base through mergers has left the U.S. in a position where it is forced into an expensive strategy of technological competition. Evident in this narrative is an incentive structure for defense companies to develop expensive, single source, platform-based weapon systems that are "too big to fail" for both the interests of the service and for the maintenance of strategic manufacturing resources.[515]

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[515] A familiar concern over expanding cost for weapons platforms is the principal motive for acquisitions reform. See: Fox, *Defense Acquisition Reform, 1960-2009;* Brown, ed., *Providing the Means of War: Perspectives on Defense Acquisition 1945–2000*); and John Deutch,

This leads to the final trend of marginal returns for increasing defense spending that has spiraled out of control of any one institutional actor. While spending on R&D as a portion of the overall defense budget has stabilized, the investment in evermore baroque weapon systems and the needs of a strategy based on technological overmatch demand more marginal investments to maintain that edge. As the cost per unit of each weapon system increases and the fixed costs of maintaining each platform expands the aggregate fixed cost, the investment of each defense dollar yields [516] Despite public perceptions, the procurement of new weaponry, even when the R&D cost are added in, the does not even account for the lion's share of military spending. The greatest portion of the U.S. defense budget is dedicated to the personnel to use these weapons and the maintenance cost of fielding a high-tech fighting force on a global scale. The resulting trend is a lower marginal return of security for each defense dollar spent that is beyond the control of any one institutional actor—the President, the Secretary of Defense, the U.S. congress, the American electorate, or even the Pentagon bureaucracy charged with reducing costs. But the commitment to a strategy founded on the principle of technological dominance demands ever more innovation and precipitation of

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"Consolidation of the U.S. Defense Industrial Base," *Acquisition Review Quarterly*, Fall 2001, 137–50.

[516] David L. I. Kirkpatrick, "Trends in the Costs of Weapon Systems and the Consequences," *Defence and Peace Economics*, Defence and Peace Economics, 15, no. 3 (2004): 259–73.

spiraling costs.[517] Meanwhile, if adversaries develop countermeasures that cost a fraction of the per unit cost, then the use of military force quickly devolves into a competition over who can outspend the other.[518]

The historical narrative outlined in this chapter gives us the sense of how the American military developed its concept of overmatch through technological advance. In the next chapter I will consider in-depth the U.S. defense establishment's response to Russia and China's resurgent military prowess via the Third Offset strategy launched by the Obama administration as a rapid modernization program aimed to address this new competition. Put simply, the nomenclature of a "Third Offset Strategy" always suggested two previous iterations by its very name reflecting the importance of this historical framework to present expression of military norms.

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517 Robert M. Gates, "A Balanced Strategy: Reprogramming the Pentagon for a New Age," *Foreign Affairs* 88, no. 1 (2009): 28–40.

518 For example, the famously expensive F-35 fighter jet has a per unit cost of $78 million. If it can reasonably be felled by a Russian S-400 air defense system with a unit cost of roughly $5 million per missile, then the U.S. cannot expect to outspend that adversary. In an extreme example, China's anti-ship ballistic missile the DF-26 (with a per unit cost estimated at $10 million) is designed to sink American aircraft carriers (the latest Gerald Ford class carrier costing nearly $13 billion.) See: Jeff Becker, "When It Comes to Missiles, Don't Copy Russia and China — Leapfrog Them," War on the Rocks, June 30, 2020, https://warontherocks.com/2020/06/when-it-comes-to-missiles-dont-copy-russia-and-china-leapfrog-them/; Government Accountability Office, "F-35 Sustainment: DOD Needs to Cut Billions in Estimated Costs to Achieve Affordability" (Washington: General Accounting Office, July 2021), https://www.gao.gov/assets/gao-21-439.pdf.

Table 5.1: US Defense Innovation Timeline 1939-2017

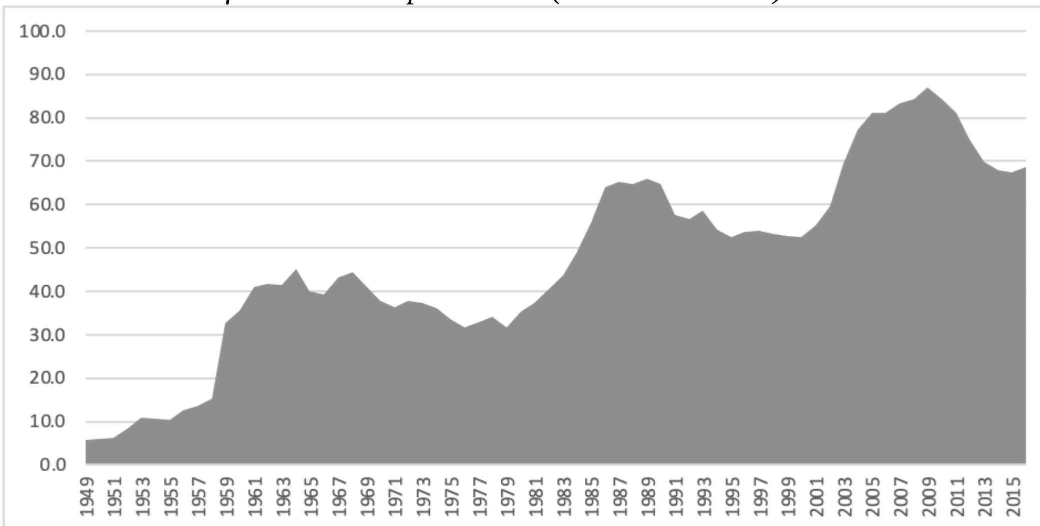
Date	Milestone
Big Science Era	
12/2/39	Einstein-Szilard letter to FDR on the feasibility of nuclear weapons and related advances by German scientists
12/17/39	Nuclear fission of heavy elements discovered by German Otto Hahn
12/7/41	US enters World War II
7/16/45	1st A-Bomb test (Trinity)
8/6/45	Hiroshima: First use of a nuclear weapon (fission bomb)
8/9/45	Nagasaki: Last use of a nuclear weapon
9/2/45	Japan surrenders marking the end of World War II
9/20/45	Air Force Cambridge Research Laboratories established by the Army Air Force to develop radar and air traffic control
10/24/45	United Nations founded
2/22/46	Kennan's Long Telegram on Soviet expansionism serves as the basis for containment policy
5/14/46	Baruch Plan: Attempt to internationalize the control of nuclear weapons at the UN fails
8/1/46	Office of Naval Research established (relegating the older Naval Research Lab to an adjunct position)
8/1/46	Foundation of the Atomic Energy Commission: in charge of peaceful development of nuclear power as well as development of weapons technology
7/26/47	National Security Act of 1947 (Establishment of the Air Force, Department of Defense, Joint Chiefs of Staff, and the CIA)
5/14/48	Establishment of RAND
6/24/48	Berlin Blockade
4/4/49	NATO founded
8/29/49	1st Soviet A-bomb test (Pervaya Molniya)
10/30/49	Report by the General Advisory Committee to the US Atomic Energy Commission advises against developing the hydrogen bomb
4/14/50	NSC 68: codifies Truman Doctrine and containment
6/25/50	North Korean Invasion of SK
6/25/50	UN Security Council Resolution 82 (US enters Korean War)
11/1/52	1st H-Bomb test: Ivy Mike (fusion bomb)
1/20/53	Start of the Eisenhower Admin.
3/5/53	Death of Stalin
6/8/53	Project Solarium: Wide ranging discussion within the Eisenhower admin. about options to counter Soviet threat.
7/27/53	End of the Korean War
8/12/53	1st Soviet H-bomb test
9/8/53	Start of Khrushchev Admin.
10/30/53	NSC 162/2 (codified the findings of Project Solarium)
1/12/54	Dulles Massive Retaliation speech: start of the New Look
1/21/54	First nuclear-powered submarine launched, the USS Nautilus
5/14/55	Warsaw Pact founded
7/18/55	Eisenhower proposes Open Skies at Geneva Summit
9/20/56	Defense Science Board Established
7/29/57	Establishment of the International Atomic Energy Agency under the "Atoms for Peace" initiative
Sputnik Era	

8/21/57	1st Soviet ICBM (R-7)
10/4/57	Launch of Sputnik
2/7/58	Establishment of DARPA
7/29/58	Establishment of NASA
9/2/58	National Defense Education Act
11/28/58	1st US ICBM (Atlas)
9/14/59	Luna 2: First Soviet unmanned moon landing
4/13/60	NAVSTAR (GPS) first deployed for the US Navy with the launch of the Transit 1B satellite
7/20/60	1st SLBM (Polaris)
1/20/61	Start of the Kennedy Admin.
4/12/61	1st man in space (Gagarin, Soviet)
5/25/61	Kennedy's Announcement to Congress: call for moon landing
6/4/61	Berlin Crisis: Soviet ultimatum that Western forces withdraw from West Berlin
6/4/61	Vienna Summit: Crisis management between Khrushchev and Kennedy over Berlin, Laos and Bay of Pigs Invasion
11/25/61	First nuclear-powered aircraft carrier USS Enterprise commissions for the US Navy
4/26/62	Ranger 4: First US unmanned moon landing
10/6/62	Start of the Cuban Missile Crisis
5/15/63	1st Soviet SLBM (R-21)
Managed Competition Era	
8/5/63	Limited Test Ban Treaty (LTBT)
11/22/63	Beginning of the Johnson admin.
10/4/64	Start of Brezhnev Admin.
3/8/65	First American combat troops committed to South Vietnam
9/16/66	Start of Operation Igloo White: first attempt to integrate electronic sensor with fire control and air attack to seal off the Ho Chi Min trail in South Vietnam
1/27/67	Outer Space Treaty
8/16/68	First flight of a US Minuteman III missile (first MIRV capable ICBM)
1/20/69	Beginning of the Nixon admin.
7/1/69	Nuclear Non-Proliferation Treaty signed: start of Détente
7/20/69	Apollo: First manned moon landing (US wins the space race)
10/29/69	First message sent view the Advanced Research Projects Agency Network (ARPANET) launched by DARPA: precursor to the world wide web and internet
2/11/71	Seabed Arms Control Treaty
5/13/72	US Air Force destroys the Dragon's Jaw bridge in North Vietnam with PAVE laser guided bombs: First combat demonstration of precision bombing
5/26/72	Anti-Ballistic Missile (ABM) Treaty
7/1/72	Strategic Arms Limitation Talks (SALT I)
1/27/73	Paris Peace Accords signed (US withdrawal from Vietnam)
6/22/73	Agreement on the Prevention of Nuclear War: non-binding agreement between the US and USSR to reduce threats and exhibit military restraint
7/1/73	Army Training and Doctrine Command (TRADOC) established in the wake of Vietnam in the interests of professionalization
7/1/73	US draft eliminated: US military becomes an all-volunteer force
10/6/73	Yom Kippur War: demonstrates the new vulnerabilities of advanced armor and aircraft
7/3/74	Threshold Test Ban Treaty (TTBT)
8/9/74	Beginning of the Ford admin.
9/1/75	Helsinki Accords signed: Creation of Conference on Security and Co-operation in Europe

5/28/76	Peaceful Nuclear Explosions Treaty (PNET)
12/1/76	Team B report: Second guessing of the CIA and claim of Soviet nuclear parity/superiority
1/1/77	First deployment of the Tomahawk ALCM: First standoff weapon incorporating new technology into established platforms
1/20/77	Beginning of the Carter admin. (Harold Brown starts as SecDef)
6/18/79	Strategic Arms Limitation Talks II (SALT II)
Second Cold War Era	
12/24/79	Soviet invasion of Afghanistan: end of Détente
7/25/80	Presidential Directive 59 (countervailing strategy)
1/20/81	Start of Reagan Admin.
4/15/81	Passing of Reagan's increased Defense appropriations/arms buildup: start of the Second Cold War
4/25/81	First Aegis cruiser enters service: USS Ticonderoga
6/18/81	First flight of F-117 stealth fighter
11/10/82	Start of Andropov Admin.
1/22/83	First US Aegis missile cruiser USS Ticonderoga launches
4/23/83	Reagan’s SDI (Star Wars) Speech
10/1/83	F-117 Nighthawk enters service: first stealth attack aircraft and product of the second offset
11/7/83	Abel Archer command post exercise
10/4/86	Goldwater-Nichols Act: Re-organization of DoD in response to several procurement scandals. Strengthened JCS over service heads and led to shared procurement between the services.
10/11/86	Reykjavík Summit: potential elimination of all nuclear weapons scuttled due to Reagan's insistence on SDI but resulted eventually in the INF treaty
4/16/87	Missile Technology Control Regime (MTCR)
12/8/87	Intermediate-Range Nuclear Forces Treaty
1/20/89	Beginning of the Bush admin.
12/9/89	Fall of Communism in Eastern Europe
8/2/90	Start of the Gulf War: Operation Desert Shield
1/15/91	First Joint Surveillance Target Attack Radar System (JSTARS) deployed for battle management, command and control
2/28/91	End of the Gulf War: Operation Desert Storm
7/31/91	Strategic Arms Reduction Treaty I (START I)
Retrenchment Era	
12/25/91	Collapse of the Soviet Union
3/24/92	Open Skies Treaty
4/6/92	Start of the Bosnian War
10/1/92	Army Research Laboratory established out of a consolidation of research units as a result of Base Realignment and Closure (BRAC) process
1/3/93	Strategic Arms Reduction Treaty II (START II)
1/20/93	Beginning of the Clinton admin.
7/3/94	Inaugural flight of MQ-1 (Predator)
7/8/95	Predators first combat deployment (Bosnia)
8/30/95	NATO air involvement in Bosnian War: Operation Deliberate Force
10/31/97	Air Force research lab consolidated into the Air Force Research Laboratory after Goldwater-Nichols and budget pressures of the 1990s
6/24/98	Joint Direct Attach Munition (JDAM) kits introduced by Boeing (GPS guided): Exponential increase in precision weapons available to US military
8/7/98	Al-Qaeda terrorist attack on US embassies in Kenya and Tanzania

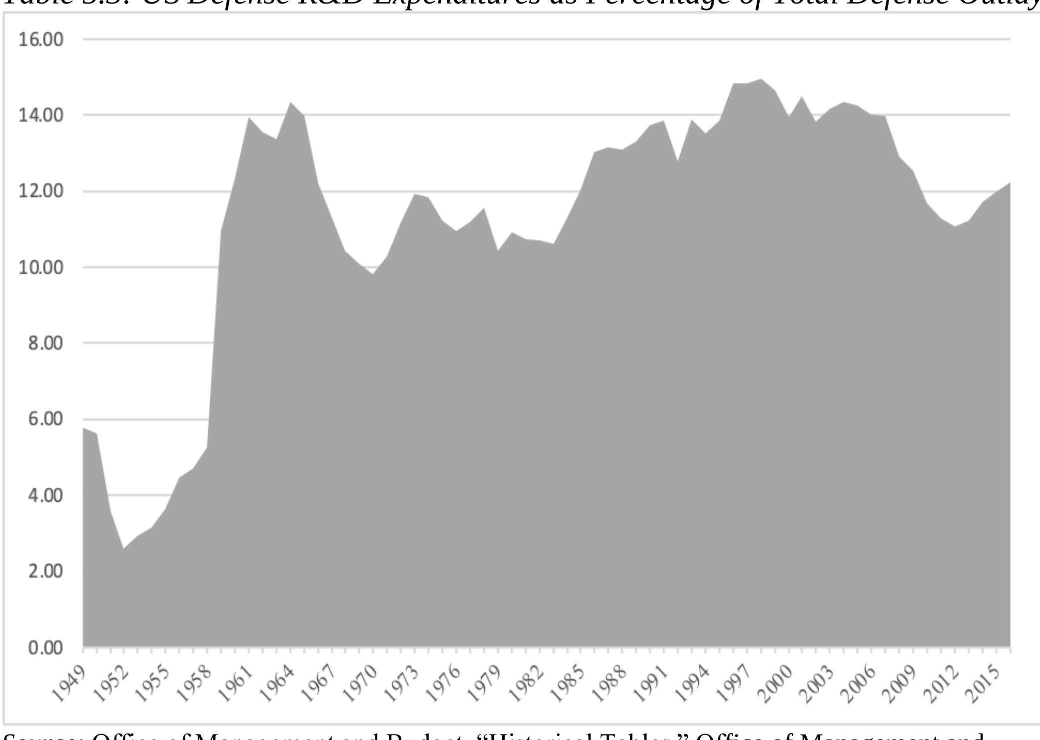
8/20/98	Operation Infinite Reach (US response to Al-Qaida with cruise missile strikes in Sudan and Afghanistan)
1/20/01	Beginning of the GW Bush admin.
2/16/01	Arming of MQ-1 with a Hellfire
War on Terror Era	
9/11/01	Al-Qaeda terrorist attack on New York, Washington DC, and Pennsylvania
10/7/01	First drone strike in Afghanistan
5/22/02	Initial flight of X-45 (partially autonomous)
5/24/02	Strategic Offensive Reductions Treaty (SORT)
11/5/02	First drone strike in Yemen (CIA)
11/25/02	International Code of Conduct against Ballistic Missile Proliferation (ICOC)
6/17/04	First drone strikes in Pakistan (CIA)
1/1/07	First drone strike in Somalia (CIA)
5/1/07	Upgraded MQ-9 (Reaper) enters service with the USAF
1/20/09	Beginning of the Obama admin.
7/1/09	Code Pink: Killer Robots Campaign Starts
9/1/09	Foundation of the International Committee for Robot Arms Control (ICRAC): NGO calling for a ban on AWS
4/8/10	New START (Strategic Arms Reduction Treaty)
9/15/10	Apex of drone strikes in Pakistan
7/19/12	DBS Autonomy Report: alludes to peer competition and need for autonomy to counter A2/AD threats
9/30/12	Killing of Anwar al-Awlaki: first US citizen targeted by drone strike
10/19/12	Foundation of Campaign To Stop Killer Robots: Coalition of existing NGOs coordinates activism against AWS development
11/12/12	DoD Directive 3000.09: outlines US military approach to autonomy in weapons systems
11/19/12	Losing Humanity published: Report from Human Rights Watch start the campaign calling for an international ban on AWS
7/10/13	Autonomous take off/landing of X-47B
7/26/13	UN General Assembly Advisory Board on Disarmament Matters calls for the UN Convention on Certain Conventional Weapons to take up the issue of autonomous weapons (Report A/68/206)
11/14/13	Start of diplomatic discussions concerning Lethal Autonomous Weapon Systems (LAWS) at UN CCCW
3/1/14	Foundation of the Future of Life Institute: Leading experts on AI call for limits on AWS and warn of the dangers of AI
11/15/14	Start of the third offset: Speech by SecDef Hagel at Reagan National Defense Forum calls for a "Third Offset" strategy
4/23/15	Drone strike kills 2 hostages (1 Italian, 1 American)
7/28/15	Open letter from leading computer scientists and AI experts calls for a ban on autonomous weapons
6/10/16	DBD Summer Study on Autonomy
7/1/16	Obama administration releases drone strike data
7/15/16	Overall apex of Obama era drone strikes (Af/Pak+Yemen+Somalia)
1/20/17	Beginning of the Trump admin.

Table 5.2: US Defense R&D Expenditures (in 2012 $ billion)



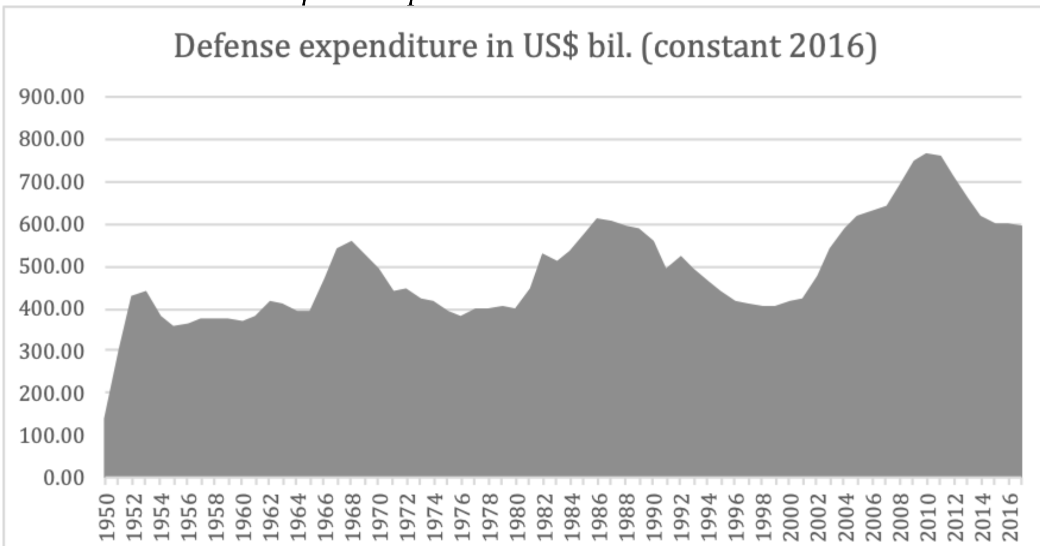
Source: Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, *https://www.whitehouse.gov/omb/historical-tables/*

Table 5.3: US Defense R&D Expenditures as Percentage of Total Defense Outlays



Source: Office of Management and Budget, "Historical Tables," Office of Management and Budget, The White House, accessed February 19, 2019, *https://www.whitehouse.gov/omb/historical-tables/***.**

Table 5.4: Total US Defense Expenditure



Source: Stockholm International Peace Institute, "SIPRI Military Expenditure Database," accessed February 19, 2019, *https://www.sipri.org/databases/milex*.

Chapter 6 The Duty to Innovate and Collective Prophesy: Autonomous Weapons and the Strategic Imaginary

"Finally, there is the mother of all technologies, artificial intelligence, where machines are actually developing the capacity to learn and to reason. There's lots of ethical and moral issues associated with all these technologies and especially in their application to warfare, but there's no doubt in my mind that the combination of geopolitical, societal, natural, economic, and technological change is rapidly converging in time and space and will likely result in the most significant and profound change in the character of war we have ever witnessed throughout all of recorded history."

General Mark A. Milley, Chief of Staff: United States Army[519]

In the last chapter, the U.S. defense community's self-regarding history provided a baseline understanding of the existing innovation strategy to secure the American-led global order during the Cold War and beyond. This chapter delves deeper into the present. Here the focus is on how strategic logic born from previous experience extends to the present, leading to the *innovation imperative* norm within the U.S. military. The norm in question is oriented towards an anticipated future security environment, and these projected imaginaries propel the effort to develop autonomous weapons across the American defense establishment.

First, let me situate the subject of this chapter in terms of the arc of my argument. Technology is bound up in the politics of the modern world. It impacts the political interactions between actors, and technology is often significant for the security politics between actors at different levels of analysis. At the same time, military technologies do not appear out of thin air. For emerging weapons, the

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[519] Mark A. Milley, "Remarks at the Dwight David Eisenhower Luncheon" (Association of the United States Army, Washington, D.C., October 4, 2016. General Milley would go on to become the Chairman of the U.S. Joint Chiefs of Staff in 2018.

impetus for their development and the decisions to commit resources to produce them are shaped by many factors. The international political context is one of these factors for advanced military powers. This context is built around social interactions between actors and their common understandings, expectations, identities, and behaviors that these interactions produce. From the constructivist perspective, the parameters of the relations between international actors are shaped by norms: "a standard of appropriate behavior for actors with a given identity."[520] Chapter four recounted how the global arms control discussion specific to autonomous weapons resulted in a norm to maintain human control over the technology. This chapter explores the countervailing norm that drives the development of these weapons. What is problematic in the case of autonomous weapons is that both the technology and the norms around them are emerging simultaneously.

As a consequence, the nascent *meaningful human control* norm and the countervailing *innovation imperative* norm common within global security culture are both speculative. Regardless of the effort by all actors involved in the discourse to responsibly make plausible predictions about the future, the present controversy is fueled by a projection into the future. These two sets of norms collide more out of a difference in how each group of actors extrapolates how the technology will shape the future. At the same time, these forecasts of the future security

[520] *Op. cit.*, Finnemore and Sikkink, "International Norm Dynamics and Political Change," pp. 891.

environment shape the parameters of weapons innovation. This fact motivates the analytic step to use the concept of the imaginary in the specific context of strategic defense planning of the most advanced military on the globe. Indeed, the strategic imaginary is a common feature for most militaries—especially one as dependent on technological overmatch as the U.S.

The focus of this chapter is the particular American military's expression of the innovation norm in order to address security challenges and the attendant strategic imaginary surrounding the emerging development of autonomous weapon systems (AWS) to counter future threats. While a number of alternative options are undoubtedly available to national armed forces in the face of strategic challenges, the U.S. military's goal is to maintain dominance over any and all potential foes via innovation in weapons technology in the post-9/11 era. The most recent manifestation of this inclination towards technological innovation was the DoD's "Third Offset strategy." This initiative, publicized by Secretary of Defense Chuck Hegel in 2014, identified specific future strategic challenges anticipated by both the uniformed and civilian leadership within the U.S. government and delineated specific technologies that DoD intended to develop in order to retain the American edge in high tech weaponry.[521] One of the prime areas of research and development (R&D) envisioned within the Third Offset was the rapid advancement of unmanned aerial systems (UAVs) —commonly referred to as drones— and the concurrent

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[521] Chuck Hagel, "Keynote Address" (Reagan National Defense Forum, Ronald Reagan Presidential Library, Simi Valley, CA, November 15, 2014).

development of autonomous systems to make these drones truly unmanned in order to maintain a strategic edge. Given that the US is the preeminent technological and military power in the current international system, its particular strategic imaginary and the technology it fosters are immensely important. As the U.S. defense R&D efforts and acquisition bureaucracies are sprawling and Byzantine, I drill down to a subset of particular "game-changing" technologies: the emerging technologies of autonomy called for by the Third Offset.

The organization of this chapter mirrors that of chapter four as both are methodologically similar, tracing two different discourses. As previously outlined, this structure is an extension of Dunn and Neuman's suggestions for analysis.[522] First, I consider the immediate national security context of the Obama administration beyond the historical background covered in the previous chapter. Next, I map out the shape of the discourse, including its scope, actors, and features. Digging into the substance of the texts that make up the Third Offset discourse, the next section maps the representations across the narrative with a focus on autonomous technologies. Then I take the step of layering the discourse, identifying the ideas that coalesce into a persistent, shared conceptualization of autonomy in weapon systems. In the final step, I report the findings of this analysis shaped by how the dominant discourse of this particular strategic imaginary informs the required capabilities of AWS under development. This illustrates the desired

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[522] Kevin C. Dunn and Iver B. Neumann, *Undertaking Discourse Analysis for Social Research* (Ann Arbor: University of Michigan Press, 2016).

outcome of a competitive edge for the U.S. military in this projected future expresses the *innovation imperative* norm.

The Proximate Context of the Third Offset Strategy

To set the stage for the strategic innovation strategy dubbed the Third Offset, consider the immediate circumstances that set off the policy shift. One pillar of the Obama campaign was opposition to the U.S. war in Iraq and the intention to extract American military power from its focus on the wider Middle East. Nested in this policy critique of the previous Bush administration's foreign policy was the assertion that the primary American effort in the wider global War on Terror (WoT) should have been in Afghanistan and that the Iraq War had drawn focus and resources away from that effort. Soon after taking office, President Obama reluctantly agreed to Pentagon pleas for a surge in U.S. troops to the Afghan campaign. The outbreak of popular resistance against authoritarian governments during the Arab Spring highlighted the tensions in an amorphous "Obama Doctrine." [523]

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[523] This account of foreign affairs over Obama's first years in office is by no means exhaustive. Instead, it's aim is to give a quick sketch of the policy environment that ushered in the Third Offset Strategy. For more extensive information see: Barack Obama, "Renewing American Leadership," *Foreign Affairs*, August 2007, https://www.foreignaffairs.com/articles/2007-07-01/renewing-american-leadership; Thomas Donnelly, Philip A. Dur, and Andrew F. Krepinevich Jr, "The Future of U.S. Military Power," *Foreign Affairs*, December 2009; and Michelle Bentley and Jack Holland, eds., *Obama's Foreign Policy: Ending the War on Terror*, 1st edition (Routledge, 2013).

The aim of this overarching foreign policy is best described as a partial retrenchment: maintaining American global leadership while also attempting to pull away from military interventions across the Middle East. The strategic revamp was also motivated by increasing Russian defense modernization and the military adventurism of the Kremlin in Georgia. More alarming to American defense planners was China's increasing economic and their increasing conversion of that economic power into new, advanced military capabilities. While the Afghan surge tarnished Obama's reputation among anti-war elements in his party and cut against the grain of his wider policy goals, he did follow through in 2011 with a withdrawal of U.S. forces from Iraq. This tumultuous year also saw the U.S. killing of Osama bin Laden, an attempted diplomatic "reset" with Russia, and a punishing domestic conflict with Republicans in Congress that resulted in the budget control act or sequestration that would constrain defense spending and impact longer-term weapons planning. Throughout the administration's two terms, the increased use of drone strikes also highlighted the impulse to reduce America's military footprint in total numbers of troops committed while still prosecuting the War on Terror.[524]

The struggle to turn the page on America's bogged down military engagements faced continual headwinds. Obama's foreign policy vision was highlighted in the "Pivot to Asia," a policy initiative to shift strategic focus to the

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[524] See John Brennan, "The Efficacy and Ethics of U.S. Counterterrorism Strategy" (Wilson Center, Washington, April 30, 2012); Micah Zenko, "Reforming U.S. Drone Strike Policies" (New York, NY: Council on Foreign Relations, 2013); and Barak Obama, "Remarks by the President at the National Defense University" (Fort McNair, Washington DC, May 23, 2013).

challenges posed by a rising China. Paradoxically, the Pivot was thwarted by events in other parts of the world while simultaneously proven prescient by China's aggressive actions. Ongoing instability in Libya, Egypt, and most consequentially in the Syrian Civil War precipitated the rise of the Islamic State in the region. The rapid development of ISIS threatened a fractious Iraq and drew U.S. military attention back to the Middle East. China's assertive construction of artificial islands in the South China Sea and territorial claims against its smaller neighbors—in violation of international law—roiled the Asia-Pacific. The most striking development to punctuate this period was Russia's annexation of Crimea and invasion of Ukraine's eastern provinces by force. The actions of China and Russia, in particular, demonstrated the necessity for a strategic refocus of U.S. national security away from counterinsurgency in the Middle East toward competition with these more advanced military powers.[525]

The Shape of the Autonomous Weapon Narrative in the U.S. Defense Community

The purpose of this section is to sketch out the structure of the discourse concerning AWS within the American defense community. The collective idea that the U.S. defense enterprise had little choice but to develop autonomous weapons evolved over the course of two vastly different administrations. Despite the dramatic

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[525] Hillary Clinton, "America's Pacific Century," *Foreign Policy*, October 11, 2011; Barak Obama, "Remarks by the President at the United States Military Academy Commencement Ceremony" (U.S. Military Academy West Point, New York, May 28, 2014); and Ben Rhodes, *The World as It Is: A Memoir of the Obama White House* (New York: Random House, 2018).

differences between the Obama and Trump presidencies, the perceived necessity to accelerate the development of autonomous weapons was consistent. The sources of document collection are detailed in the Appendix 3 codebook.

The timeframe of the discourse surrounding this technology took place between 2008 and 2021. The contours of these dialogs are marked by three distinct phases conceptualized as:

- Phase 1: Conceptual and Technical Maturation
- Phase 2: The Third Offset Strategy
- Phase 3: The AI Arms Race

The first phase took place from 2008 to 2014, which I describe as the *conceptual and technical maturation* period. Prototyping of autonomous weapons and efforts towards a "proof of concept" took place with amorphous rationales. The vague rationales for AWS were brought into focus as competition between the U.S., and near-peer rival states lent itself to a more sharply articulated policy. This phase represents approximately 29% of the documents collected. The second phase of the discourse is the *Third Offset strategy* period, where an explicit policy shift from the top down to reshape the Department of Defense's innovation efforts took place. This short period from late 2014 until 2018 was marked by a sharp focus of the discussion on specific technology innovations and a stark increase in the volume of engagement on the topic. Half of all the text collected comprises this portion of the discourse. The final phase of the dialog from 2018 to 2021 saw a shift in focus to Artificial Intelligence (AI) broadly while narrowing the focus to concerns about

Chinese threats. I label this final phase the *AI arms race,* and 21% of the total collected texts originate in this period.

The scope of the discussions across the national security community regarding autonomous weapons was expansive, involving a variety of perspectives. Of course, there are challenges to capturing the whole of this discussion as it is only reasonable to assume a number of classified communications, reports, and program rationales are simply unavailable. This prospect obscures a full picture of the collectively held principles and expectations of appropriate behavior for national security professionals to advance this technology in the interests of national security. That being said, a remarkable volume of the policy discussions surrounding modernization during this period was quite public. The wide variety of sources focused on autonomous weapons meant some scope conditions were needed. Once the researcher wades into the intricacies of the Pentagon, it becomes clear that it is a wildly bureaucratic organization that manufactures a staggering number of reports and concepts. As if it were a country unto itself, the DoD consists of competing interests and institutions, each with its own outlook and pet projects. This is to say, there is a large enough volume of discourse on the future of warfare and how officials anticipate the role of autonomous weapons in that future to build a representative corpus despite the challenges of classification. With additional sources from the wider community of national security professionals, think tanks, and the broad media that covers national defense, a robust pool of documents were collected.

Scope conditions for collecting documents were based on the timeline, subject matter, and primary sources. The time range for sources was based on existing programs to develop autonomous weapons vaguely rationalized around countering a peer adversary to the most explicit articulation of the *innovation imperative* norm regarding autonomous weapons.[526] The subject of military modernization is sprawling, and collecting every document concerning all aspects of military innovation during this time period is tangential to the focus on the norms around AWS. Thus, the search for documents focused on the categories of uninhabited weapon systems. The explicit naming of the Third Offset strategy during the second phase makes data collection easier with a focus on discussions around that phrase. The topic of Artificial Intelligence was evident during the second phase but became more pronounced during the Trump administration and served as a locus for data collection for that part of the discourse. The final scope characteristic of focusing on primary sources hemmed in data collection. Often, where media articles quoted an official, the original speech, presentation, or official report was located and favored in lieu of the shorter reportage. The resulting corpus totaled 1,050 documents.

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[526] These bookends roughly coincide with: Thomas Ehrhard and Robert Work, "Range, Persistence, Stealth, and Networking: The Case for a Carrier-Based Unmanned Combat Air System," Thinking Smarter About Defense (Washington: Center for Strategic and Budgetary Assessments, June 18, 2008); and Robert Work and Eric Schmidt, "Final Report" (Washington: National Security Commission on Artificial Intelligence, October 2021).

In terms of the actors across the national security enterprise engaged in the autonomous weapons discussion, their affiliations and roles vary. Table 6.1 below details the different actor types across the collected texts and their roles within the defense community. Parties within and outside of government are involved in defense policy, and this dialogue reflects this fact. Within the executive branch of the U.S. government alone, there are a multiplicity of actors. Certainly, the two different presidents and the organs of their administrations lead directly and by agenda-setting. National security practitioners of the civilian leadership of the Department of Defense, research and acquisitions specialists, and the affiliated defense agencies are prominent across these documents. Uniformed military leadership and practitioners at lower ranks also feature prominently. The separate research labs of each service were rich sources of texts on AWS. Another set of organizations that produce abundant textual data on this subject within the defense establishment are the service academies of the respective military branches. As all U.S. officers within the military have to cycle through one of these educational institutions, the academic journals, special symposia, and publicly accessible theses provide a distinct window into military thinking. As a separate branch of government, Congress plays an important role in oversight. While representatives and senators joined the discussion, the subcommittees and research bodies (e.g., Congressional Research Service reports) were more forums for testimony from other actors aggregating views on this national security matter. Legislation with an appropriation for specific research and weapons programs was a good indication of the outputs of the discourse over this technology.

Actors formally outside of government also played an important role in the American considerations over developing autonomous weapons. For example, defense intellectuals within research organizations colloquially referred to as think tanks produced a sizable amount of text revolving around this technology. These organizations also propagated discussion from government officials with a number of public events, panels, and policy forums on this subject. From the perspective of the researcher, traditional defense companies were much less open about the autonomous systems they were contracted by the Pentagon to engineer. Much of their communication about technological advances is conveyed in classified memos. Some marketing materials online and at military conferences did publicly tout their innovations in this area, but the inclusion of the defense press—basically a small set of industry publications that cater to national security practitioners—did provide more insight into this set of actors. In addition, during the last two phases of the discussions, as the Department of Defense sought to enlist the services of less traditional Silicon Valley companies in their quest for rapid innovation, these new entrants into the world of defense contracting were more open with the media about autonomous technology.

Table 6.1: Actors within the U.S. Autonomy discourse

Actor	Role	Texts (Typology)
President/White House	Broad civilian leadership of the executive	Speeches Directives Strategy documents
Secretary of Defense	Civilian leadership of the Department of Defense	Speeches Directives Reports Strategy documents
Deputy Secretary of Defense	Civilian adjunct to the Secretary of Defense	Speeches Directives Policy documents
Director of the CIA	Civilian leader of the primary intelligence service	Speeches
Secretaries of the Services	Civilian leaders of each military branch within the DoD	Speeches
Joint Chiefs of Staff	Military leadership of the service branches that coordinate military operations	Directives Doctrine Strategy documents
DARPA	Sustains technological superiority of the U.S. by supporting high-risk/high-reward military innovations	Press releases Reports
Defense Sciences Board	Advises the DoD on emerging science and makes recommendations on how to apply technology to strengthen national security	Reports
Professional Military Academies	Collegiate training of officer corps in each military branch and centers for intellectual development of strategy and doctrine	Speeches Reports Academic journals Doctrine
Defense Innovation Board	Provide the DoD with independent advice and recommendations on innovative means to address future national security challenges in 3 focus areas: people/culture, technology/ capabilities, and practices/operations	Speeches Policy documents Reports
Joint Artificial Intelligence Center	Leverages the transformative potential of Artificial Intelligence technology to benefit U.S. national security	Speeches Policy documents Reports
State Department	Diplomatic representation of the U.S. abroad	Speeches Reports

House Armed Services Committee	Primary Congressional oversight committed focused on defense policy in the House of Representatives	Speeches Testimony
Senate Armed Services Committee	Primary Congressional oversight committed focused on defense policy in the U.S. Senate	Speeches Testimony
Congressional Research Service	The internal "think tank" of Congress collating and produces reports on issue areas pertinent to legislation	Reports
Government Accountability Office	A non-partisan Congressional agency examining how taxpayer dollars are spent and provides objective, non-partisan, fact-based information and findings	Reports
National Security Commission on Artificial Intelligence	Established by Congress to consider how to advance the development of AI to address the national security needs of the U.S.	Speeches Reports
Defense Media	Print-based and online journalism with an audience focus on the defense establishment, the defense industry, and national security policymakers (multiple)	Print and video stories Conference hosting
National Security Think Tanks	Non-profit policy and research organizations with a significant focus on national security policy (multiple)	Conference hosting Media outreach Reports Speeches
Defense Contractors	Broad collection of private companies that produce weapon platforms, software and provide services for the DoD (multiple)	Speeches Marketing material

The overall structure of this discourse concerning autonomous weapons was different from the parallel negotiations within the international community. For one, there was a wider variety of actors that interacted at different levels and within various forums in this case. There were also different objectives for the endpoint of the discussion. Instead of consensus through compromise in a debate (as was the case in the CCW), the U.S. defense establishment's discourse on AWS involved a certain level of contention but was more geared towards organizing all of the different institutions to a common understanding.

Initially, the rationales for autonomous weapons fermented both inside and outside of the Defense Department. In the second phase of the discourse, these rationales directed across the national security enterprise were notably directed from the top down. This hierarchy is reflected in another unique characteristic of the defense discourse on autonomy: the publication of regularly scheduled strategic guidance. In essence, there are a series of texts that are mandated (either by Congress or by internal Pentagon policy) to repeat as part of the interagency national security process. Table 6.2 details the key series in this process, the actors who author them, and their frequency. At the top of this pecking order is the National Security Strategy, a broad document produced by the White House. This informs the National Defense Strategy that comes from the Secretary of Defense that outlines how the DoD will pursue the military aspects of a president's strategy. The Chairman of the Joint Chiefs of Staff also produces the National Military Strategy describing how the different service branches will implement the other broad directives from civilian leadership. Much of the common vision, operational concepts, and shared agendas flow from these high-level documents. Often, the language used in these topline strategy documents is purposefully broad and general, emphasizing the core principles and goals of the military under civilian leadership.

Table 6.2: Recurrent Strategy Documents within the Autonomy discourse

Title	Source	Function	Dissemination & Frequency
National Security Strategy (NSS)	White House	Communicate the executive branch's national security vision utilizing all aspects of national power (diplomatic, informational, economic, and military)	Submitted to Congress every year. Some years are classified reports or are replaced with a shorter Interim National Security Strategic Guidance. (Congressionally mandated)
Quadrennial Defense Review (QDR)	Office of the Secretary of Defense	A comprehensive review of the nation's defense strategy, force structure, modernization, infrastructure, and foundations	Submitted to Congress every 4 years. Replaced by the NDS in 2018. (Congressionally mandated)
National Defense Strategy (NDS)	Office of the Secretary of Defense	Capstone report that focuses on the DoD's role in implementing the President's NSS	Submitted to Congress every 4 years. Produced in a shorter unclassified summary and a more comprehensive classified form since 2018 (Congressionally mandated)
National Military Strategy (NMS)	Joint Chiefs of Staff	Provides the strategic direction for the armed forces in their current configuration to address the requirements of the NSS and NDS	Submitted to the Secretary of Defense and Congress every 4 years (Congressionally mandated)
Nuclear Posture Review	Office of the Secretary of Defense	Process to determine the role of nuclear weapons in U.S. security strategy	Produced once every presidential administration to inform Congress, the DoD, and the Department of Energy.
Unmanned Systems Integrated Roadmap	Office of the Secretary of Defense	Report by the DoD focused on the use of and future technology related to unmanned systems.	Produced roughly every 4 years since 2001 for internal dissemination across the military services.
Military and Security Developments Involving the People's Republic of China	Office of the Secretary of Defense	Report on the probable future development of Chinese military technological capabilities and PLA strategy	Annually since 2000 (Congressionally mandated)
Summer Study Reports	Defense Science Board	Topics of study vary from year to year as requested by civilian DoD leadership. Autonomy was a specified	Produced yearly for Under Secretary of Defense for Research and Engineering.

		subject of study in 2012, 2016, and 2020	

Source: Catherine Dale, "National Security Strategy: Mandates, Execution to Date, and Issues for Congress" (Washington: Congressional Research Service, August 6, 2013).

Other periodic documents produced below the level of principle leadership take these guiding principles and expand upon them. One prominent example relating to autonomy is the Unmanned Systems Integrated Roadmap series that outlines existing UAV systems and unclassified systems under development. Beyond these customary documents, *ad hoc* policy reports and unique directives on autonomous weapons were produced by the Secretary of Defense and within the individual service branches. Congressionally empaneled commissions on the particular point of concern surrounding AI also produced detailed studies and spun out into open forums often hosted by think tanks. The Department of Defense also contracted studies from these think tanks on the subject, and these reports, again, spurred more panel discussions across the defense community. Beyond military analysis, some think tanks were also tasked with designing open-source war games for the military, another future-facing endeavor that projected autonomous weapons capabilities into the mix. Questions about autonomy found their way into published doctrine and strict rules of war revised by the Joint Chiefs. Over the course of thirteen years, the subject of autonomous weapons found its way across Washington D.C., into every nook and cranny of the Pentagon.

Mapping the AWS Discussion Across the Defense Establishment

Having established the structure of these policy discussions, I turn to the next step of discourse analysis, delving into the substance of the narrative: identifying the predominant threads that shape the collective ideas around AWS technology. The analysis of these representations is informed by the theoretical framework detailed in chapter three. The ultimate objective is to understand how the *innovation imperative* norm is applied to the specific technology of autonomous weapons and translated into a shared conviction that the Pentagon must proceed with developing such weapons. Because this modernization effort takes place under the constraints of strategic planning and the conundrum of a future threat environment that is inherently speculative, the analytic concept of the strategic imaginary informs the coding choices made in this analysis.

With the data set of texts collected under the scope conditions described above in hand, I utilized NVivo qualitative data software to organize and code the corpus of documents. A first step was tagging each document with the associated actors.[527] The next step is to mark up the documents for reoccurring topics and patterns of thought. This part of the coding process involves a large degree of iteration, building from concepts to motifs to prevalent themes in the representations about how the defense community ought to think about AWS. Having quickly read the texts during the collection phase, I already had a broad

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[527] Here the actors in their spoken or written communications are labeled according to their formally identified positions representing organizations. The Department of Defense does not literally "speak" or "think" as an institution but the Secretary of Defense does speak for the institution.

understanding of the issues involved in the discourse, and this lent itself to a list of keywords to search for and markup. Multiple coding queries building from the ground up allowed for the identification of wider themes. For example, consider how ideas around adversaries are built up and how future threats are conceptualized. In this instance, an initial query on the phrases "adversary" or "enemy" (including stemmed words) results in 7,168 mentions across 550 (a little over half) of the texts. Digging into those coded texts reveals the related concept of "peer competitor" and "near-peer rivals" that are run in a separate coding query that are included under the wider heading of threats. Also, evident when scrutinizing these resulting passages within the discussion, I note the particular countries or actors listed as threats, code them and run additional coding queries to note where these identified adversaries are mentioned. Greater detail about the coding strategy and specific queries are included in Appendix 3.

This approach is helpful in sorting through Pentagon-speak and operational concepts. For example, the phrase "anti-access/area-denial" or in the jargon "A2/AD" is repeated in the context of anticipated future warfare. This strategic concept is shorthand for the development of military capabilities that would effectively negate U.S. capabilities for power projection in the air and at sea. Through a combination of advanced air defenses, improved radars, and long-range missiles precise enough to successfully target American land bases and aircraft carriers at sea, a successful "A2/AD" capability would mean U.S. forces would not be able to effectively defend NATO and Asian allies.[528] Thus, coding for this phrase across the texts is also included under the heading of threat.

Additional steps in coding built a more complete picture of the discursive policy process. The ability to cross-tabulate coding is a helpful feature of NVivo, and this allowed for identifying the reoccurring themes and for me to trace back the source of these themes to canonical texts. Again, the methodology suggested by Dunn and Neumann is to narrow down to these sources within a discourse and focus on how they signpost the directions taken in constructing collective ideas. The actors themselves would explicitly reference these previous documents and speeches as a rhetorical tactic to bolster their views. The codebook in Appendix 3 specifies the queries used in coding and the heuristics that inform them.

Turning to the substantive analysis of the policy discussions, the next section is organized by each phase, identifying the themes across the documents, and engaging the important, canonical texts that anchor the shared ideas among national security actors.

Phase 1

In the first phase of the discussions, the conceptualization of a need for weapons that could perform military strikes independent of human operators drifted across

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[528] Take note: this concept is a projection matching unproven and currently under development military systems with the supposition of future intent. See: David W. Kearn Jr., "Air-Sea Battle, the Challenge of Access, and U.S. National Security Strategy," *American Foreign Policy Interests* 36, no. 1 (January 1, 2014): 34–43; and Luis Simón, "The 'Third' US Offset Strategy and Europe's 'Anti-Access' Challenge," *Journal of Strategic Studies* 39, no. 3 (April 15, 2016): 417–45.

the national security community. Within the DoD, research, development, and acquisition administrators would cite the need for these systems in congressional testimony and presentations, along with a long list of other modernization aspirations.[529] Defense intellectuals at think tanks were more expansive in their rationalizations for autonomous weapons. Yet, the justification in these reports pointed towards a myriad of different threats (both state actors and global terrorism) and gestured towards the inevitability of autonomous technology itself as a reason to develop AWS.[530] In an odd parallel, DARPA was developing the previously mentioned X-47B proof of concept program during this period. Originally conceived as a remotely piloted vehicle, the program winded its way through congressional funding cuts and the Air Force waking away from the joint program with the Navy. Despite these facts, DARPA and the contractor, Northrup Grumman, created a drone that performed the most challenging elements of flight autonomously.[531] In initial Air Force and Navy concerns about maintaining a communications link with the UAV, DARPA simply opted for an autonomous

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[529] One example: Al Shaffer et al., "Appropriations for Fiscal Year 2015 for Military Activities of the Department of Defense: Part 3 Reediness and Management Support," § Committee on Armed Services (2014).

[530] Ehrhard and Work, "Range, Persistence, Stealth, and Networking, (2008), Bob Grabowski and Jesscia Rajkowski, "Anticipating the Onset of Autonomy: A Survey of the DoD, Armed Service, and Other Federal Agencies' Outlook on Autonomy," Technical Report (Washington: MITRE, March 2013); and Shawn Brimley, Ben FitzGerald, and Kelley Sayler, "Game Changers: Disruptive Technology and U.S. Defense Strategy" (Washington: Center for a New American Security, September 2013).

[531] John Tirpak, "Towards an Unmanned Bomber," *Air Force Magazine*, June 2005; Mike Francis, "J-UCAS Program Office Director" (DARPA-Tech 2004 Conference, Anaheim, March 13, 2004).

vehicle with little publicly announced operational concept against a particular adversary. With experience engineering autonomous UAV prototypes for American intelligence agencies, this was a straightforward technical fix.[532]

The two subsections of national security practitioners that were most actively engaged with the matter of autonomous systems at this time were the research institutions of the Pentagon and the academic community in the service academies. However, these two groups approached the prospects of AWS from surprisingly contrasting perspectives, raising different issues. On the part of the defense research cluster, the discourse during this time was highly technical, concentrating on the feasibility of incorporating autonomy into weapon systems. Surprisingly, the most explicit articulation of international threats driving the imperative to create these weapons was a summer study report on autonomy by the Defense Science Board in 2011. This document is remarkable in that it matched specific concerns about technological competition with an almost exclusive spotlight on China. While there are few later references to this report to categorize it as a canonical text, it does presage a number of later rationalizations in favor of an aggressive program to advance the technology. The DBS summer study is idiosyncratic given that it is a product of a technical body but wholeheartedly delves into a future projection of threats from China (not yet a declared global rival in

[532] Jan Tegler, "Giant Steps: DARPA's X-Planes and the Quest to Redefine the Boundaries of Flight," in *DARPA at 60: 1958-2018*, ed. Ivan Amato et al. (Tampa: Faircount Media Group, 2018), 38–45; "Unmanned Combat Air Vehicle Advanced Technology Demonstration" (Arlington: DARPA, March 9, 1998).

2011), and the report views incorporating ethical concerns as a self-inflicted vulnerability to this pending military competition.[533] A number of uniformed scholars within the U.S. service academies reacted to the possibility of AWS development with profound ethical concerns during this period. Because public outcry over drone strikes was already vexing the flying service at the time, these soon-to-be officers were more attuned to the ethical hazards of employing remote technology in lethal engagements. Beyond the difficulty in conceptualizing how autonomous weapons would comport with the laws of armed combat, the amorality of these weapons would be caustic to military professionalism. If AWS were part of the arsenal—some of these arguments insisted—then their use ought to be limited in scope to military materials and unoccupied vehicles. Additionally, these military scholars anticipated that the use of autonomous would inevitably increase the liability and responsibilities of commanders that employ them under the laws of armed combat.[534]

As developments in autonomy increased, R&D efforts accelerated, and the possibility of autonomous weapons gained attention amid national security actors, Deputy Secretary of Defense Ash Carter issued a policy specific to autonomy in

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[533] Defense Science Board, "The Role of Autonomy in DoD Systems," Task Force Report (Washington: Department of Defense, October 2011).

[534] Example include: Michael R. Contratto, "The Decline of the Military Ethos and Profession of Arms: An Argument Against Autonomous Lethal Engagements" (Maxwell AFB: Air War College, February 16, 2011); Matthew Domsalla, "Rise of the Ethical Machines" (Maxwell AFB: Air University, June 1, 2012); Jeffrey S. Thurnher, "No One At the Controls: The Legal Implications of Fully Autonomous Targeting," *Joint Forces Quarterly* 67, no. 4 (2012): 77–84; and Gabriel B. Cavazos, "Robot Wars: An Ethical Way-Ahead" (Quantico: Marine Corps Command and Staff College, April 14, 2010).

weapon systems. In a short, 15-page document, Directive 3000.09 stipulated a number of guidelines, set the tone for the measured development of AWS in the U.S. military, and was a canonical text: often alluded to in the discussions that followed. First, the Directive set the definition of AWS across the Defense Department as: "A weapon system that, once activated, can select and engage targets without further intervention by a human operator. This includes human-supervised autonomous weapon systems that are designed to allow human operators to override operation of the weapon system, but can select and engage targets without further human input after activation."[535] It also set guidelines for more stringent levels of verification, validation, and testing of future systems with the stipulation for approvals from much higher-ranking Pentagon officials than would be the case for typical weapons development. The policy emphasized human-machine teaming, the need for "appropriate levels of human judgment over the use of force," the design parameters of a comprehensible user interface, traceable feedback for supervision of the weapon, and that safeties were in place for a human operator to intervene in targeting situations. These weapon developments would also be subject to additional legal reviews along with repeated

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535 Office of the Secretary of Defense, "Directive 3000.09 Autonomy in Weapon Systems" (U.S. Department of Defense, November 2012) pp. 12-13. Of note: one of the principal authors of the Directive, former Army Ranger Paul Scharre, would go on to a position at the Center for a New American Security, a think tank prominently involved in the AWS discourse. He later authored an influential book on autonomous weapons: *Army of None: Autonomous Weapons and the Future of War* (New York: W. W. Norton & Company, 2018).

testing and evaluation after deployment.[536] While Directive 3000.09 did not ban the development of AWS, it did subject the research and development of these weapons to a remarkably high level of scrutiny.

Themes across the documents during the *conceptual and technical maturation* phase are somewhat nebulous. There are echoes of the historical theme from earlier periods of military innovation detailed in the prior chapter. For instance, the general concern about America suffering from a technological gap is detected across the policy discussions of the period with appeals to maintain military-technological dominance. But this sentiment in the context of the time resembles a strange end in and of itself in two ways. First, there is no consensus across the text on the overarching threat or a shared perception of an adversary approaching technological parity. In some quarters (e.g., in think tank reports), there are vague concerns about near-peer states.[537] But owing to the anxiety at the time of continued counterterrorism and counterinsurgency operations in Afghanistan and winding down in Iraq, many of the policy documents also list the continued threat of non-state actors as a justification for the development of autonomous weapons with no plausible argument for why this new capability would be necessary against those enemies. Second, in a number of documents of this phase, the advance of the technology itself is identified as the security threat

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[536] Directive 3000.09

[537] Again, the anomaly is the Defense Science Board report where the authors (computer scientist) steered into the lane of geopolitical threat assessment.

that must be met with more innovation. This notion that inevitable technological progress compels a policy response of accelerated technological development is a tautology with a multiple billion-dollar price tag.

During this phase of the autonomy dialog, there were mixed signals concerning the traditional faith in technology to solve military challenges. On the one hand, calls to invest in advanced technology and redouble efforts to transform how the U.S. military waged war were not silent. Institutional advocates for maintaining America's technological edge were prevalent within the civilian leadership of the Department of Defense and, unsurprisingly, in the R&D community. However, unfettered faith in technology was uneven across the services. Recall that Secretary Rumsfeld's efforts at transformational Revolution in Military Affairs had tragic consequences for U.S. ground forces. By 2013, the U.S. military had been mired for over a decade in two wars, and while the "light footprint" approach in both had impressive early results, both Afghanistan and Iraq suffered from internecine warfare because of inadequate troop numbers. Skepticism within the defense community of yet another appeal to invest in disruptive technology to redefine future warfare was understandable in the middle of two decidedly low-tech counterinsurgencies. Coupled with the lack of a clear international opponent, invoking previous military-technical achievements like the Manhattan project was absent. Technical details were a focus of this early part of the discourse, and as highlighted in Directive 3000.09, a prevalent theme is a human-machine interaction. Planning for how uniformed operators will interface and “team” with AWS is a notable topic, and the R&D community quickly designated the need to establish “trust in autonomy” as an overarching design goal in engineering these future weapons. The recognition that service members distrust of weapons that potentially could act beyond human control indicates a level of pessimism about technology in general. Again, this is contrary to the traditional theme of belief in the inherent value of technical innovation to solve problems.

A final set of themes revolve around the anticipated implications of autonomy and the need to address the possible ramifications early on in the policy process. A very public reckoning over the ethics and efficacy of drone strikes as a part of the War on Terror looms large during the period of 2008 to early 2014. The sharp increase in the use of UAVs in the lethal prosecution of counterterrorism led to considerable blowback, and the Air Force found itself under heavy criticism for CIA lead operations outside of declared warzones. The prospects of developing drones that would be autonomous were often a point made in many of the critiques over piloted UAVs. The long-standing habit of analogizing between existing and hypothetical weapon systems once again informed these questions of ethics. Indeed, the need for the emphasis on ethics for these new weapons and appropriate human judgment enshrined in Directive 3000.09 solidified the last theme of this period. That motif was the urgent warning for defense professionals to establish stringent moral and legal constructs for AWS in particular.

The ambiguity during this phase of the discourse was due in part to the lack of any narrative structure. Possible future competitors were vague. The day-to-day operations of the national security enterprise were still concerned with non-state terrorists and the pacification of internal factions across two foreign occupations. Without a clear antagonist driving a conflict narrative requiring more advanced weaponry, there was little motive for the U.S. as the notional protagonist to prioritize AWS development. This meant that there was no compelling rationale to organize a vision of what a future conflict that would necessitate a broad innovation strategy. The Taliban were not going to start building killer robots to launch from aircraft carriers. Absent a plausible vision of a future threat environment requiring autonomous weapons, there was little foundation for a strategic imaginary that would shift the general *innovation imperative* norm onto the specific AWS path.

Phase 2

As alluded to above, aggressive events on the international stage prompted shifts in a number of U.S. foreign policies, chief among them defense strategy. Chinese territorial aggression in the South China Sea, along with Russia's annexation of Crimea and covert support for separatist regions against Ukraine, sharpened the attention of the U.S. The 2014 Quadrennial Defense Review signaled a shift toward "rebalancing" with a worry about Chinese and Russian A2/AD capabilities in China and Russia and the familiar concern over eroding American technological superiority.[538] In a 2014 speech to the Regan National Defense Forum, Secretary of Defense Hagel announced the launch of the Third Offset strategy as a response.

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[538] Office of the Secretary of Defense, "Quadrennial Defense Review Report" (Washington DC: US Department of Defense, March 2014).

This speech was accompanied by a formal directive by the Secretary launching the Defense Innovation Initiative. As the name suggests, the Third Offset harkens back to the first two instances of American overmatch through military technology, resonating with the past habit of appealing to previous technical achievements. As the updated version was envisioned, the U.S. would repeat the innovation achievements of the past through a similar process to the Second Offset. Hagel specified Russia and China as the primary geopolitical competitors to the United States and emphasized that America's technological superiority was endangered. In its initial form, the Third Offset listed robotics, autonomous systems, miniaturization of electronic components, big data, and advanced manufacturing as technologies to prioritize. In terms of actions, the Third Offset was geared towards investments in key technologies to accelerate U.S. competitive advantages and to reform the Pentagon's modernization bureaucracy. [539] The Third Offset speech also marked a change in the direction of the AWS dialog. Rather than ideas percolating up from disparate corners, the top-down initiative increased engagement across the whole of the defense enterprise and structured the conversation.

A flurry of memos, policy recommendations, public events, and pronouncements from top DoD officials followed. This prolific period in the discussion expanded upon the earlier themes and introduced some new variations.

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[539] Secretary of Defense Chuck Hegel, "Reagan National Defense Forum Keynote Address" (Reagan National Defense Forum, Simi Valley, November 14, 2014); Chuck Hegel and Office of the Secretary of Defense, "Memorandum: The Defense Innovation Initiative" (Washington: US Department of Defense, November 15, 2014).

The chief architect of the Third Offset was the new Deputy Secretary of Defense, Bob Work, and he was given the lead in evangelizing for the Third Offset effort. His ubiquitous presence at many of these forums was notable where he made autonomy the centerpiece of his vision for the future of warfare.[540] In multiple forums, Work invoked the old specter of imminent technological inferiority to rising adversaries, and this concern was echoed by others. The diagnosis, in this case, was extended to the domestic sphere with a variation on the idea. Concern over the state of military modernization relative to commercial innovation is repeated in the textual data. In other words, military development and acquisition of new weapons had become byzantine, ridged, and too slow to adequately keep up with the pace of innovation by private firms. Indeed, many of the identified R&D areas were dual-use technologies with both military and civilian applications.[541]

Ideas within the autonomy discourse took an interesting thematic turn during this phase. As good students of military innovation studies themselves, senior DoD leadership knew that organizational transformation was necessary. Quickly developing new "game-changing" weapons and effectively using them involved reorganizing hidebound defense institutions as much as perfecting the technologies.[542] The open policy discussions, in this sense, were aimed at actors in

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[540] Secretary Work had also cycled through a number of think tanks (CSBA and CNAS), and the Office of Net Assessment in the Pentagon.

[541] Those innovations, particularly coming out of Silicon Valley, were also available on the open market, vulnerable to industrial espionage, and reverse engineering.

[542] See: Adam Grissom, "The Future of Military Innovation Studies," *Journal of Strategic Studies* 29, no. 5 (October 1, 2006): 905–34; and Stuart Griffin, "Military Innovation Studies:

national security enterprise as much as the wider public. The overarching aim of the initiative was to steer consensus across the largest bureaucracy in the world towards a new paradigm. And one key message of the Third Offset was for the Pentagon to mirror the practices of Silicon Valley behemoths and to enlist their help directly. Below I consider the intuitional impacts of this discourse. At this point, Pentagon jargon started to incorporate the buzzwords of the tech world. Initiatives for cross-functional teams, agile software development, tech accelerators, and idea incubators started to pop up across the "defense ecosystem," mimicking a start-up culture that demands innovators should fail fast but fail-often in order to foster "disruption." In short, the conceit of the Third Offset was that the Pentagon needed to be more like Google and less like Ford. Thought leader events with panels of billionaire tech luminaries sitting next to Air Force generals became *de rigueur*. However, the Department of Defense's courtship of Silicon Valley was difficult. Tech workers on the West Coast expressed an aversion to a hierarchical military culture based on either their liberal leanings or the libertarian tendencies of conservative techies. Suspicion across the tech industry over mass government surveillance efforts during the War on Terror and controversy over civilian drone strike casualties.

The burgeoning engagement between big tech and the Department of Defense was troubled early on. Under the aegis of the Third Offset, the Pentagon

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Multidisciplinary or Lacking Discipline?," *Journal of Strategic Studies* 40, no. 1–2 (January 2, 2017): 196–224.

established an outpost in Silicon Valley christened Defense Innovation Unit experimental in 2015. This organization reached out to tech firms with a streamlined process to award defense contracts and aimed to establish coordination with the industry. One early program, Project Maven, sought to leverage machine learning and computer vision to sort through the massive amount of image data military intelligence had to shift through daily. Hours of UAV reconnaissance video in the operations against ISIS absorbed too much of analysts' time for them to effectively communicate threats and targets to forces in the field. Google was awarded a contract to create a system that would sort through hours of reconnaissance video and cue only those portions of the footage that would be tactically relevant. Once Google employees realized the application of their work, they extrapolated that it could easily be applied to both drone strikes and the development of autonomous systems that could do the same. A minor revolt over the program took place as they objected loudly and in public to aiding the creation of killer robots. Google withdrew from the contract, and the DoD dealt with a public relations disaster in the middle of their modernization push.[543]

Actors within the defense community also expressed apprehension regarding AWS along ethical lines. Carrying over from the previous phase, the

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543 Scott Shane and Daisuke Wakabayashi, "Google Will Not Renew Pentagon Contract That Upset Employees," *New York Times*, June 1, 2018, sec. Technology; Google Employees, "Letter to Google CEO Sundar Pichai," April 4, 2018; Patrick Tucker, "Here's How Google Pitched AI Tools to Special Operators Last Month," Defense One, June 10, 2018; Robert Work, "Establishment of an Algorithmic Warfare Cross-Functional Team (Project Maven)," Deputy Secretary of Defense (Washington: U.S. Department of Defense, April 26, 2017).

theme of ethical doubts grew in scope now that the top DoD officials grappled with the question. For example, Air Force General Paul Selva—who would ascent to the Joint Chiefs of Staff—articulated his own concerns on multiple occasions as the "Terminator conundrum." The crux of the conundrum was that American defense officials were keenly aware of the ethical hazards of fully autonomous weapons while also anticipating that authoritarian regimes would not feel so constrained by legal expectations in war. Selva insisted that the U.S. military would always adhere to the laws of war and ethical concerns when taking lethal action because that reflected American values, regardless.[544] Having taken over as Secretary of Defence in 2015, another vocal advocate for the Third Offset, Ash Carter, also rejected the prospects of full autonomy in lethal engagements. For his part, he insisted that there would always be an operator of a weapon in the loop to exercise appropriate human judgment.[545] However, this ran counter to the projected benefits of autonomous weapons, that the tactical decision reaction time at machine speed would be superior to any human-operated platform in a hypothetical engagement. For his part, Deputy Secretary Bob Work acknowledged the ethical dangers of autonomous weapons. On the other hand, he suggested that the U.S. would leverage

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[544] Paul Selva, "Hearing to Consider the Nomination of General Paul J. Selva, USAF, for Reappointment to the Grade of General and Reappointment to Be Vice Chairman of The Joint Chiefs of Staff," § Committee on Armed Services (2017); and Paul Selva and Kathleen Hicks, "Innovation in the Defense Department" (CSIS Military Strategy Forum, Washington, August 25, 2016).

[545] Sydney J. Freedberg Jr, "Killer Robots? 'Never,' Defense Secretary Carter Says," *Breaking Defense*, September 15, 2016; and Ashton B. Carter, "Shaping Disruptive Technological Change for Public Good," Belfer Center for Science and International Affairs, August 2018.

the technology to bolster human decision-making rather than override ethical judgment. Two rhetorical themes would develop as key counterarguments to AWS critics. First, the U.S. could engineer effective human-machine teaming in Third Offset programs. Indeed, all of the pronouncements now coming from the top leadership on the potential legal and ethical hazards put a spotlight on R&D for effective human-machine teaming. Second, the idea that Russia and China would not have such moral qualms that would hinder the advantages of autonomy was firmly established as a counter to these concerns.[546]

As initiatives under the Third Offset got underway, reservations within the national security community expanded beyond ethics to include cultural and operational concerns. Playing out future scenarios as encouraged by this strategic imaginary, military academics debated the impact and feasibility of replacing human pilots with computers. Projected future wars fought by AI agents cut to the heart of the warrior ethos of airmen.[547] In terms of how AWS might operate in future conflicts, it was also conceivable that fully autonomous weapons would also endanger soldiers fighting alongside them with unintended fratricide in the complex

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[546] Robert O Work, "Welcoming Remarks and Morning Keynote Address" (CNAS Inaugural National Security Forum, Washington, December 22, 2015).

[547] Capt Michael W Byrnes, "Nightfall: Machine Autonomy in Air-to-Air Combat," *Air & Space Power Journal* 28, no. 3 (June 2014): 48–75; Michael P. Kreuzer, "Nightfall and the Cloud: Examining the Future of Unmanned Combat Aerial Vehicles and Remotely Piloted Aircraft," *Air & Space Power Journal* 29, no. 5 (October 2015): 57–73; Capt Michael W Byrnes, "Dark Horizon: Airpower Revolution on a Razor's Edge--Part Two of the 'Nightfall' Series," *Air & Space Power Journal* 29, no. 5 (October 2015): 31–56.

and fluid environment of battle.[548] While Third Offset initiatives redoubled the efforts to establish trust in autonomy through technical fixes, all of these concerns taken together signaled that developing AWS would entail careful consideration. There was a significant amount of policy to be crafted addressing all of these questions.

While the return of techno-optimism embedded in this high-level effort to develop AWS was tempered by these concerns, the *Third Offset* phase of the discourse started to lose focus. Two dynamics evident in the discussions contributed to this outcome. First, upon taking office, the Trump administration distanced itself from all policies of its predecessor. The nomenclature around the Third Offset was not immune. The new Secretary of Defense Mattis gave lukewarm support for modernization efforts but indicated his early priorities were training and personnel issues. A host of critics outside of the department surfaced complaining that the Third Offset was not a proper strategy and relied too much on technology.[549] On the other hand, during the first transition year, Deputy Secretary Work was retained and pushed many of the initiatives forward, all be it quietly and without the "Offset" moniker. The second dynamic that bedeviled efforts toward military autonomy was the proliferation of exotic technologies for development. In addition to the original list, different actors chimed in with their desired priorities of directed energy

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[548] For example, see: Paul Scharre, "Autonomous Weapons and Operational Risk," Ethical Autonomy Project (Washington: Center for a New American Security, February 2016).

[549] James Mattis, "Reshaping the United States Military," Pub. L. No. S. HRG. 115–853, § Committee on Armed Services, 50 (2017).

weapons (lasers), quantum computing, hypersonic weapons, 5G connectivity, biotechnology, nanotechnology, cyber warfare (both defensive and offensive capabilities), the broader tech of AI, and updates to nuclear weapons platforms. With too many aspirational technologies, R&D efforts were distracted from setting priorities and committing resources to any single approach with a coherent concept of operation.[550]

On balance, The *Third Offset* phase of the AWS discourse was moderately productive as an effort to forge collective ideas and expectations about how to prepare for the future of warfare. The defense establishment is a sprawling collection of actors, each grounded in a variety of institutions that often compete against each other for resources while oriented towards external competition. Firmly establishing a narrative about prospective security challenges and getting everyone in the choir to sing off the same page is a daunting task. In this sense, the champions of the Third Offset were aided in their overly ambitious goals by a coherent duo of antagonists that fit the bill of a great power rival. It is worth remembering that the expansive national security apparatus was tooled as a contingency planning machine over the course of the Cold War. For a set of organizations designed around the historical scope of that major competition, the return of great power competition between the U.S. and peers like Russia and China

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[550] Paul Scharre, "The Defense Department Needs a Real Technology Strategy," Defense One, April 21, 2020, https://www.defenseone.com/ideas/2020/04/pentagon-needs-technology-strategy/164764/.

was a familiar problem set. These antagonists provided a driving motive to the storyline that promoted a renewed innovation strategy. If nothing else, this brief but intense set of initiatives driven from the top echelons was explicitly billed as a new narrative. Security practitioners were encouraged to think outside the box about how autonomous weapons might be employed. Under the banner of the Third Offset, this push for innovative thought was formally institutionalized in programs that encouraged thinking about the future of war through science fiction.[551] In short, the Third Offset focused minds on a problem and made a compelling case for applying the *innovation imperative* norm to autonomous weapons. The plan did accelerate the development of autonomous systems.

The faults in Third Offset policy outcomes originated from a familiar theme: the misapplication of historical analogy. This requires a slight digression concerning advances in Russian and Chinese military operations. The Russian annexation of Crimea in 2014 employed new tactics aimed at destabilizing Ukraine by orchestrating disinformation, cyberattacks, sabotage, and organized crime

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[551] In a fascinating turn, sic fi vignettes found their way into policy documents and were encouraged as a form of training. For example: Secretary of the U.S. Air Force, *Air Force Future Operating Concept: A View of the Air Force in 2035.* (Washington D.C: Department of the Air Force, 2015); David J Blair and Nick Helms, "The Swarm, the Cloud, and the Importance of Getting There First: What's at Stake in the Remote Aviation Culture Debate," *Air & Space Power Journal* 27, no. 4 (2014): 25; "U.S. Army Mad Scientist Initiative, Mad Scientist Laboratory," February 28, 2019, https://madsciblog.tradoc.army.mil/tag/u-s-army-mad-scientist-initiative/; "Future Warfare Writing Program," Army University Press, accessed May 22, 2022, https://www.armyupress.army.mil/Special-Topics/Future-Warfare-Writing-Program/; ML Cavanaugh, "Art of Future Warfare: What Might the next Great Power War Look Like?," Modern War Institute, January 16, 2015, https://mwi.usma.edu/2015116art-of-future-warfare-what-might-the-next-great-power-war-look-like/; and Sydney J. Freedberg, "Iron Man, Not Terminator: The Pentagon's Sci-Fi Inspirations," *Breaking Defense*, May 3, 2016, https://breakingdefense.com/2016/05/iron-man-not-terminator-the-pentagons-sci-fi-inspirations/.

elements in coordination with combat forces.[552] Dubbed in the West as a new form of "hybrid warfare," this approach leveraged Russian cultural links and widespread corruption to the Kremlin's advantage. In parallel, Moscow made investments in upgrading and expanding a layered air defense system as a screen for these operations against U.S. gains in air superiority. For its part, the Chinese People's Liberation Army (PLA) accelerated military modernization, investing in R&D, developing indigenous precision weapons, upgrading air defense systems, and especially increasing its missile arsenal to keep the U.S. Navy and Air Force at bay. The PLA made clear that this innovation strategy was aimed at American power projection capabilities in support of Taiwan.[553] In both the Russian and Chinese context, U.S. defense thinkers framed this realignment as an anti-access/area denial (A2/AD) challenge to American forces. The fatal flaw of the Third Offset approach was to bundle both challenges under the same modernization effort leading to the proliferation of desired technologies. To counter hybrid war, the Defense Department would need better cyber capabilities, signals intelligence, and AI to quickly counter non-traditional Russian actions along with modernization for

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[552] The use of tactics short of armed combat also included the subterfuge of the famous "little green men,"—Russian troops in tactical gear with no identifying insignia. See: Andrew Monaghan, "The 'War' in Russia's 'Hybrid Warfare,'" *The US Army War College Quarterly: Parameters* 45, no. 4 (December 1, 2015): 65–74; Charles K. Bartles, "Getting Gerasimov Right," *Military Review* 96, no. 1 (February 2016): 30–38; and Mark Galeotti, "The Mythical 'Gerasimov Doctrine' and the Language of Threat," *Critical Studies on Security* 7, no. 2 (May 4, 2019): 157–61.

[553] For example: David W. Kearn Jr., "Air-Sea Battle, the Challenge of Access, and U.S. National Security Strategy," *American Foreign Policy Interests* 36, no. 1 (January 1, 2014): 34–43; and Richard Bitzinger, "Third Offset Strategy and Chinese A2/AD Capabilities" (Washington, DC: Center for a New American Security, May 2016).

ground forces in Europe. The challenge in the Indo-Pacific was to overcome great distances in the air and at sea, favoring not only autonomy but also hypersonic weapons, directed energy, and 5G connectivity for command and control. The “offset” framing also signaled a misuse of the concept. The leap forward through weapons R&D implored from on high was not to gain a qualitative advantage over the quantitative advantage of two rival states. Instead, this was a case of the U.S. trying to keep pace with other military powers who were working to develop the same types of weapons. With these two dynamics pulling against it, the Third Offset narrative lost the plot.

Phase 3

It is reasonable to expect that a new administration of the opposite political party will shift defense priorities and strategy. While references to the Third Offset were expunged from the Department of Defense’s lexicon, the programs underway moved forward. Policy discussions about autonomous weapons continued in the national security community, with a number of questions raised about the direction of modernization left unanswered. In general, the Trump administration was averse to telegraphing military plans or thoughts, and the new Secretary of Defense was notably tight-lipped with the press.

In early 2018 Mattis definitively placed his marker on defense policy and vocalized the *innovation imperative* for AWS with the release of the National Defense Strategy. This was the first high-level strategic document that explicitly directed the Department of Defense to develop AWS for future military competition.[554] It is difficult to overstate how this particular National Defense Strategy influenced the policy decisions taken by other actors. Its impact grew over time, given how reluctant the Secretary of Defense—and by extension, his top lieutenants—were to engage with the media over weapons developments. Building off the designation of Russia and China, the 2018 NDS was vehement that the U.S. was in the midst of a direct, long-term strategic competition with its rivals and that it was dangerously behind. The capabilities of autonomy and AI were directly made priorities for development, and this text expressed the urgency of out-innovating these rivals lest the U.S. lose its preeminent military position in the world.[555] The alarming tone from the head of the largest military on the globe was punctuated with a new theme that became a new buzzword across the defense establishment: lethality. This strategic imaginary shifted from a projected future of warfare that was to be managed and controlled through information technology (e.g., the earlier concept of network-centric warfare) to a vision of a Hobbesian battlefield where neither side could rely on concealment or stealth, and new weapons technology would enable each side to ruthlessly slaughter the other.[556] Unarticulated was how

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[554] Office of the Secretary of Defense, "Summary of the 2018 National Defense Strategy" (Washington: Department of Defense, 2018).

[555] *Ibid.*

[556] Jeff Schoogol, "How Mattis Made the Whole Military Obsessed with 'Lethality,'" *Task & Purpose*, November 9, 2018, https://www.military.com/daily-news/2018/11/09/how-mattis-made-whole-military-obsessed-lethality.html; Jared Keller, "James Mattis's Bizarre Cult of 'Lethality,'" *The New Republic*, September 9, 2019; Terri Moon Cronk, "James Mattis: U.S. Military Becoming 'Stronger, More Lethal, More Agile,'" *DOD News*, August 28, 2018, https://www.defense.gov/News/News-Stories/Article/Article/1614636/mattis-us-military-becoming-stronger-more-lethal-more-agile/; James Mattis, "Secretary of Defense: Message to the Force" (Headquarters Marine Corps, August 17, 2018).

this new paradigm of lethality would comport with the laws of war once autonomous weapons were introduced.

The pivot in the AWS dialog from the 2018 National Defense Strategy towards accelerated development was also shaped by the unique outlook of the Trump Administration. This manifested in the narrowing of focus on China as a threat and a widening of the scope of the discourse from "autonomy" to the more general technical subject of "artificial intelligence." There are a number of reasons for these shifts in discussions. The mercurial leadership style emanating from the Oval Office impacted the "America First" style of foreign policy resulting in a confusing and erratic set of national security priorities.[557] While the president's sanguine evaluation of Russian actions was not shared across the Defense Department, his emphasis on competition, broadly construed to include military and economic facets, was a shared outlook that became more embedded within the discourse over the course of the administration. This shifting sentiment from great power competition to Russia and China as peer adversaries to China as the pacing threat with Russia as a revisionist power on the wane was a notable theme in phase three. In addition, President Trump's tendency to view competition through an economic lens in zero-sum terms drew his attention and policy directives towards China, the world's most notable rising economic and military power.

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[557] Simply consider the erratic U.S. engagement with North Korea. See: Hal Brands, "Reckless Choices, Bad Deals, and Dangerous Provocations," *Foreign Affairs*, September 27, 2019.

The shift across the collected texts from the narrowly tailored idea of autonomous weapons to the broader technical category of AI was propelled by the administration's fixation on China. Again, AI is a general technology akin to electricity or the internal combustion engine that has extensive applications in both military and economic areas. In this sense, it is much more than a dual-use technology (like GPS) but is projected as a transformational technology, impacting all facets of life.[558] Of course, AI in some form is a precursor technology for the more specific category of autonomous weapons. Owing to the potential of such a technology, the stated efforts by the Chinese government to become the leader in AI development by 2030 alarmed many in the defense circles.[559] Coupled with the resurgence of the historic technological inferiority motif in the 2018 NDS, the administration started crafting national initiatives to accelerate AI development not only for strategic uses but also to advance economic, competitive advantage, and scientific aims.[560]

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558 Horowitz, Michael. "Artificial Intelligence, International Competition, and the Balance of Power." *Texas National Security Review* 1, no. 3 (May 15, 2018).

559 Graham Webster et al., "Full Translation: China's 'New Generation Artificial Intelligence Development Plan' (2017)," *New America* (blog), August 1, 2017, http://newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/.

560 Donald Trump, "Executive Order on Maintaining American Leadership in Artificial Intelligence" (The Office of the President of the U.S., February 11, 2019); Office of the President of the U.S., "Accelerating America's Leadership in Artificial Intelligence," February 11, 2019. For the shift within the DoD see: Office of the Secretary of Defense, "Summary of the 2018 Department of Defense Artificial Intelligence Strategy: Harnessing AI to Advance Our Security and Prosperity" (Washington: Department of Defense, January 1, 2018).

The evolution of ideas during this period reflected a growing sense of peril and moved from general competition between the U.S. and China to a state of active antagonism. The echoes of Cold War grand strategy were more prominent as the theme of an AI arms race was repeated across the discourse. The heightened rhetoric of the 2018 NDS and increasingly antagonistic pronouncements in reference to Beijing by the White House set the stage for such framing. Indeed, the whole of society effort that would be necessary to harness a ubiquitous technology like artificial intelligence suggested a national scale effort akin to the space race or Manhattan project.[561] While there were a handful of references to these past achievements, the arms race idiom favored the theme of technological mediocrity in the face of an implacable foreign power.[562] Indeed, more references to a new Sputnik moment and past shortfalls rather than past achievements drove the urgency to catch up in an AI race that had already started. Indeed, the strategic imaginary presented here posits that both the technology of AI has already outrun the institutions and norms of the U.S. military on its own. The disquiet for strategic planners is that they now have to catch up with science and technology itself, in addition to playing catch-up with China as a future adversary.[563] In this sense, the

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[561] Graham Allison and Eric Schmidt, "Is China Beating the U.S. to AI Supremacy?," August 2020, https://www.belfercenter.org/publication/china-beating-us-ai-supremacy; Henry A. Kissinger, "How the Enlightenment Ends," *Atlantic* 321, no. 5 (June 2018): 11–14.

[562] M. A. Thomas, "Time for a Counter-AI Strategy," *Strategic Studies Quarterly* 14, no. 1 (2020): 3–8; Dennis Nguyen and Erik Hekman, "A 'New Arms Race'? Framing China and the U.S.A. in A.I. News Reporting: A Comparative Analysis of the Washington Post and South China Morning Post," *Global Media and China* 7, no. 1 (March 1, 2022): 58–77.

[563] Sean Lawson, "Articulation, Antagonism, and Intercalation in Western Military

historical theme of technological catch-up overwhelmed appeals to past achievements.

The thematic shift from autonomous weapons to AI in the military context also had ramifications for the continued discussions over ethics. Think tanks started new initiatives to research the impacts AI might have on multiple fronts of society, and engagement over ethics and autonomous weapons became swamped in a wider conversation about the ethics of AI.[564] This murkiness came at an inopportune time, given that the Pentagon was still needed to attract Silicon Valley expertise in AI and ethical issues were the source of tensions between defense and industry.

Several lines of discussion propagated across the national security enterprise concerning AI ethics to address those concerns in the interest of accelerating AI adoption as per the National Defense Strategy. Indeed, this theme was prominent during this phase of the discourse and moved towards ever more legalistic discussions. Ethics were more often considered in a framework of compliance with a set of parameters rather than a deep discussion concerning the moral ramifications of AWS technology.

Imaginaries," *Security Dialogue* 42, no. 1 (February 1, 2011): pp. 44.

[564] For example, lines of research into AI and National Security at CSIS now span from ethics around facial recognition applications to the AI Ecosystem for National Security. See: https://www.csis.org/programs/strategic-technologies-program/archives/artificial-intelligence; https://www.csis.org/programs/international-security-program/future-strategy-forum; and https://www.csis.org/analysis/artificial-intelligence-and-national-security-importance-ai-ecosystem

Four key ethical hedges become more pronounced in the *AI Arms Race* phase of the discourse. First, efforts at human-machine teaming are emphasized across texts, especially on the topic of ethical use of AI in the future. The projected idea of trustworthy systems that work in tandem with warfighters to prevail in combat is a point of repetition.[565] The second type of evasion taken in these discussions is to aver that developing AI technology is not aimed exclusively at creating killer robots. This stylistic maneuver often points out the more prosaic applications for AI in the military in areas like readiness, intelligence collection, scheduled maintenance, personnel, and the veteran's administration. Resembling the arguments from the DoD over the Project Maven controversy, this retort to ethical concerns relied on diverting focus to more benign applications of autonomy. A third tactic embedded in discussions during this phase was to counter that the two primary antagonists to the U.S. (China and Russia) were likely to develop AI and use it in combat without any moral qualms. This theme originated in the previous, *Third Offset* phase but was employed more frequently in the discourse over AI ethics. The fourth motif in defending autonomous weapons development against ethical objections was to emphasize precision. This tactic relied on the supposition that AI would inevitably lead to greater precision and projected that these weapons would have incredible levels of accuracy. This move also fell back on a previous

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[565] Interestingly, there are fewer overtly fictionalized expressions about how this would work in a human-machine teaming. But the increase of the associated catchphrases is notable during phase three.

tendency in the U.S. military to equate precision with the principle of distinction in the laws of war.[566]

The full application of the *innovation imperative*—identifying AWS as a necessary capability to produce regardless of other normative concerns—punctuates the end of this phase. One of the organizations established under the Third Offset, the Defense Innovation Board, was an active participant in this regard, recommending more greater adoption of tech industry approaches and facilitating rapid software engineering initiatives. In 2019 The DIB outlined its recommendations for ethics in the application of AI to national security. Tellingly, the report addressed the parallel debates at the UN under the CCW as follows:

> "Given the ongoing global debates over when and under what circumstances employing AI in a national security context is appropriate, it is essential to note that DoD has a duty to the American people and its allies to preserve its strategic and technological advantage over competitors and adversaries who would use AI for purposes inconsistent with the Department's values."[567]

This short paragraph in a document written ostensibly on the topic of ethics was only a small preview of things to come. In 2019 Congress chartered the National

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[566] Erik Lin-Greenberg, "Wrestling with Killer Robots: The Benefits and Challenges of Artificial Intelligence for National Security," *MIT Case Studies in Social and Ethical Responsibilities of Computing*, no. Summer 2021 (August 10, 2021); C Todd Lopez, "DOD Seeks Ethicist to Guide Artificial Intelligence Deployment," U.S. Department of Defense, September 3, 2019, https://www.defense.gov/News/News-Stories/Article/Article/1950724/dod-seeks-ethicist-to-guide-artificial-intelligence-deployment/; and Talal Husseini, "US Army Clarifies Rules on Autonomous Armed Robots," *Army Technology*, March 13, 2019, https://www.army-technology.com/news/us-army-armed-robots/.

[567] Defense Innovation Board, "AI Principles: Recommendations on the Ethical Use of Artificial Intelligence by the Department of Defense" (Washington: Defense Innovation Board, October 31, 2019), https://media.defense.gov/2019/Oct/31/2002204458/-1/-1/0/DIB_AI_PRINCIPLES_PRIMARY_DOCUMENT.PDF. Pp. 4.

Security Commission on Artificial Intelligence (NSCAI) with a two-year task to fully evaluate American competitiveness in defense-related AI, make recommendations on maintaining U.S. military-technological advantage, and assess the risks of military applications of AI.[568] The report itself exhibits a number of now well-established themes embedded in autonomous weapon discussions but with some variations that add to its eventual conclusion. The final report is filled with techno-optimism concerning the possible impact of AI on the lives of everyday Americans and on its potential military applications. On the other hand, there are no appeals to past technological achievements. While there is some mention of America's potential to innovate, any optimistic sentiment is completely overshadowed by the stark fear of pending technological inferiority. The established trope of an AI arms race is deployed across the texts to great effect, backing the logic of nearly every recommendation. While there is little reference to history in terms of achievements, the implication of the NSCAI's work is a new Cold War between the U.S. and particularly its Chinese rival. It remains to be seen if applying this historical analogy is fitting or if it is a self-fulfilling prophecy.[569]

The NSCAI final report in 2021 represented the cumulation of the AWS discourse over the three phases, cumulating with an unflinching articulation that

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568 National Security Commission on Artificial Intelligence, "Charter," NSCAI, June 24, 2020, https://www.nscai.gov/about/charter/; JJames M. Inhofe, "National Defense Authorization Act for Fiscal Year 2020," Pub. L. No. S.1790, 116–92 133 STAT. 1198 (2019).

569 Robert Work and Eric Schmidt, "Final Report" (Washington: National Security Commission on Artificial Intelligence, October 2021), https://www.nscai.gov/wp-content/uploads/2021/03/Full-Report-Digital-1.pdf.

U.S. security practitioners must develop autonomous weapons in order to defend American interests. Over the course of seven hundred pages, the document forcefully argues that the U.S. is only at the beginning of an AI arms race with peer competitors that will last over the long term. While examples of Russian efforts are provided, extreme emphasis is placed on the threat of China gaining the military upper hand through AI. The urgency to dedicate resources and attention to catching up with Chinese efforts is a relentless theme in this text.

Dedicating a whole chapter to the specific subject of autonomous weapons, the final report concludes that compelling logic dictates that the U.S. should quickly and responsibly move forward with AWS development and deployment.[570] The commission is also explicit in its opposition to any treaty to ban killer robots through the CCW. The now-familiar hedges against moral objections are employed. More importantly, the NSCAI tactically frames ethical concerns in terms of *risk* rather than morality. Risks can be managed and weight against each other rather than norms with moral weight that regulate action. The U.S. military's formulation of "appropriate levels of human judgment" for lethal AWS use is given attention in the report. But the commission concludes that existing procedures and policies are more than adequate to ensure that principle is upheld. Overall, the thrust of the argument is that the necessity for (projected) military advantage far outweighs the normative concerns that would hamper AWS development. However, two caveats

[570] *Ibid.,* pp. 89-105.

are presented as recommendations. First, the U.S. government should formally state that AWS and AI systems will never control nuclear weapons and encourage Russia and China to agree to such a declaration. Second, owing to the well-established reservations over rivals' lack of ethical employment of AI, the commission vaguely calls for a trilateral dialogue concerning strategic stability in AI-enabled warfare.[571] Interestingly, the scope of the strategic imaginary in this document expands out, eschewing the scenarios of specific combat engagements seen in the previous phase. Instead, it presents a picture of a new Cold War competition at the international level and obligatory recommendations for how the U.S. ought to respond to this impending global future.

Aggregating elements from previous phases of the discourse, the expression of the *innovation imperative* for autonomous weapons in the NSCAI final report represented the successful narrative arc for the discourse. It is difficult to steer a dispersed and heterogeneous set of actors like the defense establishment towards a new paradigm. It required a compelling vision, intuitionally distributed by the appropriate actors with enough frequency and persuasion to convince the largest bureaucracy on the planet to change course. By the *AI Arms Race* phase of the discourse, the narrative had matured enough to give all the organizations, institutions, and actors a shared vision of the future and a clear policy pathway to confront that future. The swapping out the historical analogy of *Offset* for *Arms*

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[571] *Ibid.*,pp. 98-100.

Race provided a clearer sense of scale and importance. Narrowing the focus to China as the main antagonist gave the narrative a coherent framework of the challenge facing national security policymakers. Framing that conflict into the familiar theme of an arms race, harkening back to the Cold War, and slotting in well with the institutional design of the Pentagon inherited from the 20th century provided a legible set of motivations. With this simplified set of oppositional actors in the narrative arc, the consensus in defining the range of policy options is facilitated. The choices for responsible national security actors to fulfill their roles are clarified. Faced with the dilemma that innovation policy has to place bets to meet an unknown future is made more tenable when a strategic imaginary is shaped into a compelling storyline. Under these conditions, the *innovation imperative* norm that undergirded the well-established DoD strategy was applied to autonomous weapons, successfully crowding out the arms control norm. Because these norms collide in the present over arms development in the projected future, the established ethical positions in the U.S. the strategic imaginary allow defense actors to circumnavigate the *meaningful human control* norm while also establishing the moral foundation in pursuit of the *innovation imperative* norm.

Findings: Impact of the Discourse on Weapons Development and Norms

The conviction that the U.S. must win the technological competition with China drives the logic of the *innovation imperative* as it is applied to autonomous weapons. Several tangible outcomes resulted from the ideas developed over the 13-

year dialog. The institutional change was one direct result, and the very material artifacts of new weapons flowed from the collective ideas of the defense enterprise. Institutional change accelerates the development of autonomous weapons. Through the distribution of the strategic imaginary to existing organs of the defense enterprise, these technologies are materially produced under the rationale of the military norm. Finally, the autonomy discourse and its manifestation in weapons programs are noted by other states (both allied and competitor alike), feeding a dynamic across the global security culture where other states incorporate the *innovation imperative* norm into their own contexts.

It is worth reiterating that describing this process in terms of ideas, narratives, or imaginaries does not imply that the aim of thought leaders and the norm entrepreneurs in the Pentagon is to spin wild tales and create science fiction. Instead, they are forced by the constraints of an unknown future strategic environment to extrapolate what should be done today to address probable future threats. The defense establishment is also constrained by its own size: in order to make major changes across a disparate set of actors and to get them to act in concert, a consensus around ideas about the future must be forged. In order to create the weapons for the wars of tomorrow, national security leaders have to present a compelling story to make defense planning a "strategic fact," cementing a course of action based on an extrapolated future.[572] Indeed, the future strategic environments they infer may come to pass.

In the case of collective ideas around autonomous weapons, part of this process was the creation of new nodes within institutions. Indeed, a major outcome through the Maturation phase, to the Third Offset, and into the recent AI Arms Race eras was institutional proliferation. New offices, initiatives, private-public partnerships, commands, commissions, and centers were the result of the *innovation imperative.* Table 6.3 below details a representative sample of novel institutions that emerged from this modernization discussion. Some of this institutional growth took on traditional forms, like consolidating multiple innovation offices into a larger entity (e.g., the Army Futures Command) or wholly new organizations charged with a mission-specific to the innovation efforts of the time (e.g., the Joint Artificial Intelligence Center). These new additions to the Department of Defense architecture quickly gained significance in the distribution of the shared idea that the new class of weapons was urgently needed. The newly minted institutions distribute operationalized visions about how the proposed autonomous systems will operate in future conflicts to other stakeholders in the defense community. When concerns are raised about AWS, the specialized offices

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[572] Elgin M. Brunner and Myriam Dunn Cavelty, "The Formation of In-Formation by the US Military: Articulation and Enactment of Infomanic Threat Imaginaries on the Immaterial Battlefield of Perception.," *Cambridge Review of International Affairs* 22, no. 4 (December 1, 2009): 629–46; and Henrik Breitenbauch and André Ken Jakobsson, "Defence Planning as Strategic Fact: Introduction," *Defence Studies* 18, no. 3 (July 3, 2018): 253–61.

become centers to address the problems, creating policy prescriptions and guidelines. Perhaps their most important function is to work across existing R&D entities and in tandem with the defense industry to award contracts—fast-tracked given a general concern that the acquisition bureaucracy is too unwieldy to meet the challenge.

One curious set of institutions that grew like wildfire were modeled on the Silicon Valley ethos of small, entrepreneurial tech accelerator centers. This "werx" model propagated across the service branches and in niche military communities, encouraging innovation from small to medium-sized commercial firms new to defense contracting and soliciting uniformed personnel to present their own ideas. While the bulk of projects sourced from these new innovation nodes were not on the scale of "disruptive" military tech, the software development models and experience gained in these new organizations lay the groundwork to advance AWS.[573]

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[573] Daryl Mayer, "Skyborg Autonomy Core System Has Successful First Flight," *Air Force* (blog), May 6, 2021, https://www.af.mil/News/Article-Display/Article/2596671/skyborg-autonomy-core-system-has-successful-first-flight/; Jim Perkins and James Long, "Software Wins Modern Wars: What the Air Force Learned from Doing the Kessel Run," *Modern War Institute* (blog), January 17, 2020, https://mwi.usma.edu/software-wins-modern-wars-air-force-learned-kessel-run/; Jenny Aroune, Robert Hollister, and Nathan Taylor, "Kessel Run: An Analysis of the Air Force's Internal Softwar Development Organization" (Thesis, Monterey, Naval Postgraduate School, 2019); Brian Beachkofski, "Making the Kessel Run," *Air Force Magazine* (blog), March 23, 2022, https://www.airforcemag.com/article/making-the-kessel-run/.

Table 6.3: Institutional Proliferation in the Autonomy Discourse

New Organization	Start Date	Origin (Reports to)	Function
Established within the Department of Defense			
Strategic Capabilities Office	2012	Secretary of Defense	Leverage existing technological capabilities as a stop-gap until other military technologies have matured and are fielded
Defense Innovation Board	2014	Secretary of Defense	Provides independent recommendations to the Secretary of Defense on emerging technologies and innovative approaches the DoD should adopt
Defense Innovation Unit (Experimental)	2015	Secretary of Defense	Accelerates the adoption of leading commercial technology throughout the military through a partnership with Silicon Valley
Army Rapid Capabilities Office	2016	Army	Expedites the delivery of critical combat materiel capabilities to warfighters to meet Combatant Commanders' needs
Army Futures Command	2018	Army	Leads a continuous transformation of Army modernization in order to provide future warfighters with the concepts, capabilities, and organizational structures they need to dominate a future battlefield
Joint Artificial Intelligence Center	2018	Deputy Secretary of Defense	Coordinate, set policy, develop shared ethics, scale, and deliver AI solutions across the DoD
National Security Commission on Artificial Intelligence	2019	Congress	Consider and make recommendations to advance the development of artificial intelligence, machine learning, and associated technologies by the U.S. to address the national security needs
Established adjacent to the military services			
Doolittle Institute/ DEFENSEWERX	2012	Air Force Research Labs	Overarching entity for innovation hubs connecting SMS businesses, innovators, academia, and military institutions

New Organization	Start Date	Origin (Reports to)	Function
SOFTWERX	2015	U.S. Special Forces Command	Public/private innovation accelerator focused on technology for U.S. Special Forces
AFWERX	2017	Air Force Research Labs	Public/private innovation accelerator focused on innovation for the USAF
Kessel Run	2017	Air Force Life Cycle Management Center	Public/private innovation accelerator focused on software development for the USAF
ERDCWERX	2018	Army Corps of Engineer	Public/private innovation accelerator focused on military engineering
Hyperspace Challenge	2018	Air Force Research Lab	Public/private innovation accelerator focused on the development of trusted autonomy
NavalX	2019	Navy and Marine Corps	Public/private innovation accelerator focused on Naval operation initiatives
Sea Land Air Military Research Initiative (SLAMR)	2019	Naval Postgraduate School	Public/private partnership seeking to catalyze rapid experimentation and prototyping to accelerate identification, and adoption or adaption of emerging technologies for national security
MGMWERX	2019	USAF Air University	Public/private innovation accelerator focused on innovation surrounding Air Force doctrine, strategies, capability needs, operational concepts, training, and education
National Security Innovation Network	2019	Defense Innovation Unit	Initiative to foster problem-solving networks of public/private partnerships across the national security space to leverage entrepreneurship towards innovation
FATHOMWERX	2019	Naval Surface Warfare Center	Public/private innovation accelerator focused on innovations in the port and maritime domains

New Organization	Start Date	Origin (Reports to)	Function
NPSWERX	2020	Naval Postgraduate School	Public/private innovation accelerator focused on curating Naval Postsecondary/ DoD Warfighter Student-led innovative ideas
Cyber Fusion Innovation Center	2020	Army Cyber Command	Public/private innovation accelerator focused on cybersecurity solutions
ARCWERX	2020	USAF Reserves	Public/private innovation accelerator focused on technology for the Air Reserves and Air National Guard
EagleWerx	2021	Army 101st Airborne Division	Public/private innovation accelerator focused on technology for Army Special Forces

Sources: MITRE Corporation, "Tap the Innovation Ecosystem," accessed April 2, 2022, https://aida.mitre.org/demystifying-dod/innovation-ecosystem/*; National Security Commission on Artificial Intelligence, "Charter," NSCAI, 2020,* https://www.nscai.gov/about/charter/*; Rapid Capabilities & Critical Technologies Office, "About The Army RCCTO," 2020,* https://rapidcapabilitiesoffice.army.mil/about/*; Defense Innovation Unit, "About DIU," 2012,* https://www.diu.mil/about*; Defense Innovation Board, "About," 2016,* https://innovation.defense.gov/About1/*;* Sam LaGrone*, "Little Known Pentagon Office Key to U.S. Military Competition with China, Russia," USNI News*, *February 2, 2016,* https://news.usni.org/2016/02/02/little-known-pentagon-office-key-to-u-s-military-competition-with-china-russia.

Through the institutional proliferation, the AWS dialog had material impacts, accelerating the development of new weapons. Examples of autonomous weapon systems started under the banner of the Third Offset and its successor, the 2018 NDS, span the service branches. Each incorporates the rationales developed by this particular strategic imaginary. The requirement to incorporate autonomy in their designs reflects the desired capability to fight in battles of the future against specific enemies. For example, the XQ-58A Valkyrie UAV was developed in 2019 under the concept of human-machine teaming with advanced Air Force fighters like the F-35. The concept is for a pilot to command multiple drones from the cockpit to extend the strike range and for the UAVs to draw enemy fire as decoys. As the program progressed, the Air Force Research Laboratory started developing the AI software through the new Skyborg program, quickly integrating ever more autonomous functions into the drones as the operational concepts anticipated a highly contested environment where direct communications could be jammed. The result was a weapon that increasingly needed less and less "command," approaching a fully autonomous weapon capable of lethal strike beyond human control.[574] The U.S. Navy initiated a host of unmanned surface and subsurface programs with high levels of autonomy to operate in the open ocean where direct data link is limited. Of various sizes and configurations, these programs (like the Sea Hunter and the Orca) are conceived as patrolling contested waters independent of operators but with some strike capabilities in the future.[575] The incorporation of autonomy in ground combat is considered more difficult. Nevertheless, the ATLAS program by the U.S. Army incorporated AI into combat vehicle targeting systems generated controversy in 2019 as some reports suggested it would essentially turn

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[574] "XQ-58A Valkyrie Factsheet," Air Force Research Laboratory, March 6, 2019, https://afresearchlab.com/technology/successstories/xq-58a-valkyrie/. "Skyborg Factsheet" (Wright-Patterson AFB, OH: Air Force Research Laboratory, June 24, 2020), https://cdn.afresearchlab.com/wp-content/uploads/2020/02/03155042/AFRL_Skyborg_FS_0921.pdf; Daryl Mayer, "Skyborg Autonomy Core System Has Successful First Flight," *Air Force* (blog), May 6, 2021, https://www.af.mil/News/Article-Display/Article/2596671/skyborg-autonomy-core-system-has-successful-first-flight/.

[575] Ronald O'Rourke, "Navy Large Unmanned Surface and Undersea Vehicles: Background and Issues for Congress" (Washington: Congressional Research Service, May 11, 2022); "Orca - Extra Large Unmanned Undersea Vehicle (XLUUV)," Lockheed Martin, January 5, 2021, https://www.lockheedmartin.com/en-us/products/orca-extra-large-unmanned-underwater-vehicle-xluuv.html;

American tanks into autonomous weapons. Clarification from the military emphasized that the decision to fire on a target still remained with crewmembers, but the gap between human-machine teaming to full autonomy was not large.[576] Each of these examples demonstrates the tension between the drive towards some degree of autonomy and the ethical norms espoused by the U.S. military in the discourse. In the event that these weapons were used in combat against rivals with fewer ethical constraints, it is not unreasonable to suggest today's self-imposed restraints would fade quickly.

Finally, the U.S. autonomy dialogue impacted the wider, global audience. Both named rival states and allied countries took notice and considers the implications of the U.S. drive towards innovation in autonomy. The speculative approach taken within the U.S. defense establishment about the future of warfare reflected a larger truth: the isomorphism of the strategic imaginary between states. In other words, the ideas embedded in the U.S. strategic imaginary have already diffused beyond this discrete community and are evident within the defense establishments of other countries. For its part, China has formulated its own vision of military transformation in order to confront an unknown future threat

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[576] Alex Hollings, "The Army's ATLAS Program Isn't Building Killer Robots (Yet)," *SOFREP*, March 8, 2019, https://sofrep.com/news/the-armys-atlas-program-isnt-building-killer-robots-yet/; Justin Rohrlich, "The US Army Wants to Turn Tanks into AI-Powered Killing Machines," Quartz, February 26, 2019, https://qz.com/1558841/us-army-developing-ai-powered-autonomous-weapons/; Patrick Tucker, "US Military Changing 'Killing Machine' Robo-Tank Program After Controversy," *Defense One* (blog), March 1, 2019, https://www.defenseone.com/technology/2019/03/us-military-changing-killing-machine-robo-tank-program-after-controversy/155256/.

environment that necessitates a crash program to develop AI and autonomy in weapon systems.[577] Russia has followed suit as well, developing prototypes of ground and air systems that operate highly independent of human operators. The Kremlin's stated aims to advance AI for autonomy are ambitious, given their lag behind other industrialized countries, but its policies are more military-oriented than other nations.[578] Central to the U.S. rationale for AWS, the ethical hedge posited that China and Russia hold no comparable moral hesitations about autonomy in weapon systems. However, similar concerns about employing this emerging technology are present in their policy documents as well. American allies like the UK, France, and Australia have also expressed their plans to develop and

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577 Ryan Fedasiuk, "Chinese Perspectives on AI and Future Military Capabilities" (Washington: Center for Security and Emerging Technology, August 2020), https://cset.georgetown.edu/publication/chinese-perspectives-on-ai-and-future-military-capabilities/; Elsa B. Kania, "'AI Weapons' in China's Military Innovation," *Brookings*, April 27, 2020; Graham Webster et al., "Full Translation: China's 'New Generation Artificial Intelligence Development Plan' (2017)," *New America* (blog), August 1, 2017, http://newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/; Elsa Kania, "Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power" (Washington DC: Center for a New American Security, November 2017).

578 Official Website of the President of Russia, "Defence Ministry Board Meeting," President of Russia, December 24, 2019, http://en.kremlin.ru/events/president/news/62401; Anna Nadibaidze, "Russian Perceptions of Military AI. Automation, and Autonomy" (Philadelphia: Foreign Policy Research Institute, January 2020); "Artificial Intelligence in Russia," The Russian Studies Program (Washington: Center for Naval Analysis, July 17, 2020); Stephanie Petrella, Chris Miller, and Samuel Bendett, "The Development of Artificial Intelligence in Russia," Artificial Intelligence, China, Russia, and the Global Order (Air University Press, 2019) pp. 168-177.

utilize AWS but with variable emphasis on ethics.[579] And both NATO and the EU promulgated policies on autonomous weapons in recent years.[580]

To be clear, this was not a linear or causal process where each county held off on their own innovation policies, only to react to U.S. policy shifts. Instead, the impact of the AWS discourse in the U.S. (as the most advanced military) set the pattern of discourse and subsequent shaping of security policy across the global security culture. The military establishment in each state grappled with how AWS fit into their modernization strategies very publicly. Weapons innovations in other areas (e.g., advances in radar technology or improved tanks) were not subject to the same scrutiny or public engagement. The terms of the discussion, the incorporation of ethical questions, and the balance between arms control norms and the innovation imperative norm were all initiated and structured along a similar line. Ultimately, the collision between the emerging norm of *meaningful human control* and the *innovation imperative* that circulated through the global military culture reinforced the notional obligation on military leaders to pursue the advantages of autonomous weapons.

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[579] Defense Ethics Committee, "Opinion on the Integration of Autonomy into Lethal Weapon Systems" (Paris: French Ministry of Defense, April 29, 2021); "National AI Strategy" (London: Government of the United Kingdom, September 22, 2021); "2020 Defence Strategic Update" (Canberra: Australian Department of Defense, July 1, 2020).

[580] Mark Roorda, "NATO's Targeting Process: Ensuring Human Control Over and Lawful Use of 'Autonomous' Weapons," SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, April 13, 2015), https://papers.ssrn.com/abstract=2593697; Zoe Stanley-Lockman, "NATO Review - An Artificial Intelligence Strategy for NATO," *NATO Review* (blog), October 25, 2021, https://www.nato.int/docu/review/articles/2021/10/25/an-artificial-intelligence-strategy-for-nato/index.html; "Guidelines for Military and Non-Military Use of Artificial Intelligence," Pub. L. No. C 456/04, § P9_TA(2021)0009 (2021).

Chapter 7 Conclusion

"The boundaries of knowledge lie between the possible and the unthinkable, sense and nonsense. We are creating these boundaries all the time. When so much knowledge is created by and for weaponry, it is not only our actual facts and the content of knowledge that are affected. The possible facts, the nature of the (ideal) world in which we live become determined. Weapons are making our world, even if they are never exploded. Not because they spin off new materials, but because they create some possibilities, and delimit others, perhaps forever. How are we to think about that?"

Ian Hacking[581]

The vacillation between pessimism and optimism when considering technology, society, and global interactions is an old story. The 20th century began with an explosion of technical innovation that transformed societies in all corners of the world. This progress also produced horrific destruction in the First World War as the first industrialized mobilization of whole societies for slaughter. The tension between unfettered possibilities and apocalyptic destruction is a chronic feature of global politics. The pattern repeated during the Second World War and Cold War competition. The incredible level of production afforded by industrial technologies wedded to atomic power seemed to promise abundance. At the same time, nuclear weapons posed the possibility of annihilation. While optimism was ascendant during the post-Cold War global politics—coupled with the early internet's utopian hope to deliver a better world—the grim violence of a superpower fighting transnational terrorism brought international affairs back to politically abysmal places as the surveillance of citizens' digital lives became ever-present. This is all to say, optimism for a better world through innovation versus

[581] Ian Hacking, *The Social Construction of What* (Cambridge, MA: Harvard University Press, 1999) pp. 167.

the pessimism around the dark side of technology is a debate that has collapsed into unproductive paralysis: it is difficult to maintain either stance at any given point. The habitual paradox of technology's simultaneous promise and peril results in a profound sense of confusion rather than clarity.

It is not hyperbole to note that we live in pivotal times. To attend to the stark facts, consider the following. The Covid-19 pandemic has killed millions of people and continues today. While various governments have held the economic upheaval at bay, liberal democracies struggle with legitimacy. Pulled apart by internal and external forces with the rise of right-wing extremism domestically, major challenges to the epistemological foundation of truth in society, and the advances of nationalistic authoritarians internationally, the future looks gloomy for the world's democracies. Income inequality—a major factor in a crisis of faith in institutions since the Great Recession of 2008—has only become more pronounced with the revamping of the Covid economy. A return of geopolitical great power competition between Russia, China, and the U.S. looms in the background promising new arms races and the reversion back to threats of nuclear war. Layered on this malaise is the slow-motion catastrophe of climate change that has weighed on the global public's consciousness (and only recently within the U.S.) with a series of extreme weather events causing havoc.

Each of these contemporary examples contains a facet of technology's relationship to politics, for good or ill. While technological innovation continues to accelerate, it does not necessarily portend a clear solution to these multiple crises.

The capitalist titans of our time—Google, Amazon, and Facebook—continue to advance digital technologies beyond the confines of developed industrialized nations. However, rather than live up to the promise of democratizing knowledge so hoped for in the early years of the internet, advances in computing have only exacerbated the anti-democratic trends enumerated above and accelerated massive income inequality. Indeed, the growth in surveillance, social media, mass communications, and machine learning utilized in the interest of authoritarian control and for funneling profit to the few with no regard for social consequences paints a dark picture of the future. The promise of astronomical profits rooted in a neoliberal faith in the market's ability to self-regulate propel Silicon Valley's innovation. Indeed, tech visionaries have far outpaced earlier innovation models driven by government interests. By extension, the faith in self-regulation is applied to the networked users of these dispersed technologies. They have also outrun any attempts by governments to mitigate the unintended consequences of rapid technological change.

On the positive side of the ledger, incredible advances in science and technology have improved our lives on a global scale, supporting the idea that progress is an unassailable good. Between the past and the future, our collective moment is markedly one of both progress and crisis all at once. Advances in genomics, artificial intelligence (A.I.), green energy, quantum computing, and the rapid development of mRNA vaccines all are hopeful prospects. The global challenges of the Covid-19 pandemic, the resurgence of authoritarian powers, and the ever-present travesty of climate change all contain aspects that relate to technology and its place in politics between and across nations. Simply presented as an intervening variable, “technology” does not automatically pose as a solution nor as a harbinger of these multiple calamities.

The tsunami of multiple and emerging dual-use technologies—that could serve either civilian or military purposes—adds to the sense of acceleration. While the pace of technological change fosters the notion that it is a self-sustaining force beyond the control of society and political attempts to regulate it, one aim of this dissertation is to put the idea of technological determinism to rest. Recent International Relations (I.R.) scholarship focused on the relationship between technology, and global politics has repeated these tendencies towards technological determinism without recognizing those political sources of innovation. A fair amount of this scholarship highlights AWS as a prime example of this new dynamic. Part of the fascination with emerging technologies like UAVs, autonomous weapons, and A.I. stem from their characteristic of operating *independently* of human control to some degree. Thus, these technologies are exemplars of man-made objects, seemingly demonstrating some agentic impact on politics. This more philosophical aspect of autonomous weapons cuts to the heart of the trepidation shared by many, a hesitation that fuels the politics of this unique technology. This more fundamental facet of AWS is beyond the scope of my study but is an area of research that deserves attention.

In more concrete terms, the emergence of autonomous weapons has been hailed recently as a harbinger of (yet) another revolution in military affairs (RMA). The Russian aggression against Ukraine and the surprising ability of that nation to repel a massive, heavily equipped combat force has many military analysts noting the impact of new weapons technologies on the battlefield. Turkish drones, American supplied loitering munitions, and (to a lesser extent) Russian loitering munitions have all made an appearance on the Ukrainian battlefield.[582] The preview of this new RMA was a swift, lethal conflict in the Caucasus where Azerbaijan used the same Turkish TB-2 drones to great effect against aging Arminian armor, routing their long-term foe.[583] The extent to which these platforms have been teleoperated

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582 Elliot Ackerman, "A Whole Age of Warfare Sank With the Moskva," The Atlantic, May 22, 2022, https://www.theatlantic.com/ideas/archive/2022/05/ukraine-russia-moskva-military-marine-corps/629930/; Phillips Payson O'Brien Stringer Edward, "The Overlooked Reason Russia's Invasion Is Floundering," The Atlantic, May 9, 2022, https://www.theatlantic.com/ideas/archive/2022/05/russian-military-air-force-failure-ukraine/629803/; Kai-Fu Lee, "The Third Revolution in Warfare," The Atlantic, September 11, 2021, https://www.theatlantic.com/technology/archive/2021/09/i-weapons-are-third-revolution-warfare/620013/; Michèle A. Flournoy, "America's Military Risks Losing Its Edge," *Foreign Affairs*, June 2021; Steven Zeitchik, "The Future of Warfare Could Be a Lot More Grisly than Ukraine," *Washington Post*, March 11, 2022, sec. Innovations, https://www.washingtonpost.com/technology/2022/03/11/autonomous-weapons-geneva-un/; Jeremy Kahn, "In Ukraine, A.I. Is Going to War," *Fortune* (blog), March 1, 2022, https://fortune.com/2022/03/01/russia-ukraine-invasion-war-a-i-artificial-intelligence/; Kelsey D. Atherton, "Are Killer Robots the Future of War? Parsing the Facts on Autonomous Weapons," *The New York Times*, November 15, 2018, sec. Magazine, https://www.nytimes.com/2018/11/15/magazine/autonomous-robots-weapons.html; Michael C. Horowitz, Lauren Kahn, and Laura Resnick Samotin, "A Force for the Future: A High-Reward, Low-Risk Approach to AI Military Innovation," *Foreign Affairs*, June 2022; Antony Beevor, "Putin Doesn't Realize How Much Warfare Has Changed," The Atlantic, March 24, 2022, https://www.theatlantic.com/ideas/archive/2022/03/putin-doesnt-realize-how-much-warfare-has-changed/627600/.

583 Soner Cagaptay and Rich Outzen, "Turkey's Lethal Weapon," *Foreign Affairs*, April 27, 2022, https://www.foreignaffairs.com/articles/turkey/2022-04-27/turkeys-lethal-weapon; Phillips Payson O'Brien, "War Will Never Be This Bulky Again," The Atlantic, May 26, 2022, https://www.theatlantic.com/ideas/archive/2022/05/ukraine-russia-putin-war/638423/; Jack

by pilots versus seeking their prey independently is not entirely clear up to this point. It is definitive that the wider application of these new weapons technologies in more traditional, interstate combat does indicate a shifting paradigm, at least at the tactical level. Whether this portends a change in the nature of warfare rather than just its character is still fiercely debated.[584] The predicament is that there is no way to judge if AWS, along with a bevy of other "disruptive" technologies, will fundamentally change warfare until they are actually used in combat. It is at this inflection that it is clear how the competing norms around AWS come to a head.

Expanding the remit of norms in I.R. to include global military culture allows a fuller picture of norm dynamics and answers how the broader aims of global governance are sometimes thwarted. A key insight from this study is how the collision between the *meaningful human control* and *innovation imperative* norms contributes to the sense that AWS technology evades any anthropological management. While research and development into these weapons continue despite deeply held ethical reservations, their emergence is compelled by a specific reading

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Detsch, "Drones Have Come of Age in Russia-Ukraine War," *Foreign Policy* (blog), April 27, 2022, https://foreignpolicy.com/2022/04/27/drones-russia-ukraine-war-donbas/.

[584] Colin Gray, "War—Continuity in Change, and Change in Continuity," *The US Army War College Quarterly: Parameters* 40, no. 2 (May 1, 2010), https://doi.org/10.55540/0031-1723.2521; Rosa Brooks, "Fighting Words," *Foreign Policy* (blog), February 4, 2014, https://foreignpolicy.com/2014/02/04/fighting-words/; Christopher Mewett, "Understanding War's Enduring Nature Alongside Its Changing Character," *War on the Rocks* (blog), January 21, 2014, https://warontherocks.com/2014/01/understanding-wars-enduring-nature-alongside-its-changing-character/; Lukas Milevski, "The Nature of Strategy versus the Character of War," *Comparative Strategy* 35, no. 5 (October 19, 2016): 438–46, https://doi.org/10.1080/01495933.2016.1241007; Thomas E. Ricks, "Future of War: Rosa Brooks Smacks down 19th c. Industrial Era Theories about Warfare," *Foreign Policy* (blog), 2014, https://foreignpolicy.com/2014/02/06/future-of-war-rosa-brooks-smacks-down-19th-c-industrial-era-theories-about-warfare/.

of the future: the strategic imaginary of the U.S. as the preeminent military-technological power instead of any intrinsic characteristic of the technology itself. Because the U.S. defense enterprise is widely mindful of ethical concerns about new weapons technology, the pursuit of autonomous weapons has operated under a more stringent set of parameters. The key formulation on the question of ethics within American policy is the preservation of "appropriate levels of human judgment." While the distance between a *meaningful human control* or *appropriate human judgment* ethical regimes is negligible both semantically and in tangible policy terms, the U.S. position lies on a bedrock foundation of faith in the perfectibility of warfare through technical means.[585] From this policy perspective, appropriate human judgment is flexible enough for certain decisions to be delegated to machine intelligence leading to a checklist approach to military ethics. If the engineers can design the weapon on the factory floor or write the code up to specifications, the weapon is deemed morally fit for combat and is expected to perform ethically better than a human.[586] The result will be uniformed officers ceding ethical choices to engineers and broadening the scope of issues resulting from "weapons malfunction." Perhaps to belabor the point, the strategic imaginary

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[585] Stephanie Carvin and Michael John Williams, *Law, Science, Liberalism and the American Way of Warfare: The Quest for Humanity in Conflict* (Cambridge: Cambridge University Press, 2014); and Samuel Moyn, *Humane: How the United States Abandoned Peace and Reinvented War* (New York: Farrar, Straus and Giroux, 2021).

[586] Michael F. Stumborg et al., "Dimensions of Autonomous Decision Making: A First Step in Transforming the Policies and Ethics Principles Regarding Autonomous Systems into Practical System Engineering Requirements" (Washington: Center for Naval Analysis, December 2021), https://www.cna.org/reports/2022/01/Dimensions-of-Autonomous-Decision-making.pdf.

shared across the defense establishment is even more critical in this instance: AWS will be initially programmed to perform in contemplated operations according to anticipated parameters. As any student of warfare will attest, initial plans never survive their first contact with an enemy. While the weapon designs and autonomous software are tailored to specific mission sets and situations, it is most likely that global events will overtake these plans, and they will be used for very different purposes against other adversaries.

What does the framing of these two norms into a collision relationship tell us about their eventual resolution? Gholiagha et al. suggest that when incompatible expectations about appropriate behavior are held by actors because of variance between two norms, there is a path to resolution. They make a distinction between different stages of norm collision: dormant and open. In the dormant stage, only a lone actor articulates the conflicting advice gleaned from two incompatible norms. The open stage is intersubjective, where other actors recognize and invoke the paradox of two different norms over the same area. This transition from dormant to open is identified as the activation of the norm collision.[587] I would suggest that the political activity at the international level within the CCW and discourses over autonomous weapons internal to the U.S. national security apparatus indicate that we have moved from dormant to open collision. The resolution of norm collision

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[587] Sassan Gholiagha, Anna Holzscheiter, and Andrea Liese, "Activating Norm Collisions: Interface Conflicts in International Drug Control," *Global Constitutionalism* 9, no. 2 (July 2020): pp. 294-299.

is a legal conflict decided upon by a judiciary or arbitration body at the international level between the two norms. Clearly, no adjudication instrument is available in this case prior to the use of autonomous weapons in war. Global military norms generally operate external to international organizations. The exception to this would be NATO as a possible clearinghouse to sort out AWS policy amongst the allies as advanced military powers. But NATO itself is a product of and beholden to global military culture and does not incorporate other states that feature prominently in the re-emergence of great power confrontation (China and Russia). As with questions over a new revolution in military affairs, it seems a resolution between the opposing norms will only be possible *after* extensive use of killer robots in war.

While I do not expect historical examples to graft exactly onto the future politics around autonomous weapons, my findings do suggest a trajectory for this class of weapon that parallels the history of chemical weapons. In his insightful work on the moral reprehension around chemical weapons (C.W.) and the subsequent norm around them in the form of a taboo, Richard Price notes that C.W. had an interesting journey to a category of stigmatized weapons technology. He notes that "poison gas" weapons were anticipated at the 1899 and 1907 Hague Peace Conferences as an emerging dual-use technology: the chemical industry was just in its infancy with a number of different practical applications. As Price illustrates, the outcomes of the Hague conventions were understandably vague, given that this was a multilateral diplomatic effort to ban a weapon that did not exist yet, but that nearly all agreed CW was not a welcome development. The delegates did agree to a prohibition of "asphyxiating shells" before their use in warfare. This embargo on C.W. appeared reasonable up until the invocation of "military necessity" of European belligerents during World War I that usurped the ban, and they were used extensively in an effort to break the military stalemate.[588] The parallel between AWS and C.W. in terms of norm collision is not identical, but they do rhyme: the impetus to gain military advantage overrode the ethical concerns that underwrote the nascent prohibition of their use. This dynamic roughly mirrors where the CCW is at today. After eight years of talks, the proposition of autonomous weapons that can select and kill targets on their own has very few enthusiastic advocates, but leading military powers resist a pre-emptive ban on the technology anticipating an arms race to develop such weapons. China, in its stated policy on AWS, for example, follows a similar logic that Price illustrated in the chemical weapons case.[589]

However, the path for Chemical Weapons took a curious turn after their widespread use. They were banned again during the Interwar period, given the global revulsion to their effects in combat. The nightmarish outcomes of chemical warfare vaguely posited before their invention did not hold a candle to their actual horror. What was surprising was their non-use (at least in combat) during an even

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[588] Richard Price, "A Genealogy of the Chemical Weapons Taboo," *International Organization* 49, no. 1 (1995): pp. 82-84.

[589] Richard M. Price, *The Chemical Weapons Taboo* (Ithaca: Cornell University Press, 2007).

wider and more devastating conflict: World War II. This is notable given the availability of C.W. to most belligerents (especially those that had used them only 25 years earlier), the ferocity of that conflict, the number of weapons innovations that increased wonton destruction, and the maximalist stakes of the war overall. Indeed, after the war, chemical weapons were placed alongside biological and nuclear weapons under the designation Weapons of Mass Destruction. The regime to uphold the normative taboo against their use was strengthened with the instantiation of this norm in Protocol I of the Geneva Conventions in 1977 and in the Chemical Weapons Convention of 1993. While these international instruments have not eradicated C.W. from the world's arsenals or even stopped every instance of their use, they have held up the taboo reasonably well.[590]

Given this historical example, coupled with my research findings and the frame of norm collision, the tragedy of autonomous weapons is that they will most likely evade global governance until they are used in war. With these signposts, it is reasonable to expect no restraints on this category of weapons until their use shocks the world. The catalyst to build a taboo upon as hoped for by transnational advocates, or even to restrain in terms of numbers or limitations over their use will probably be a malfunction with dire enough consequences to bring sufficient political will to bear towards global governance. While the concerns thus far in the CCW have focused on international humanitarian law, unanticipated catastrophes

[590] *Ibid.*

are also possible with AWS. For example, fratricide (where autonomous weapons misstate forces on their own side for the enemy) or unintended conflict escalation (where lethal actions by autonomous systems inadvertently create strategic instability between nuclear states) also have the potential to elevate *meaningful human control* norms above the motivations of the *innovation imperative*. While this conclusion is not an optimistic one, it is one with a small amount of sober hope that one day the global community will collectively reassert its control over its own creations. Technology is made for human concerns. It is only up to us to insist on that control.

Appendix 1: Chapter 4 Codebook

NVivo is type of Qualitative Data Analysis software. It allows researchers to collect and analyze large amounts of textual data through organization and coding of text, photos, videos, and audio sources. Its strengths lie in the ability to quickly and systematically organize this type of data, the additional benefit of automated transcription of audio sources, and data visualization.

In the conventions of discourse analysis, all entries into an analysis are referred to as "texts" including not only written sources but also oral statements, visual symbols, photos, and videos. In my project, "text" referrers to written statements, reports, policy positions, white papers, or oral statements.

For my purposes, I have focused on collecting text versions of my sources in order to automate coding and leverage the capabilities of NVivo to efficiently.

DATA COLLECTION
Criteria for the corpus:
Sources
Targeted Time Period
Naming Conventions: the saved t
Strategy for foreign language texts
Strategy for unreadable (PDF as picture) text
Strategy for audio or video recordings

CODING FOR CASES
Identified as the units of observation (a.k.a. significant entitles under study)
Classification of types of actors

- States/State Parties
- Experts & Think Tanks
- NGO Activists
- UN and IGO actors

CODING FOR THEMATIC NODES
First run: word frequency query and word tree

Second run: query based on keywords focusing on positions and auto coding

- Themes developed on runs one and two:
- What are the primary issues surrounding AWS?
- Who are the major players driving the debate?
- What positions can we discern from the responses of the actors?
    - Position on what the norm should be
    - Position on

Third run: cross reference query on positions and themes

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Appendix 2: Chapter 5 Primary Documents

Historiography Sources

The methodological approach of this chapter is to succinctly replicate how the U.S. military tells its own history of weapons technology development. Thus, the sources consulted are not "primary" documents in the strict sense, but are selected from sources that inform the defense establishment's self-image. This gives us the conceptual foundation for the idea that technology is inherently a driver for strategic overmatch in the military mind.

A number of institutions are specifically given the duty of documenting the official history of American armed forces within the Department of Defense. These offices constituted the main source of histories that informed this chapter.

Historical Offices

This organization within the OSD is charged with the mission to "collect, preserve, and present the history" of the Pentagon in the widest sense. A number of the historical accounts consulted for this chapter were published under the auspices of this organization.

- "Historical Office of the Office of the Secretary of Defense." Accessed March 7, 2019. *https://history.defense.gov/***.**

The other DoD spanning organization concerned with the collection and dissemination of the official history is the Joint History Office. The majority of studies compiled by this organization are operational histories of military actions rather than concerned with the internal organization of the overall defense establishment. However, a few works produced by this institution shed some light on its distinct perspective.

- Joint Chiefs of Staff, "Joint History Office," accessed April 26, 2019, *https://www.jcs.mil/About/Joint-Staff-History/***.**

Each service branch also runs their own individual organizations concerned with establishing the official history from their perspective. There is considerable overlap between the materials collected within each of these institutions, the collections of their respective military education institutions, and material cross-listed with the central historical offices.

- "Naval History and Heritage Command." Accessed March 7, 2019. *https://www.history.navy.mil/***.**

- "U.S. Army Center of Military History." Accessed March 7, 2019. *https://history.army.mil/***.**

- "Air Force Historical Research Agency." Accessed March 7, 2019. *https://www.afhra.af.mil/***.**

- “Marine Corps History Division, Histories Branch.” Accessed March 7, 2019. *https://www.usmcu.edu/research/histories/***.**

PME Institutions

The service academies run by each military branch constitute what is referred to as Professional Military Education (PME). Each service requires officers to advance in their education in order to rise through the upper ranks. This means that the PME intuitions inhabit a major role in the acculturation of how the U.S. military writ large envisions the function of technology in warfare. For the purposes of this chapter, the journals, dissertations, and publications sponsored by these institutions are a rich source for understanding the internal historical narrative. In addition to these publications, syllabi for courses where history and technology intersect are also mined for sources.

- “Air University Press.” Accessed April 27, 2019. *https://www.airuniversity.af.edu/AUPress/***.**

- “Historical Monographs- U.S. Naval War College.” Accessed April 27, 2019. *https://digital-commons.usnwc.edu/usnwc-historical-monographs/***.**

- “National Defense University Press: Journals.” Accessed April 27, 2019. *https://ndupress.ndu.edu/Journals/***.**

- “The US Army War College Quarterly: Parameters.” Accessed April 27, 2019. *https://press.armywarcollege.edu/parameters/***.**

- “U.S. Army War College Press.” Accessed April 27, 2019. *https://press.armywarcollege.edu/***.**

Online Collections

Other sources for the internal historical narratives are official and unofficial clearinghouses for government documents. The Department of Homeland Security maintains a robust digital library of documents that overlap some of the previously noted sources above but also includes collections from other government sources concerned with national security (e.g., Congress.) that includes some historical studies in addition to contemporary research. In addition, external non-profit and academic organizations also collect government documents that may migrate off the official government websites or are simply not typically organized in a central location (e.g., Congressional Research Service reports.)

- Homeland Security Digital Library. “Homeland Security Digital Library.” Accessed April 17, 2021. *https://www.hsdl.org/?search***.**

- National Security Archive. “National Security Archive.” Accessed April 17, 2021. *https://nsarchive.gwu.edu/virtual-reading-room*.

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Appendix 3: Chapter 6 Codebook

In the conventions of discourse analysis, all entries into an analysis are referred to as "texts" including not only written sources but also oral statements, visual symbols, photos, and videos. In my project, "text" referrers to written statements, reports, policy positions, white papers, or oral statements. For my purposes, I have focused on collecting text versions of my sources in order to automate coding and leverage the capabilities of NVivo to efficiently.

Sources:

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Obama White House archive	https://obamawhitehouse.archives.gov/
Office of the Secretary of Defense	https://www.defense.gov/News/Press-Products/ and https://history.defense.gov/
Joint Chiefs of Staff	https://www.jcs.mil/
National Archives	https://www.archives.gov/research
National Science Foundation	https://www.nsf.gov/publications/
Defense Technical Information Center	https://discover.dtic.mil/
Homeland Security Digital Library	https://www.hsdl.org/c/
Federation of American Scientist	https://irp.fas.org//index.html
National Security Archive	https://nsarchive.gwu.edu/ and https://nsarchive2.gwu.edu/
Defense Visual Information Distribution Service	https://www.dvidshub.net/
Undersecretary for Research and Engineering	https://ac.cto.mil/
Defense Innovation Marketplace	https://defenseinnovationmarketplace.dtic.mil/
Defense Innovation Unit	https://www.diu.mil/
Defense Innovation Board	https://innovation.defense.gov/
Defense Science Board	https://dsb.cto.mil/
DARPA	https://www.darpa.mil/news
Joint Artificial Intelligence Center	https://www.ai.mil/
Office of Naval Research	https://www.onr.navy.mil/
Air Force Research Labs	https://www.afrl.af.mil/
Army Research Laboratory	https://www.arl.army.mil/
Army Futures Command	https://armyfuturescommand.com/
Army Training and Doctrine Command	https://www.tradoc.army.mil/
Air Force Science Advisory Board	https://www.scientificadvisoryboard.af.mil/

Department of the Air Force	https://www.e-publishing.af.mil/Product-Index/
Department of the Navy	https://www.navy.mil/Resources/Strategic-Library/
Department of the U.S. Army	https://www.army.mil/publications/
Commandant of the Marine Corps	https://www.hqmc.marines.mil/cmc/News/
Department of State	https://www.state.gov/ and https://www.state.gov/u-s-department-of-state-archive-websites/
Department of State Undersecretary for Arms Control and International Security	https://www.state.gov/bureaus-offices/under-secretary-for-arms-control-and-international-security-affairs/
Library of Congress	https://www.congress.gov/
U.S. House Armed Services Committee	https://armedservices.house.gov/
U.S. Senate Committee on Armed Services	https://www.armed-services.senate.gov/
Government Accountability Office	https://www.gao.gov/
Congressional Research Service	https://crsreports.congress.gov/
Center for a New American Security	https://www.cnas.org/
Center for Strategic Budgetary Assessment	https://csbaonline.org/
RAND Corporation	https://www.rand.org/
Brookings Institution	https://www.brookings.edu/
Center for Strategic and International Studies	https://www.csis.org/
Center for Naval Analyses	https://www.cna.org/
MITRE	https://www.mitre.org/
Aspen Institute	https://www.aspeninstitute.org/
Regan National Defense Forum	https://www.reaganfoundation.org/reagan-institute/
Hoover Institution	https://www.hoover.org/
American Enterprise Institute	https://www.aei.org/
Foreign Policy Institute	https://www.fpri.org/
Institute for the Study of War	https://www.understandingwar.org/
National Defense University	https://ndupress.ndu.edu/ and https://inss.ndu.edu/
Defense Acquisitions University	https://www.dau.edu/

Naval War College	https://www.usnwc.edu/Publications/Reports-and-Studies
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Air Force Academy	https://www.usafa.af.mil/
Air War College	https://www.airuniversity.af.edu/AWC/
Army War College	https://www.armywarcollege.edu/ and https://press.armywarcollege.edu/
Modern War Institute	https://mwi.usma.edu/
Association of the U.S. Army	https://www.ausa.org/
Air Force Association	https://www.afa.org/
Surface Navy Association	https://navysnaevents.org/national-symposium/
Defense Leadership Forum	https://www.usdlf.org/
Defense One	https://www.defenseone.com/
Janes 360	https://www.janes.com/
National Defense	https://www.nationaldefensemagazine.org/
Defense Systems	https://defensesystems.com/
C4ISR Net	https://www.c4isrnet.com/
Breaking Defense	https://breakingdefense.com/
Flight Global	https://www.flightglobal.com/
Aviation Week	https://aviationweek.com/
War on the Rocks	https://warontherocks.com/
The Drive	https://www.thedrive.com/the-war-zone
Strategy Bridge	https://thestrategybridge.org/
Texas National Security Review	https://tnsr.org/
War is Boring	https://warisboring.com/
From Balloons to Drones	https://balloonstodrones.com/
Military Times	https://www.militarytimes.com/
US Naval Institute	https://news.usni.org/
Army Times	https://www.armytimes.com/
Air Force Times	https://www.airforcetimes.com/
Air Force Magazine	https://www.airforcemag.com/
Armed Forces Journal	http://armedforcesjournal.com/

DATA COLLECTION

Criteria for the corpus:

- Targeted Time Period Criteria: Collection of materials limited to 2012-2020.

- Limited to sources within the National Security Community of the United States
- Heuristic for identifying sources:
    - Is the primary audience aimed at other national security practitioners? If yes, include.
    - Is the primary subject of the text military technology? If yes, consider.
    - Is the primary or secondary subject of the text the military technologies of UAVs, AWS, or AI? If yes, include.
    - Does the source reference a more wholistic text (e.g., a short news report of a longer statement)? If yes, locate primary source (speech or statement) and exclude reportage. If no, include.
        - If reportage restates a more wholistic statement but also includes other original statements, then include.

Naming Conventions
Files are saved into NVivo with a file name indicating date of authorship,

associated institution, named author (if indicated), and title of text.

Examples:
- 2021_03_01_NSCAI_Full final Report
- 2012_02_28_DoD_Keynote DepSecDef Ashton Carter to RSA Conf
- 2017_07_18_SASC_Selva Renomination
- 2011_09_01_AF_TechnologyHorizons2010-2030
- 2014_12_09_CSBA_Towards a New Offset Strategy
- 2015_07_28_Defense One_US Drone Pilots Are As Skeptical of Autonomy As Are Stephen Hawking and Elon Musk

Strategy for unreadable PDFs
NVivo functionality includes a scan to recognize text in imported PDFs that allows for inclusion of scanned documents.

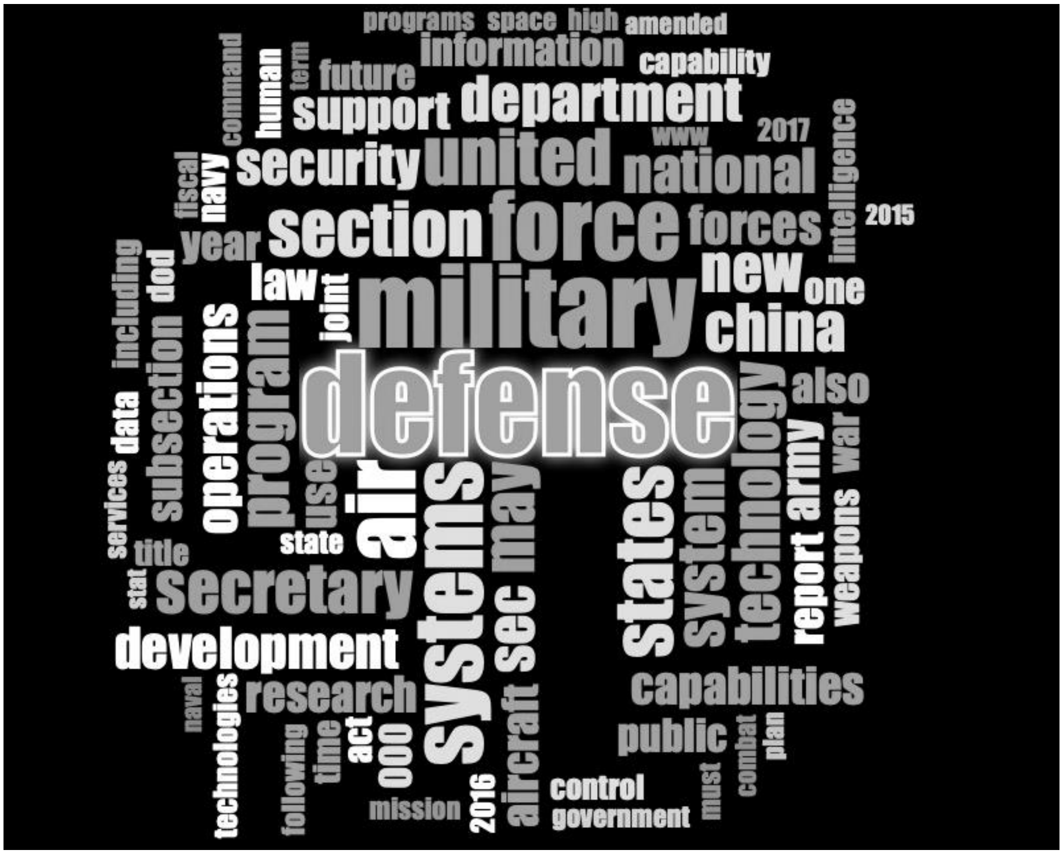
Strategy for audio or video recordings
If a transcript is unavailable for a broadcast audio or video recording (typically in the context of a Think Tank panel or military professional conference) then I first seek out the transcription function on YouTube or via C-SPAN (both required by the ADA). If this is unavailable, then NVivo functionality for audio to text transcription is utilized (involving an additional fee.)

Coding for Cases

Identified as the units of observation (a.k.a. significant entitles under study) and each is classified as a “case” node.

- Defense Media
- DoD Periodicals
- Think Tanks
- Executive Branch
  - Department of Defense (under the Secretary of Defense)
  - Army
  - Navy
  - Air Force
  - Marines
  - Service Academies and military scholarship
  - Defense Innovation Board
  - Defense Science Board
  - DARPA
  - JAIC
  - Joint Chiefs of Staff
  - State Department
- Legislative Branch
  - Senate
  - House of Representatives
  - National Security Commission on Artificial Intelligence

Coding for Thematic Nodes
First run: word frequency query and word tree. Here I note the frequency at the individual word level. The following word cloud is representative of this query:



Second run: queries run on specific military technologies (includes stemmed words (e.g., talk and talking)) and auto coding.

- "autonomous weapon" OR “autonomous weapon systems” OR “killer robots” OR “lethal military robot”
- “drones” OR “unmanned aerial systems” OR “unmanned aerial vehicles” OR “UAV” OR “UAS” OR “robotic aerial”
- “artificial intelligence” OR “AI” OR “machine learning” OR “neural learning network” OR “neural network”

Reviewing the coded text, I extend the coding beyond single words to whole sentences or paragraphs on these particular subjects. I also take note of the reoccurring phrases that surround these technologies in the texts, and run a new set of coding queries. Thus, the coding for themes developed on subsequent coding runs.

The following reoccurring themes are similarly auto coded by phrase, reviewed, and extended:

- "peer competitor" OR "near peer competitor" OR "near-peer"
- “adversary” OR “enemy” OR “competitor”

- "military-technical competition" OR "Security challenges" OR "Military aggression" OR "Contested environments"
- “military-technological superiority” OR “Technological overmatch” OR “Technological over-match” OR “technological superiority” OR “technological dominance”
- “China” OR “Chinese”
- “Russia” OR “Russian”

This set of queries and expanded coding sketches the rough outlines of the rationale for AWS development. At this point, I paused to pose a few heuristic questions to consider for further coding of the details of the contemporary strategic imaginary.

How does the text typify its vision of the future?

- Aspirational versus operative
    - what is hoped to happen with the introduction of the new technology vs. what is anticipated the impact of AWS on operations
- Differentiation in projections of the future (rationales for autonomy)
    - Level of abstraction vs. specificity in narrative
        - Envisioning of a one to one (one operator to one machine in a singular mission) type of story vs. an iterated, flexible capability with follow up/anticipated consequences
        - Specified and named threat vs. amorphous/coded language (identification of antagonist)
        - Universe of interaction with other actors/units?
    - How explicit in scenario crafting the technology will ideally operate in (e.g., specific adversaries and their projected capabilities vs. simply “counter adversaries” of near-peer competitors) is a function of the level of detail or purpose within a text envisioning a built capability and varies by service
- Variation of discourse adoption across institutions

This set of heuristics are coupled with the following coding query to capture instances where the future is projected in these texts:

- "Third Offset" OR "future" OR "forecast" OR "envision" OR "scenario" OR "presage" OR "predict" OR "foresee" OR "Net Assessment" OR "prophesize" OR "prophesy" OR "portend" OR "LRRDPP" OR "Long Range Research and Development" OR "Defense Innovation Initiative" OR "DII" OR "tomorrow"

Series of cross matrix queries (threats, specific technologies, and specific actor categories) allow for coding along the heuristics suggested above. It also allows me to identify the following within the discourse:

- What are the primary issues surrounding AWS?
- Who are the major players driving the debate?
- What positions can we discern from the responses of the actors?

Finally, the question of how ethics or the international norm fits into the this discussion is explored through the following coding queries with expanded coding taken up as I dig into individual texts:

- ethics" OR "moral"
- "laws of war" OR "laws of armed combat" OR "LOAC" OR "Geneva convention" OR "international humanitarian law" OR "international law"
- "meaningful human control" OR "MHC"
- "appropriate levels of human judgement" OR "human judgement"

Though cross matrix coding, I delineate the position of different actors on what the internal norm ought to be.

The following canonical texts are also coded for (as they are referenced within other texts):

- "2018 National Defense Strategy" OR "2018 NDS"
- "Directive 3000.09"

Here address the wariness/hesitation within the defense establishment

Hesitation over AWS within the U.S. Defense Establishment (Phase 2)
Representative quotations
"We have proven that we can build and field unmanned underwater vehicles, unmanned surface vehicles, unmanned wheeled vehicles, and remotely piloted air vehicles. We can actually build autonomous vehicles in every one of those categories. This gets us to the cusp of a question about whether or not we are willing to have unmanned autonomous systems that can launch on an enemy. I think that is a huge technology question that we will all have to wrestle with. There are ethical implications; there are implications for the laws of war. There are implications that I call the "terminator conundrum." What happens when that thing can inflict mortal harm and is empowered by artificial intelligence? How are we going to deal with that? How are we going to know what's in the vehicle's mind, presuming for the moment we are capable of creating a vehicle with a mind. It's not just a programmed thing that drives a course or stays on the road or keeps you between the white lines and the yellow lines, doesn't let you cross into oncoming traffic, but can actually inflict lethal damage to an enemy and has an intelligence of its own. How do we document that? How do we understand it?

How do we know with certainty what it's going to do? Those are the problem sets that I think we are going to have to deal with in the technology sector that making building the platform actually a relatively simple problem."
-General Paul J. Selva, USAF. The Brookings Institution: Trends in Military Technology and the Future Force, January 21, 2016

"First of all, there will be a raucous debate in the Department about whether or not we take humans out of the decision to take lethal action. I will tell you in this forum that I am an advocate for keeping that restriction. Because we take our values to war and because many of the things that we must do in war are governed by the laws of war, which say we must take proportional and discriminate action against an enemy to achieve our objectives, I do not think it is reasonable for us to put robots in charge of whether or not we take a human life. That does not mean that we do not have to address the development of those kinds of technologies and potentially find their vulnerabilities and exploit those vulnerabilities to our own. But publicly I think we should all be advocates for keeping the ethical rules of war in place, lest we unleash on humanity a set of robots that we do not know how. And that is way off in the future, but it is something we need to deal with right now."
-General Paul J. Selva, USAF. U.S. Senate Armed Services Committee Hearing, July 18, 2017

"I don't think that in matters of gravity, like the application of lethal force, that you can have true autonomy. I don't believe that human beings can cede their responsibility because I would certainly feel responsible, and I felt responsible every time we used lethal force. I thought that was necessary, we needed that to protect our people. But I certainly felt responsible in the very fullest sense as a human being by it, and everybody in my chain of command did and the president did. And every president I've ever worked for has felt that way too. You don't want them feeling any other way. But how do you locate human responsibility in an AI system?"
-Former Secretary of Defense, Ash Carter. Vox Recode, May 13, 2019

"Now everyone says this is another one of these are things where all you're talking about is technology and that is why human machine is explicitly in what we talk about the way we will approach this is that this is designed to make the human more effective in combat. Remember what [Russian General] Gerasimov said. And I will make a hypothesis that authoritarian regimes who believe people are weaknesses in the machine that they are a weak link in the cog, that they cannot be trusted. That they [Russia] will naturally gravitate towards totally automated solutions. Why do I know that? Because that's exactly the way the Soviets conceived of their reconnaissance strike complex. It was going to be completely automated. We believe the advantage we have as we start this competition is our people that tech savvy people who've grown up in a democracy

in the world will kick the crap out of people who grow up in the world in an authoritarian regime. And guess what. If this changes the authoritarian regime to the way they allow their people to have more initiative, that in the long run will help us because that will inevitably lead to a more meritocracy, and a more democratic approach inside their armed forces that may over the long term actually help us."
-Deputy Secretary of Defense, Bob Work. CNAS National Security Forum Dec 22, 2015

Urgency for AWS development in the 2018 NDS (Phase 3)
"Today, we are emerging from a period of strategic atrophy, aware that our competitive military advantage has been eroding. Inter-state strategic competition, not terrorism, is now the primary concern in U.S. national security."

"We face an ever more lethal and disruptive battlefield, combined across domains, and conducted at increasing speed and reach—from close combat, throughout overseas theaters, and reaching to our homeland. Some competitors and adversaries seek to optimize their targeting of our battle networks and operational concepts, while also using other areas of competition short of open warfare to achieve their ends (e.g., information warfare, ambiguous or denied proxy operations, and subversion). These trends, if unaddressed, will challenge our ability to deter aggression."

"The security environment is also affected by rapid technological advancements and the changing character of war. The drive to develop new technologies is relentless, expanding to more actors with lower barriers of entry, and moving at accelerating speed. New technologies include advanced computing, "big data" analytics, artificial intelligence, autonomy, robotics, directed energy, hypersonics, and biotechnology— the very technologies that ensure we will be able to fight and win the wars of the future."

"New commercial technology will change society and, ultimately, the character of war. The fact that many technological developments will come from the commercial sector means that state competitors and non-state actors will also have access to them, a fact that risks eroding the conventional overmatch to which our Nation has grown accustomed. Maintaining the Department's technological advantage will require changes to industry culture, investment sources, and protection across the National Security Innovation Base."

"Advanced autonomous systems. The Department will invest broadly in military application of autonomy, artificial intelligence, and machine learning, including rapid application of commercial breakthroughs, to gain competitive military advantages."

“No comfortable historical reference captures the impact of artificial intelligence (AI) on national security. AI is not a single technology breakthrough, like a bat-wing stealth bomber. The race for AI supremacy is not like the space race to the moon. AI is not even comparable to a general-purpose technology like electricity. However, what Thomas Edison said of electricity encapsulates the AI future: “It is a field of fields … it holds the secrets which will reorganize the life of the world.” Edison’s astounding assessment came from humility. All that he discovered was “very little in comparison with the possibilities that appear.”

The National Security Commission on Artificial Intelligence (NSCAI) humbly acknowledges how much remains to be discovered about AI and its future applications. Nevertheless, we know enough about AI today to begin with two convictions.

First, the rapidly improving ability of computer systems to solve problems and to perform tasks that would otherwise require human intelligence—and in some instances exceed human performance—is world altering. AI technologies are the most powerful tools in generations for expanding knowledge, increasing prosperity, and enriching the human experience. AI is also the quintessential “dual-use” technology. The ability of a machine to perceive, evaluate, and act more quickly and accurately than a human represents a competitive advantage in any field—civilian or military. AI technologies will be a source of enormous power for the companies and countries that harness them.

Second, AI is expanding the window of vulnerability the United States has already entered. For the first time since World War II, America’s technological predominance—the backbone of its economic and military power—is under threat. China possesses the might, talent, and ambition to surpass the United States as the world’s leader in AI in the next decade if current trends do not change. Simultaneously, AI is deepening the threat posed by cyberattacks and disinformation campaigns that Russia, China, and others are using to infiltrate our society, steal our data, and interfere in our democracy. The limited uses of AI-enabled attacks to date represent the tip of the iceberg. Meanwhile, global crises exemplified by the COVID-19 pandemic and climate change highlight the need to expand our conception of national security and find innovative AI-enabled solutions.” Pp 7

“The U.S. military has enjoyed military-technical superiority over all potential adversaries since the end of the Cold War. Now, its technical prowess is being challenged, especially by China and Russia. Senior military leaders have warned that if current trend lines are not altered, the U.S. military will lose its military-technical superiority in the coming years.1 Artificial intelligence (AI) is a key aspect of this challenge, as both of our great power competitors believe they will be able to offset our military advantage using AI-enabled systems and AI-enabled autonomy. In the coming decades, the United States will win against technically sophisticated adversaries only if it accelerates adoption of AI-enabled sensors and systems for command and control, weapons, and logistics.” 62

“Even with the right artificial intelligence (AI)-ready technology foundations in place, the U.S. military will still be at a battlefield disadvantage if it fails to adopt the right concepts and operations to integrate AI technologies. Throughout history, the best adopters and integrators, rather than the best technologists, have reaped the military rewards of new technology.1 The Department of Defense (DoD) should not be a witness to the AI revolution in military affairs, but should deliver it with leadership from the top, new operating concepts, relentless experimentation, and a system that rewards agility and risk.

A new warfighting paradigm is emerging because of AI. Our competitors are making substantial investments to take advantage of it. This idea has been called “algorithmic” or “mosaic” warfare2; China’s theorists have called it “intelligentized” war. All of these terms capture, in various ways, how a new era of conflict will be dominated by AI and pit algorithms against algorithms. Advantage will be determined by the amount and quality of a military’s data, the algorithms it develops, the AI-enabled networks it connects, the AI-enabled weapons it fields, and the AI-enabled operating concepts it embraces to create new ways of war. Today’s DoD is trying to execute an AI pivot, but without urgency. Despite pockets of imaginative reform and a few farsighted leaders, DoD remains locked in an Industrial Age mentality in which great-power conflict is seen as a contest of massed forces and monolithic platforms and systems. The emerging ubiquity of AI in the commercial realm and the speed of digital transformation punctuate the risk of not pivoting fast enough. The Department must act now to integrate AI into critical functions, existing systems, exercises, and wargames to become an AI-ready force by 2025. Simultaneously, DoD must develop more creative warfighting concepts that are paired with investments in future AI-enabled technologies to continuously out-innovate potential adversaries. If our forces are not equipped with AI-enabled systems guided by new concepts that exceed those of their adversaries, they will be outmatched and paralyzed by the complexity of battle.” Pp. 77

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