

Automating Violence: A History of United States Drone Warfare, 1900-1970

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Dissertation submitted in partial fulfillment of  
the requirements for the degree of Doctor  
of Philosophy in the Department of  
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2022

ABSTRACT

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## **Abstract**

Drones may appear a recent technology whose future may have just barely started. But drone technology's development and the rationales for their adoption extend back over a century ago to weapons called "pilotless airplanes" during World War I. Historians have examined the deployment of drones in military campaigns, the history of drones as technical systems, science fiction as a cultural inspiration for engineers, and the institutional machinations required to fund new war machines. Philosophers and jurists debate the ethics and legality of conducting violence through remote control. Peace activists, whistleblowing drone operators, and interfaith coalitions have formed a burgeoning anti-machine war movement. Yet, amongst the dynamic discussions surrounding drones, the fantasies and anxieties that animated the technology's adoption during the twentieth century remain largely unexamined.

My dissertation offers a cultural history of U.S. drone warfare during the twentieth century. Cultural discourses and practices proved key to the policy formations, military planning, and political economy of the American way of war's increasing turn to mechanization. I present the military use of drones as a key, yet understudied, part of the larger history of U.S. machine warfare that relied on superior productive power to overwhelm enemies with technological means. Airpower became central to U.S. war-making during the era of the world wars, the Cold War, and beyond.

Drones, in turn, developed into an ever-more important “asset” in the U.S. aerial arsenal before reaching a central place in present day pursuits of war.

Drone technology’s ascent owes less to its utility in war than to the cultural projections and fears that surrounded pilots in air war. Technical bugs often rendered drones less than mechanically stellar. Despite functional flaws, replacing pilot with machine in war became attractive precisely because human agents consistently seemed limited instruments of war in popular and policy discourse. Soldiers always died in war. Many became security risks when captured and tortured for information. Some turned against the war they were supposed to fight. Grieving families politicized their personal loss. War made U.S. audiences anxious their men were not “man enough” to achieve victory. Remote-controllable drones seemed to solve these problems, by sparing American lives, by rendering war less visible, and by removing men deemed incapable of war from the site of combat, thereby ‘depoliticizing’ war and saving armed conflict as an instrument of policy.

The history of drone adoption is not a teleological story of linear technological progression, but rather a narrative of fits and starts, with differing actors operating in differing contexts imagining war machines to accomplish differing goals. Current claims to a “humane” form of war through “surgical strike” capabilities and effective surveillance do not sum up the history of the drone. The drone has long been used as a means of mass destruction including chemical war, nuclear war, and missile multitudes.

## **Dedication**

This dissertation is dedicated to Professor David H. Culbert (1943-2017) whose teaching of history made me want to learn more and who pushed me to attend graduate school.

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## Introduction: How Did Drones Take Center Stage in U.S. War Making?

I attended a conference at Duke University's Fuqua School of Business in 2015 that brought national security scholars and U.S. Air Force officials into conversation about drone warfare. Speakers included Air Force Generals – all men – and two women - civilians, yet militant. The two women were the then Secretary of the United States Air Force Deborah James and a retired U.S. Navy pilot turned aviation software systems engineer Professor Mary “Missy” Cummings. Despite the U.S. military's long history of excluding women from aviation service, by 2015 James had risen to the highest civilian leadership position of the U.S. Air Force, a military service branch in which men still predominated the ranks. Professor Cummings' career was arguably more anomalous. Following her time in military aviation her position as the head of Duke University's Humans and Autonomy Lab placed her in the unique position of designing operating systems for military and commercial drones.<sup>1</sup>

Air Force Secretary James and Duke Engineering Professor Cummings shared a panel stage *sans* men of brass and uniform, highlighting and separating the two influential women in aviation from their audience made up mostly of men. I cannot remember everything the two discussed. What was most memorable was a joke,

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<sup>1</sup> Duke University Electrical and Computer Engineering Professor Missy Cumming's professional history is available through her department webpage: <https://pratt.duke.edu/faculty/missy-cummings>

disagreements, and claims to history. Secretary James, in mid-conversation about controversies surrounding U.S. drone operations reportedly causing far more civilian casualties than the Obama administration admitted, dismissively quipped, – “Can you imagine how things would be under Trump?” Her joke elicited laughter from the listening audience at a time when Donald Trump was still a prospective Republican presidential candidate whose campaign seemed like a farce. Trump had recently remarked on the campaign trail that his strategy for fighting the war on terror would be to “bomb the hell out of ISIS” – a threat in many ways carried out during his administration through the relaxing of regulations guiding U.S. air bombings and the use of the massively destructive “Mother of All Bombs.”<sup>2</sup> But in 2015, James’ joke about a potential Trump presidency served to deflect criticisms of the Obama administration’s drone wars by suggesting future drone war could be far more destructive under Trump.

As Air Force Secretary Deborah James and Duke Engineering Professor Missy Cummings discussed drone war there was a tension in the terms each used. James exclusively used the term “remotely piloted aircraft” whereas Cummings preferred the word “drone.” Their differing language caused contention and debate. James insisted

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<sup>2</sup> William Finnegan, “The Escalating Slurs of Donald Trump,” *The New Yorker*, December 3, 2015, <https://www.newyorker.com/news/daily-comment/donald-trump-escalating-slurs>; Jenna Johnson, Jenna Johnson, “Donald Trump promises to ‘bomb the hell out of ISIS’ in new radio ad,” *The Washington Post*, November 18, 2015, <https://www.washingtonpost.com/news/post-politics/wp/2015/11/18/donald-trump-promises-to-bomb-the-hell-out-of-isis-in-new-radio-ad/>

the term remotely piloted aircraft maintained a recognition that airmen were still a significant part of drone operations through operators who controlled aircrafts from a distance, engineers who designed the war machines, and technicians who maintained their operation. Cummings, the software engineer, disagreed. She argued that drones had a long history extending back to the age of the Air Force's founding General Henry Harley "Hap" Arnold, while also suggesting more and more of drone operations relied on automating programming that took control of drones out of human hands.

This disagreement was not surprising, but it is illuminating. James, as representative of the Air Force and its constituent personnel, speaking to a room mostly filled with uniformed airmen, paid tribute to the human factor of drone war. Cummings, who designed drone software systems, emphasized her own work that geared drones to need less and less human interaction. Most significantly, the competing emphases between the role of remote operators and the pursuit of machine autonomy spoke to alternate visions for drones traceable to drones' earliest iterations.

A photo-op followed Secretary James and Professor Cummings' panel. The walk from lecture hall to photo stage provided me the opportunity to ask Cummings a question I suspected I knew the answer to. As conference attendees grouped together, I approached Cummings and asked: "Did you name the Humans and Autonomy Lab

(HAL) after the computer system HAL in Stanley Kubrick's film *2001: A Space Odyssey*?"<sup>3</sup> She answered, "Yes, of course."<sup>4</sup>

Cummings' admission that she was influenced by Kubrick's film *2001* illustrated a cognitive dissonance common in the minds of those who see no wrong in their violent practices. Cummings claims her lab's aim is not simply to engineer drones and their operating systems but also to make people more comfortable with the automating technologies she helps design. Despite the namesake of her engineering lab being a machine that disobeyed its human supervisors and killed them, she has actively tried to sway the public to favor drone technology that reaches for full automation. Cummings whitewashed contemporary drone war through production of a PBS documentary and public speaking appearances. Publicity for her 2012 PBS film *Rise of the Drones* included an appearance on the *Daily Show with John Stewart* in which she dismissed questions about civilian casualties caused by drone war. An associate I met while researching at the Linda Hall Library in Kansas City shared with me the story of Cummings speaking at the research library about her work on drone technology and again dismissing

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<sup>3</sup> Kubrick's HAL invoked the actual computer company International Business Machines (IBM) a U.S. company with a long history and then active production of machines put to work in war including railways, card punches, and computers. For a history of IBM's relationship with Nazi Germany see: Edwin Black, *IBM and the Holocaust: The Strategic Alliance Between Nazi Germany and America's Most Powerful Corporation*, Dialog Press, 2001; for a history of IBM's engagement with the U.S. war in Vietnam, see: Dan E. Feltham, *When Big Blue Went to War: The History of the IBM Corporation's Mission in Southeast Asia During the Vietnam War (1965-1975)*, Abbott Press, 2012.

<sup>4</sup> Author in conversation with Missy Cummings, October 26, 2015, U.S. Air Force National Security Scholars Conference, Fuqua School of Business, Duke University.

questions about civilian casualties posed by audience members. A survey produced by the HAL lab aimed to gauge public opinion on drones and improve the technology's image.<sup>5</sup> The survey juxtaposes questions about respondents' support for the CIA using drones to launch missiles against targeted individuals, or drones monitoring U.S. borders, next to proclamations of drone capabilities to deliver medicine to rural communities or inspect bridges for engineering failures. The survey's back and forth of already practiced violent capacities contrasted with drones' supposed potential to do good, or even banal acts like collecting images for real estate marketing, leave a survey respondent with the impression that drones are multi-use technologies, not only war machines. Yet, despite the plethora of functionalities people are finding for drones, their primary use in the present and past has been as an instrument of violence.

But what sort of violence do drones conduct? The contemporary moment's drone wars have been infused with the rhetoric of "surgical precision" originally enunciated by John Brennan, a counterterrorism advisor in the Obama administration later named CIA Director. Brennan deployed the "surgically precise" metaphor during the first official admission of the U.S. waging war with drones in 2012; he acknowledged what had become a controversial open secret of the weapons platforms' deployment not only in Iraq and Afghanistan, but also over Pakistan, Yemen, and Somalia. In the original

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<sup>5</sup> Duke University Pratt School of Engineering, Humans and Autonomy Lab survey, found here: <https://hal.pratt.duke.edu/>

phrasing, Brennan offered an ethical argument for drones insisting they adhered to principles of international law including necessity, distinction, and proportionality. He argued drones imparted “humanity” to organized violence by enabling the sparing of American lives in war while wielding a “surgical precision - the ability with laser-like focus to eliminate the cancerous tumor called an al-Qaida terrorist, while limiting damage to the tissue around it.” Despite Brennan’s claims to ethical and just violence through drones, his pathologizing of America’s enemy as cancerous tumors spoke more directly to the dehumanization inherent in the violent logics of the U.S. war on terror. He claimed a righteous exercise of force against an enemy ostensibly in need of elimination; in effect he turned the U.S. into the world’s doctor whose drones might serve as healing scalpel.

Brennan’s claims aside, the U.S. government’s assertions of using surgical precision against terrorist targets, mitigating civilian casualties, and saving American lives had already faced a bevy of challenges by 2012. The controversies surrounding drone war’s destructiveness was a key reason the Obama administration finally acknowledged its use of drones. Non-government organizations like the Bureau of Investigative Journalism and Airwars have combed news reports from locales that experienced drone bombings and conducted oral interviews with bombing victims.

These organizations provide a statistical record of civilian casualties that far exceeds the number of dead that the U.S. government admits to causing with drones.<sup>6</sup>

These statistics not only speak to the regularity of civilian casualties counted into the many thousands, but also provide a better understanding of the regularity of drone strikes being conducted by the tens of thousands. A case in point: nearly 20,000 drone strikes occurred in Syria alone between 2014 through 2022. These drone strikes not only produce death, but also dislocation and refugee crises. The U.S. government often publicizes the deaths of militant leaders targeted by drone strike, yet most drone bombing victims are low level militants, women, and children who go unmentioned in official pronouncements. While drone strikes kill far more people than admitted, claims that distanced bombing by drone saves American lives have been undercut by the prevalence of post-traumatic stress disorder and suicide among drone operators. The battlefield exchange of bullets is ostensibly a more intimate form of war. Yet, scholars and military bioethicists link the prevalence of moral injuries and mental illness among drone operators to the expectations placed upon them, including being asked to surveil

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<sup>6</sup> Data on U.S. drone war in Afghanistan, Pakistan, Yemen, and Somalia from 2010-2020 can be found through the Bureau of Investigative Journalism: <https://www.thebureauinvestigates.com/projects/drone-war>. Data on U.S. drone war in Iraq and Syria can be found through the watchdog group Airwars: <https://airwars.org/conflict/coalition-in-iraq-and-syria/>

targets for extended periods, watching them live their lives for days, then receiving orders to kill.<sup>7</sup>

The limits to claims of drones reforming war into something “humane” echo a primary argument of this dissertation – that the historical legacy of the drone is one of immense violence. “Automating Violence” is a study of drone war that offers a critical genealogy of a kind of warfare that has become emblematic of U.S. war making in the recent past and present. The history of U.S. drone war offers a lens into the nation’s practices of waging a form of machine war that relied upon massive productive capacity and resource consumption to place technology at the center of war making. The history of drone war also fits within the broader history of air war, which the U.S. wielded throughout the 20<sup>th</sup> century as a key means of keeping war elsewhere, waged at a distance. While drone war would not be fully realized as a reliable means of surveillance and bombardment until the 21<sup>st</sup> century, what is important and overlooked about the century long history of U.S. drone war is the extensive imagination that surrounded the

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<sup>7</sup> Former drone operator Brandon Bryant has become a whistle blower describing the war crimes he witnessed and participated in through drone operations as well as discussing the damaging mental health effects of drone war for operators, see: Von Nicola Abé interview with Brandon Bryant, “Dreams in Infrared: The Woes of an American Drone Operator,” *Der Spiegel*, 2012, <https://www.spiegel.de/international/world/pain-continues-after-war-for-american-drone-pilot-a-872726.html>; see also Brandon Bryant’s essay: “Letter from a Sensor Operator,” in *Life in the Age of Drone Warfare*, eds. Lisa Parks and Caren Kaplan, Duke University Press, 2017; Eyal Press, *Dirty Work: Essential Jobs and the Hidden Toll of Inequality in America*, Chapter 4: “Joystick Warriors,” Farrar, Straus and Giroux, 2021; Research conducted by the U.S. military’s own bioethicists have shown PTSD to be more prevalent among drone operators than in any other form of military service, Jaff Matsler, U.S. Army Bioethicist, Conference Presentation, “Conference Against the Use of Drones in Warfare,” Duke University Divinity School, 2017.

drone since its earliest iteration during the First World War. Examining the imaginary that surrounded drones in the past helps us better understand the drone as something relevant to yet distinct within the broader history of machine war. Where technological instruments of machine war like machine guns or airplanes amplified human agency to conduct violence, the drone has long been imagined as something capable of replacement, or as a *machine substitution* for the “human factor” in war. More than amplifying a person’s capacities for violence, war planners who imagined and animated the drone’s use in war often saw the drone as holding agency itself, especially in cases where drones could operate automatically, but also in instances where remote operators still held drones’ controls.

Contemporary drone strikes of the 21<sup>st</sup> century combine a panoptical capacity to surveil targets for extended periods with precision weapon systems that enable bombardiers to place explosions where desired. While the supposed “surgical precision” of contemporary drone war has not managed to avoid frequent civilian casualties and collateral damage, the use of precision weapon systems is a sign of change over time in U.S. bombing practices, especially when compared to prior bombing efforts of the World Wars and Cold War that centered around mass indiscriminate bombing. Drones in the past, however, operated within the indiscriminate logics of city bombing, chemical warfare, and nuclear war, thereby offering a lens into both continuities and changes in

an American way of war that often focused on the total destruction of an enemy other. It is through the drone's history and its varied applications as bombing mechanism over time that one can see the contrast of "mass destruction" with "surgical precision" as a false binary misrepresentative of both past and present war violence.

The history of U.S. drone warfare is also a transnational story. Immigrants from other spaces around the world became key figures who designed or pushed for U.S. drone technology. U.S. based drone makers sought international buyers for their weapons technologies during multiple moments in time. In the second half of the 20<sup>th</sup> century, international institutions like the North Atlantic Treaty Organization's Advisory Group for Aeronautical Research and Development became key spaces for the transnational construction and dissemination of knowledge about air war. Drones have long been a component of U.S. war making that aimed to keep wars "foreign." Conducting war far away from the U.S. continent has required a reliance upon air bases built in other countries' territory for operation. The primary victims of the violence exerted during U.S. drone wars are non-Americans.

"Automating Violence" is as much about the ideas that surrounded drones as it is about the technology's development and deployment. Popular audiences and policy makers constructed discourses that often focused on the vulnerabilities of pilots in air war. The perceived problems with pilots fueled fantasies of how drones could perform

as machine substitutions that automated the violent labors of air war. Hopes grew that war machines like drones could more effectively conduct violence and kill enemy others while sparing American lives. U.S. war makers imagined and deployed the drone through the 20<sup>th</sup> century as a violent instrument that conducted indiscriminate air bombing not precise attacks. I hope that by examining the drone's long history and role in indiscriminate air wars of the past that drone technology can be brought into a critique informed by a deep recollection the drone's violent legacy that is missing from the existing literature.

The drone's convoluted and non-linear history is reflected in semantics. The use of the word "drone" to refer to a flying machine has an etymological history. British Royal Air Force officers working with remotely flown aircraft in the late-1930s are accredited with coining the phrase. Cheaply constructed and remotely controlled "aerial targets" officially named the "Queen Bee" were flown as targets to be shot at by naval gunners during firing practices. The device's sacrificial use as a firing practice target alongside its official designation as a "Queen Bee" shaped the devices' "drone" nickname. The British term "drone" grew in popularity within United States military discourse as British and U.S. air forces coordinated bombing campaigns during the Second World War, a moment which included the first use of "drones" to bomb enemy

targets.<sup>8</sup> This explicit designation of drone aircraft as sacrificial echoes the role of the drone bee in nature, and signals disposability as another key distinction of the drone from other components of machine war like piloted airplanes that were not made to be lost.

Prior to the term “drone,” war machine makers in the First World War era used a slew of other terms – “aerial torpedo,” “pilotless airplane,” “flying bomb,” - for flying machines made to soar and bomb without a person onboard. These terms also held histories and meanings. Aerial torpedo, for example, appeared in patent filings at the opening of the 20<sup>th</sup> century, and in international film by the early-1910s, before its wide use by military officials and machine designing engineers during World War I. Pilotless airplane, flying bomb, and other terms like “automatic aircraft” emerged during World War I, and often appeared alongside one another as synonyms in correspondence or policy documents.

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<sup>8</sup> Military historians trace the term “drone” to the British “Queen Bee” target drone flown to be shot down amidst Navy firing practice in 1935. U.S. Navy officers like Delmar Fahrney are often accredited with coining the phrase or alternatively accredited with introducing the British phrase to U.S. military audiences. However, the wider usage of the term “drone” by Royal Air Force officers compared to its slower appearance in U.S. military discourse suggests that the term originated with British airmen. The primary evidence historians have drawn upon to accredit Fahrney with the term is his own unpublished and aggrandizing manuscript on the history of drones and “guided missiles,” another term Fahrney claimed to coin. Fahrney’s manuscript provides a sweeping interpretation of drone history including his own contributions as a Navy aeronautical engineer. But the manuscript is filled with errors, so much so that Smithsonian Institution archivists abandoned their attempt to publish the manuscript due to the prevalence of inaccuracies in the text. Conversation with Smithsonian Air and Space Museum archivist Frank H. Winter, National Air and Space Museum, August 2019; Thomas Ehrhard, *Air Force UAVs: The Secret History*, Mitchell Institute Press, 2010, 66; Katherine Chandler, *Unmanning: How Humans, Machines, and Media Perform Drone Warfare*, Chapter 1: “Drone,” Rutgers University press, 2020.

Other terms like “guided missile” emerged amidst World War II as purposeful distinctions between weapons then being made and a prior generation of aerial torpedoes and pilotless planes. Other new terms like “robot airplane” also found common usage during the Second World War, again often appearing alongside old terms like “aerial torpedo” or “pilotless airplane,” or alternatively alongside the term “drone” as its usage grew in the early 1940s.

“Unmanned” first found discursive favor in the 1950s as a reference to satellites launched into space to orbit Earth. In the late 20<sup>th</sup> into 21<sup>st</sup> century, “Unmanned Aerial Vehicle” (UAV) challenged but never eliminated the preponderant phrase “drone” in part because it was one among other clunky acronyms including “Remotely Piloted Aircraft” (RPA) or “Unmanned Aerial System” (UAS).

In each chapter, I have taken care to use the terms and meanings used by the historical actors of the moment under analysis. I have also tried to avoid a tendency in some military histories to become dependent upon acronyms that can obfuscate authors’ writing. The history of the “drone” is not self-evident as the word itself has a history. By tracing this history even further back to the time of the “pilotless airplane” and “aerial torpedo” we gain a greater understanding of what the drone was imagined doing in war.

Drone warfare's growing significance in 21<sup>st</sup> century international conflicts calls for a history of the technology's place in the past that speaks to the present. The United States of America became a nation through war; belligerency has shaped its history ever since. Yet, American ways of war have changed over time. Across the 20<sup>th</sup> century up to today, air war has risen to be the United States' paramount tool of violence and projection of power in the world. Existing scholarship has not adequately examined the place of the drone within the history of air war. While there is a large and growing interdisciplinary literature that studies war machines called "drones" or "Unmanned Aerial Vehicles," there are real limits to the analyses offered by existing scholarly literature. "Automating Violence" draws upon but moves beyond the existing literature on drones to offer a new interpretation of the technology's history.

It is not an insignificant method of dividing the existing literature on drone warfare by comparing works that appeared before or after September 11, 2001. Historical actors involved in the making of drone war wrote their own histories before scholars.<sup>9</sup> Contemporary journalists and popular writers also turned their attentions to

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<sup>9</sup> Paul de Kruif and Charles Kettering, *Boss Kettering*, Saturday Evening Post, 1933; Henry Harley Arnold, *Global Mission*, Harper & Brothers, 1949; Delmar S. Fahrney, "The History of Pilotless Aircraft and Guided Missiles," c. 1958, Smithsonian National Air and Space Museum, Air and Space Archives, Delmar S. Fahrney Manuscript, Box 1.

early pilotless planes.<sup>10</sup> Autobiographical texts from leading engineers and military officials who directed drone development in the first-half of the 20<sup>th</sup> century helped inform historians of technology and science writing in the 1970s and 1980s. The latter often produced biographies that retold the stories of major figures who had helped animate aerial torpedoes and pilotless airplanes during the world wars.<sup>11</sup> The best of these works incorporated the emergent methods of social history including analyses focusing on corporate capital exchange and made narrative efforts to decenter the state in history, yet the biographical emphases of these works tended to place inventive “great men” at the center of pilotless airplane development, and ignore the importance of race, gender, or sexuality in history.<sup>12</sup> Military historians writing in the late-20<sup>th</sup> century also showed interest in the early generations of drones. Yet, these works often constructed teleological narratives that linked the disparate developments of similar, yet different, war machines separated by time, historical actors, or guiding ideas.<sup>13</sup> This tendency easily veered into efforts to construct an “evolutionary” notion of the drone’s development that paid little attention to the fits and starts that characterize a century

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<sup>10</sup> In addition to many contemporary news articles, journalists also wrote books on drone operations from the world wars, for example see: Jack Olson, *Aphrodite: Desperate Mission*, Putnam, 1970.

<sup>11</sup> Thomas Parke Hughes, *Elmer Sperry: Inventor and Engineer*, John Hopkins University Press, 1971; Stuart W. Leslie, *Boss Kettering: Wizard of General Motors*, Columbia University Press, 1986; William W. Davenport, *Gyro!: The life and times of Lawrence Sperry*, Scribner, 1978.

<sup>12</sup> Ibid.

<sup>13</sup> Thomas P. Ehrhard, *Unmanned Aerial Vehicles in the United States Armed Services: A Comparative Study of Weapon System Innovation*, John Hopkins University dissertation, 2000; Hugh McDaid and David Oliver, *Robot Warriors: The Top Secret History of the Pilotless Plane*, Orion, 1997.

long struggle for functional drones filled with both technical failure and periods where the war machines – or war itself – held little allure.<sup>14</sup> Many military histories also aimed at comprehensive narratives by either examining every drone device ever pursued by U.S. military services or alternatively devoting entire monographs to a single drone's operational record.<sup>15</sup> Much of the literature written in the 20<sup>th</sup> century suffered from the limits of the existing archive constructed by the state classification of military records or corporate restriction of designing engineers' personal papers.

Some of the same analytical limitations extended into the literature on drones written in the 21<sup>st</sup> century. There are now many more histories that aim for a comprehensive account of past drones.<sup>16</sup> Yet these works often focus on technical devices' functionality while lacking a broader attention to culture, politics, or the ideas that infused these war machines' allure within a particular historical context. Many works have been written specifically about the "Predator" drone and its "Reaper" successor, which were the primary drones used to conduct missile strikes during the

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<sup>14</sup> Kenneth P. Werrell, *The Evolution of the Cruise Missile*, Air University Press, 1985.

<sup>15</sup> Ehrhard, *Unmanned Aerial Vehicles in the United States Armed Services*; William Wagner and William Sloan, *Fireflies and Other UAVs (Unmanned Aerial Vehicles)*, Midland Publishing, 1992.

<sup>16</sup> Thomas P. Ehrhard, *Air Force UAVs: The Secret History*, Mitchell Institute Press, 2010; H.R. Everett, *Unmanned Systems of World Wars I and II*, Massachusetts Institute of Technology Press, 2015; James Goodall and Jay Miller, *Lockheed's SR-71 "Blackbird" Family -A-12, F-12, D-21, SR-71*, Aerofax, 2003; John David Blom, *Unmanned Aerial Systems: A Historical Perspective*, Combat Studies Institute Press, US Army Combined Arms Center, 2010.

George W. Bush and Barack Obama administrations.<sup>17</sup> There is a large literature on the (il)legality of contemporary drone war or works examining the ethical and philosophical implications of remote-control war.<sup>18</sup> But too often the theoretical insights offered by jurists, philosophers, anthropologists, and other scholars within an active interdisciplinary literature on drone war have constructed their theories wholly divorced from a cognizance of the drone's historical development. These works are prone to ahistorical comparisons of past wars – even as far back as antiquity – with contemporary drone war to affect a sense of revolutionary change in the 21<sup>st</sup> century that ignores the long history and development of drone technology.<sup>19</sup> While some polemics have offered a critical theory of drone war their arguments rely upon faulty assumptions that the “drone upsets the available categories, to the point of rendering them inapplicable.”<sup>20</sup> They thus ignore drone war's long history and discount prior critiques

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<sup>17</sup> P.W. Singer, *Wired for War: The Robotics Revolution and Conflict in the 21st Century*, Penguin Press, 2009; Richard Whittle, *Predator: The Secret Origins of the Drone Revolution*, Macmillan, 2014.

<sup>18</sup> Sikander Ahmed Shah, *International Law and Drone Strikes in Pakistan: The Legal and Socio-political Aspects*, London: Routledge, 2015; Peter Bergen and Daniel Rothenberg, eds. *Drone Wars: Transforming Conflict, Law, and Policy*, Cambridge University Press, 2015; Cohn, Marjorie, ed. *Drones and Targeted Killing: Legal, Moral, and Geopolitical Issues*, Northampton: Olive Branch Press, 2015; Evangelista, Matthew, and Henry Shue, eds. *The American Way of Bombing: Changing Ethical Norms from Flying Fortresses to Drones*, Cornell Press, 2014; Fisk, Kerstin, Jennifer Ramos, eds. *Preventive Force: Drones, Targeted Killing, and the Transformation of Contemporary Warfare*, New York University Press, 2016; Parks, Lisa, and Caren Kaplan, eds. *Life in the Age of Drone Warfare*, Duke University Press, 2017; Medea Benjamin, *Drone Warfare: Killing by Remote Control*, Verso Books, 2013.

<sup>19</sup> Hugh Gusterson, “Toward an Anthropology of Drones: Remaking Space, Time, and Valor in Combat, in *The American Way of Bombing: Changing Ethical Norms from Flying Fortresses to Drones*, Cornell Press, 2014, p. 191-206; Hugh Gusterson, *Drone: Remote Control Warfare*, MIT Press, 2016.

<sup>20</sup> Grégoire Chamayou, *A Theory of the Drone*, The New Press, 2015, p. 111.

of air war. Even some historically informed works on the “drone” have suffered by taking the mid-1930s discursive emergence of the term “drone” as their analytical starting point, thereby ignoring the significance of World War I era “pilotless airplanes” and the historical actors who carried their ideas about automating air war from the First World War into the Second World War.<sup>21</sup>

While many recent works on the drone are prone to see the technology as a new and revolutionary war machine of the 21<sup>st</sup> century, “Automating Violence’s” central premise is a recognition of the drone as an old relic carrying with it into the present long established ideas about the violent practice of air war. Past theorists’ ideas about mechanization and machine war remain relevant to understanding the drone. Karl Marx wrote of the mechanization of labor on factory floors as an amplification of human capacity aiming for an increased output of materials, a reduction of workers’ requisite skill, and a lessened reliance upon laborers. These observances about labor’s mechanization apply to machine war’s battle fields that mass produced death up to the present point of 21<sup>st</sup> century drones guided by artificial intelligence software promising to eliminate the need for remote operators and wholly automate war’s violence.<sup>22</sup>

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<sup>21</sup> Chandler, *Unmanning*, 2020.

<sup>22</sup> Vivek Wadhwa, “Killer Flying Robots Are Here. What Do We Do Now?”, *Foreign Policy*, <https://foreignpolicy.com/2021/07/05/killer-flying-robots-drones-autonomous-ai-artificial-intelligence-facial-recognition-targets-turkey-libya/>; Stephen Witt, “The Turkish Drone that Changed the Nature of Warfare,” *The New Yorker*, May 9, 2022, <https://www.newyorker.com/magazine/2022/05/16/the-turkish-drone-that->

The political theorist Hannah Arendt offered more direct critique of war's automation. In *On Violence*, Arendt speculated about the proposition of robots' use in war. She considered the automation of violence even more appalling than totalitarian rule, a state system she experienced as a Jewish woman intellectual in Nazi Germany. After defining what she saw as fundamental differences between the exercise of power rooted in the consent of others, versus violence that relies upon force to compel, she wrote:

Even the totalitarian ruler, whose chief instrument of rule is torture, needs a power basis – the secret police and its net of informers. Only the development of robot soldiers, which, as previously mentioned, would eliminate the human factor completely and, conceivably, permit one man with a push button to destroy whomever he pleased, could change this fundamental ascendancy of power over violence.<sup>23</sup>

Arendt wrote in a speculative voice without conceptualizing the apex technologies of Nazi Germany, the *Vergeltungswaffen* (vengeance/retaliation weapons), as robots. Yet at

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changed-the-nature-of-warfare; Robyn Dixon, "Azerbaijan's drones owned the battlefield in Nagorno-Karabakh — and showed future of warfare," *The Washington Post*, November 11, 2020, <https://www.washingtonpost.com/world/2020/11/11/azerbaijan-drones-azerbaijan-aremenia/>

<sup>23</sup> Hannah Arendt, *On Violence*, Houghton Mifflin Harcourt, 1970, p. 46.

the time of their use, those on the receiving end of the bombs identified these weapons through terms like “drone” or “robot airplane” alongside more remembered phrases like “buzz bomb” or “doodlebug.” Recognizing that the German and U.S. militaries’ embrace of “robots” in war were intertwined and mutually constitutive helps conceptualize drone war as maintaining a legacy of totalitarianism through the ascent of violence over power apparent today.

The philosopher Herbert Marcuse offered a perceptive read of the immoral relationships created by distanced missile bombing. Comparing industrial modernity’s mundane murders to its spectacular violence, Marcuse wrote that the “speeding driver of an automobile or motor boat is not called a murderer even if he is one; and certainly the missile-firing engineers are not.” Marcuse argued:

The new modes of aggression destroy without getting one’s hands dirty, one’s body soiled, one’s mind incriminated. The killer remains clean, physically as well as mentally. The purity of his deadly work obtains added sanction if it is directed against the national enemy in the national interest.<sup>24</sup>

Such fantasies of distanced killing rendering war’s violence ostensibly cleaner or safer have permeated the pursuit of push-button violence. Yet while the separation of missile-

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<sup>24</sup> Herbert Marcuse, *Negations: Essays in Critical Theory*, Penguin Press, 1968, p. 265. I am indebted to historian Bill Sharman for bringing this quote to my attention.

firing killer from the death wrought by distanced explosion seemed realized in the late 1960s when Marcuse mused about missiles, the history of drone development shows the making and operation of these war machines often required a dangerous intimacy between war machine and machine operator.

Critical historians such as Priya Satia and Thomas Hippler have linked drone surveillance and air bombings to long established practices of air war. Satia for example examined British practices of air bombing in “Arabia” during the 1920s and 1930s. She showed how British colonial agents drew upon their faulty orientalist understandings of local Iraqi people and culture to rationalize their surveillance and bombing regime. British ideas about surveilling and punishing from the air fit within the Benthamian notions of panopticism, most famously theorized by Michel Foucault as a potential continuous surveillance that threatened violent punishment in the pursuit of disciplining prisoners.<sup>25</sup> Panopticism is inseparable from the story of the drone as imagined from its earliest iterations as overflying surveillance and bombing machines in the era of the First World War and up to today. Desire to merge the means of

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<sup>25</sup> Priya Satia, "Drones: A History from the British Middle East," in *Humanity: An International Journal of Human Rights, Humanitarianism, and Development*, Vol. 5, no. 1 (2014): 1-31. Priya Satia, *Spies in Arabia: The Great War and the Cultural Foundations of Britain's Covert Empire in the Middle East*, Oxford University Press, 2008; Michel Foucault, Alan Sheridan, trans., *Discipline and Punish: The Birth of the Prison (Surveiller et punir : Naissance de la Prison)*, Pantheon Books, 1977.

surveillance with the means of disciplining and punishing is at the heart of distanced watching and bombing of an enemy other.

The drone played a key role in Achille Mbembe's conceptualization of "necro-politics," a politics defined by the state's ability to inflict death.<sup>26</sup> A shift from Michel Foucault's notion of biopolitics or a state politics whose constitutive welfare systems aimed for the maintenance of a population, the contemporary moment of necro-politics is perhaps most observable in the United States' claims to a right to distribute death through drone strike in violation of longstanding principles of territorial sovereignty that historically prevented states from violently policing other states when not actively at war. A recognition that the drone has long served as an idealized means of violating sovereign air spaces and extracting information about U.S. adversaries or bombing enemies helps us better understand the origins of today's necro-politics.

"Automating Violence" argues that two interrelated factors motivated U.S. warmakers to adopt the drone: their anxieties about pilots as unreliable agents of war as well as fantasies of hyper-capable war machines that needed less and less human interaction to engage in violence. There are existing works examining the "problem with pilots," to use the title of Tim Schultz's important work on the subject. Yet these works focus primarily upon biological constructions of the pilot as mortal or woundable that

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<sup>26</sup> Achille Mbembe, "Necropolitics," *Public Culture*, Duke University Press, Vol. 15, No. 1, 2003, 11-40; Achille Mbembe, *Necropolitics*, Duke University Press, 2019.

required state responses including the emergence of aviation medicine and greater attention to the ways the human body needed sustenance while flying at high altitudes and rapid speeds.<sup>27</sup> There are also works that focus on cybernetics and efforts to improve man and machine's co-functionality through mechanisms like auto-pilot, landing assistance, or the construction of cockpits to be as pilot-friendly as possible.<sup>28</sup> Other factors including the limits of human senses, especially the need for line-of-sight direction of drones before long-distanced communication networks existed, have been analyzed by scholars of drone history.<sup>29</sup>

If the inherent biological limitations imposed upon pilots by their bodies have been increasingly studied by scholars, less examined are the ways public and policy discourse juxtaposed the capabilities of human and war machine to favor an inclination towards mechanization to the point of complete automation, or *machine substitution*. As early as the first auto-pilots made before World War I, designing engineers predicated the automation of flight control through arguments that human capabilities were too limited or strained to maintain control of wayward flying machines subject to changes in wind direction and that mechanical control provided a more effective means of direction

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<sup>27</sup> Timothy Schultz, *The Problem with Pilots: How Physicians, Engineers, and Airpower Enthusiasts Redefined Flight*, Johns Hopkins Press, 2018.

<sup>28</sup> Steven A. Fino, *Tiger Check: Automating the US Air Force Fighter Pilot in Air-to-Air Combat, 1950–1980*, Johns Hopkins University Press, 2017.

<sup>29</sup> Chandler, *Unmanning*, 2020.

in the air. It is no accident that the Sperry-Gyroscope Company responsible for inventing and manufacturing the original auto-pilot would also design the earliest “aerial torpedoes” and “pilotless airplanes” during World War I. While biological constructions of pilot limitations including mortality were important factors in the rise of drones, “Automating Violence” directs attention to broader anxieties about vulnerable pilots that emerged over time – concerns over airmen’s masculinity, worries about prisoners of war creating security risks when interrogated by enemies, political controversies erupting from war’s requisite sacrifice of life – and demonstrates how these constructions of pilots’ limitations fed into fantasies of hyper capable mechanical instruments of violence.

The notion of machine substitution carried its own fantasies. War planners not only hoped to reduce the loss of pilots but also aimed to gain a machine that could perform the tasks of air war more effectively than a person. Machine substitution sought to save soldiers’ labor and lives by outsourcing war’s violent work to obedient instruments of war incapable of dying or shying away from killing. “Automating Violence” insists that the true allure of drone war was always more than “saving lives”: it was to make it easier to inflict death. This critical endeavor takes the work of historian Michael Sherry as its key model for understanding the ways an ideology of

“technological fanaticism” operating within the minds of U.S. policy makers and public gave rise to an American airpower that threatens Armageddon.<sup>30</sup>

The four chapters of “Automating Violence” examine significant historical moments that shaped drones’ development and deployment in war. Chapter 1 shows how the first U.S. commitment to weapons called “pilotless airplanes” emerged during World War I alongside the first full-fledged war in the air. I argue that lead designers Elmer Sperry and Charles Kettering imagined their war machines as a means of maximizing violence while minimizing U.S. casualties amidst attritional total war. Military and corporate engineers designed pilotless airplanes as disposable carriers of poisonous chemicals or bombs that could overfly trench lines or bomb German cities. Personal concerns for loved ones sent to war and material concerns about war profits infused designing engineers’ pursuit of pilotless airplanes. Though Germany’s surrender halted mass production of the pilotless airplane in the U.S., post-war experimentation fueled war planners’ ideas about self-directed or remote-control mass bombing in war and helped popularize the pilotless airplane in public discourse.

Chapter 2 foregrounds the U.S. National Inventors Council as a key node in the nation’s war-making machinery during World War II. Created by corporate scientists, military officers, and U.S. Commerce Department officials, this state institution solicited

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<sup>30</sup> Michael Sherry, *The Rise of American Airpower: The Creation of Armageddon*, Yale University Press, 1987.

civilians to design war technologies to aid the Allied war effort. The Council drew hundreds of thousands of war designs from people in the U.S. and around the world. I show that lay-inventors' designs for "remotely controlled devices" submitted to the Council shaped Chair Charles Kettering's work as he redesigned his "pilotless airplane" from 1918 into a "robot airplane." I connect the efforts of the Council to the U.S. military's first use of drones in war launched amidst mass bombing campaigns against German cities and flown during atomic bomb testing at Bikini Atoll.

Examining an emblematic moment of U.S.-Soviet "Cold War" confrontation, Chapter 3 demonstrates how the Soviet downing and capture of CIA U-2 pilot Francis Gary Powers in 1960 prompted popular and policy debate in the U.S. that rendered the man inside the cockpit a military liability. Powers' equipment as a CIA "spy in the sky" included a lethal injection he failed to use; that reluctance prompted popular critiques of his masculinity alongside moral critiques of U.S. covert operations. Civilian audiences and administration officials constructed a dichotomy between flawed man (Powers) and perfect machine (U-2 plane), which informed the Eisenhower administration's creation of the National Reconnaissance Office and the state institution's turn towards "unmanned" surveillance technologies including satellites and drones.

Chapter 4 analyzes drones' the role of drones in the Cold War's nuclear standoff and the U.S. War in Vietnam. I examine a particular drone program, the QH-50 Drone

Anti-Submarine Helicopter (DASH), which carried nuclear depth charges to attack Soviet submarines in the case of war. The QH-50 drones suffered frequent technical malfunctions and operator failures. Strategists eventually recognized that the resulting blast of a nuclear bomb would endanger the warships that ferried remote control crews. Despite the failure of operation "DASH," the Advanced Research Projects Agency re-equipped the QH-50 drone for "precision bombing," extended surveillance, pilot rescue, and a bevy of other military uses. The militant imagination constructed around the QH-50 by the Advanced Research Projects Agency shaped a subsequent generation of drones' adoption and uses most notably the interest paid by the Defense Advanced Research Projects Agency to the "Predator" drone's prototype in the late-1970s.

Based on multi archival research, "Automating Violence" offers a cultural history of U.S. machine war with a focus on drone warfare through much of the 20<sup>th</sup> century. It demonstrates that the history of drone war was not an inevitable story of technological progression nor a pursuit of a humane form of violence. It instead argues the story of the drone is one of fits and starts across disparate moments connected by a genealogy of ideas about the technology's violent role in war. This long history of the drone's place in war shows U.S. war makers used the drone to terrorize and use force expansively against both military and civilian targets.

## **Vicarious Violence: International Weapons Manufacturers and the Pursuit of Pilotless Airplanes During the First World War Era**

The First World War spawned a new capacity to kill from the air. Numbers demonstrate aviation's first full-fledged embrace for war. In July 1914 no nation's military contained more than 150 airplanes. By war's end, hundreds of thousands of airplanes had been built to surveil, "dog fight," and city bomb.<sup>1</sup> Airships and airplanes expanded the boundaries of armed conflict during the First World War by bombing urban centers while also directing artillery fire and the movement of troops along front lines. The First World War's history has long been understood as a machine war of sacrificial slaughter where millions died to artillery fire obliteration, machine gun butchery, poison gas asphyxiation, combat in or bombardment from the air. Within this history is a less understood fantasy for a new weapon of war birthed by the mass sacrifice of life to total war's violent instruments.

International weapons manufacturers like Elmer and Lawrence Sperry of the Sperry Gyroscope Company helped "modernize" the Navies of the First World War's belligerent nations in the years immediately preceding the outbreak of war in Europe. The Sperrys and other corporate war producers including Charles Kettering and Orville Wright drew support from the U.S. military branches to design and manufacture a

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<sup>1</sup> John H. Morrow, *The Great War in the Air: Military Aviation from 1909 to 1921*, University of Alabama Press, Smithsonian Institution Press, 1993, 371.

weapon known alternatively as the “aerial torpedo,” “pilotless airplane,” or “flying bomb,” with hopes of aiding the Allied “terror” bombing of Germany.<sup>2</sup> Corporate and military engineers repurposed the Sperry company’s gyroscopic “auto-pilot” into the control apparatus for flying machines capable of “mechanically and automatically” carrying bombs or poison gas to kill distant enemies all while operating “without the presence of a man.”<sup>3</sup> By October 1918, the new weapon seemed so promising to its major backers like Chief Officer of the Army Signal Corps George O. Squier that the U.S. Aircraft Board initiated the weapon’s mass production by the tens of thousands to aid a major Allied air offensive in 1919 – violent imaginings for an air war cut short by the German surrender.

Historians have studied the aerial torpedo’s development through biographies of key engineers and analyses of technical devices yet the violent imaginary that

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<sup>2</sup> For the presence of “terrorism” within Allied air strategy, see: Thomas Hippler, *Governing From the Skies: A Global History of Aerial Bombing*, Chapter 3: “Knights in the Sky,” Verso books, 2017.

<sup>3</sup> George O. Squier, “Automatic Carrier for the Signal Corps (Liberty Eagle),” Chief Signal Officer of the Army Memorandum to the Chief of Staff, October 5, 1918, Exhibit F, pg. 1, compiled in Bion J. Arnold, “Secret Report on Automatic Carriers, Flying Bombs (F.B.), Aerial Torpedoes (A.T.), January 31, 1919,” Submitted to The Secretary of War through the Director of Military Aeronautics, January 31, 1919, Kettering University Archives, Kettering Office Files, Box 107, Folder “Kettering Aerial Torpedo: “Bug”--June 1919.” (Hereafter abbreviated as Bion Arnold, Secret Report, Kettering University Archives.) Varying terms often used interchangeably to describe the war machines made during the World War I Era included “aerial torpedo,” “automatic carrier,” “ammunition carrier,” “flying bomb,” “automatic aeroplane,” “passengerless aeroplane,” or “pilotless airplane.” Aerial torpedo was the most common phrase used by engineers, military officers, politicians, and journalists who learned of the secret weapons amidst and after the war. The phrases “drone” or “unmanned” in reference to a flying machine do not appear in any of the records I have encountered from the First World War era.

surrounded the pilotless airplane and survived into the post-war years has been largely overlooked.<sup>4</sup> The pilotless airplane was envisioned as a combination of the war's most deadly technology – long distance artillery – and its most revolutionary war machine – the airplane. Seen as a new and revolutionary weapon by its makers and boosters, the pilotless airplane emerged as something distinct, a self-guided or remotely-controlled instrument of mass bombing that claimed to not endanger a nation's pilots who were suffering immense losses during the war. The weapon's backers imagined the pilotless airplane could perform as a machine substitution, a stand-in for pilots during dangerous air war that seemed to perform the violent tasks of piloted airpower more effectively than human soldiers. The logics of mechanized war that pushed total war to attritional stalemate were taken to their ultimate conclusion through U.S. war planners' attempt to automate air war with the pilotless airplane. Examining the imaginations of key U.S. war planners demonstrates anxieties surrounded U.S. pilots as they proved vulnerable instruments of air war. The anxieties surrounding pilots helps contextualize the fantasies that surrounded the pilotless airplane that war planners envisioned as a hyper-capable new instrument of war seemingly capable of achieving Allied victory.

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<sup>4</sup> Thomas P. Hughes, *Elmer Sperry: Inventor and Engineer*, John Hopkins University Press, 1971; William W. Davenport, *Gyro! The Life and Times of Lawrence Sperry*, Scribner, 1978; Stuart Leslie, *Boss Kettering: Wizard of General Motors*, Columbia University Press, 1983; Joris Mercelis, *Beyond Bakelite: Leo Baekeland and the Business of Science and Invention*, MIT Press, 2020; Paul W. Clark and Laurence A. Lyons, *George Owen Squier: U.S. Army Major General, Inventor, Aviation Pioneer, Founder of Muzak*, McFarland and Company, 2014; H.R. Everett, *Unmanned Systems of World Wars I and II*, MIT Press, 2015.

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The ascent of balloons, airships, then airplanes in war fueled fantasies in popular discourse about human flight's uses.<sup>5</sup> Jules Verne wrote multiple fictions in the later decades of the 19<sup>th</sup> century imagining hot air balloons that enabled English penetration into interior Africa or facilitated rapid travel around the world "in eighty days."<sup>6</sup> H.G. Wells furthered this aerial imagination at the turn of the century through popular and transnational literary works including *The War of the Worlds* and *The War in the Air*.<sup>7</sup> These writings forecasted long-distant globe-faring flights that proved outside the capabilities of early 20<sup>th</sup> century aviation technology. Yet, predictions of airpower's utility to further empire or city bomb proved prescient.<sup>8</sup> Air war's destructive potential

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<sup>5</sup> Experiments with air war extend back to and through the 1800s. Balloon surveillance and reconnaissance was used in the Napoleonic wars in Europe, in the American Civil War, and in European efforts to "chart" Africa in pursuit of empire. Many historians of aviation have pointed to the significance of popular discourse and culture as shaping the emergence and uses of airships and airplanes, for some examples see: Tom D. Crouch, *A Dream of Wings: Americans and the Airplane, 1875-1905*, Norton Press, 1981; Michael Sherry, *The Rise of American Air Power: The Creation of Armageddon*, Chapter 1: "The Age of Fantasy," Yale University Press, 1987; Bayla Singer, *Like Sex with Gods: An Unorthodox History of Flying*, Texas A&M University Press, 2003; Thomas Hippler, *Governing From the Skies: A History of Global Bombing*, Chapter 2: "Towards Perpetual Peace," David Fernbach translator, Verso Books, 2017.

<sup>6</sup> Jules Verne, *Five Weeks in a Balloon, or, A Journey of Discovery by Three Englishmen in Africa*, Pierre-Jules Hetzel Publishing, 1863; Jules Verne, *Around the World in Eighty Days*, serialized in *Le Temps*, 1872, reprinted Pierre-Jules Hetzel Publishing, 1873.

<sup>7</sup> H.G. Wells, *The War of the Worlds*, Serialized in *Cosmopolitan*, published by William Heineman publishing, 1898; H.G. Wells, *The War in the Air*, serialized in *The Pall Mall Magazine*, 1908, republished MacMillan, 1908.

<sup>8</sup> Airplanes became violent tools of European imperial conquest in the early 1900s. An Italian airman was the first person to drop a bomb from an airplane in 1911 amidst his nation's invasion of Turkish territory during the Italo-Turkish war. His targeting of an active oasis marketplace near Tripoli signaled from the first exercise of air bombing how the violent practice enabled an

was not a subject reserved for fiction. Feared and restricted in international law as early as the Hague convention of 1899 a successive slew of legal initiatives aimed to restrict air war's use in Europe the First World War.<sup>9</sup>

The broader cultural context imagining air war helped fuel fantasies for the "aerial torpedo." British magician turned filmmaker Walter R. Booth prophesized the future perils of air war and the "aerial torpedo" in a seven-minute silent film. Booth's film was distributed to cinemas in Britain, Germany, France, and the United States in 1909 under the titles "The Airship Destroyer" (Britain), "Der Luftkrieg der Zukunft (The Future Air War, Germany)," "the Aerial Torpedo" (France)," and "The Battle in the Clouds" (United States). The "trick film" used models, cut-out animation, and editing to depict a fleet of Zeppelin-like airships bombarding the people and buildings of a Londonesque city.<sup>10</sup> The U.S. based film publication *Moving Picture World* enticed

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indiscriminate attack upon peoples while distancing a killer flying overhead from their space of death and destruction. Hippler, *Governing from the Skies*, Prologue.

<sup>9</sup> Hippler, *Governing from the Skies*, 19-36.

<sup>10</sup> Walter Booth, *The Airship Destroyer*, 1909, British Film Institute digital archives, <https://player.bfi.org.uk/free/film/watch-the-airship-destroyer-1909-online>. The film is also available on YouTube, for example: [https://www.youtube.com/watch?v=kduzyasEWTQ&t=43s&ab\\_channel=silentfilmhouse](https://www.youtube.com/watch?v=kduzyasEWTQ&t=43s&ab_channel=silentfilmhouse); Before he imagined remote controlled air war in *The Airship Destroyer*, Booth directed films focused on mythical technical adventure like his "The '?' Motorist" where a magical automobile steered itself driving passengers over an obstinate traffic cop, up walls, and into outer space to circle Saturn's rings. Booth followed *The Airship Destroyer* with similar invasion genre films – *The Aerial Submarine* (1910) and *Aerial Anarchists* (1911). Both Booth films exemplified a fantastical

potential viewers to watch the film with a plot summary: "Airship versus aeroplane – Wreck of the aeroplane – The burning of a town by the aerial fleet – Thrilling rescue of his sweetheart by the inventor. – Defense. The Inventor with the assistance of his sweetheart sends his airship destroyer on its mission of vengeance. The torpedo, steered through the air by wireless telegraphy – One flash and the airship is doomed – It falls, a mass of scorching fire, into the waters of a lake."<sup>11</sup>

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imagination of future flying technologies and their possibilities for war making, while simultaneously stoking popular anxieties of aerial invasion or "Zeppelin scares" before the war.

<sup>11</sup> Ibid. "The Battle in the Clouds," *Moving Picture World*, Chalmers Publishing Company, December, 31 1909, Museum of Modern Art Library. A digital copy of the original document is available through archive.org, <https://archive.org/details/moviewor05chal/page/972/mode/2up?q=airship>. Copies of *Moving Picture World* are also available through the Wisconsin Center for Film and Theatre Research's Media History Digital Archive, see: <https://mediahistoryproject.org/collections/earlycinema/>.



Figure 1: Image from Walter Booth's *The Airship Destroyer*, 1909, the inventor stands to the right operating wireless telegraphy controls while his assistant lights the weapon's fuse.<sup>12</sup>

Booth's film, while wholly imaginary, captured future truths of air war's city bombing and the allure of the aerial torpedo. Defending against invading airships proved difficult. The downing of airplane pilots encouraged their substitution with a wholly mechanized flying war machine. Launched and directed from afar at no risk to self, an aerial torpedo might wage air war, perhaps even combat foreign airship invasion. More than a depiction of fantasy technology, Booth's film suggested the thinking engineer could save oneself, loved ones, and change war's shape with a machine. Booth's film *The Aerial Torpedo* aimed to evoke emotions from love, loss, and

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<sup>12</sup> Walter Booth, *The Airship Destroyer*, 1909.

fear of losing home and those loved in war. These emotional factors came to fill the minds of those who first made the aerial torpedo a reality.

Figures prone to fantastic visions for machine futures became connected to the aerial torpedo's rise. Hudson Maxim, brother of machine-gun inventor Hiram Maxim, was a noted inventor and a founding member of the U.S. Naval Consulting Board – the first U.S. state institution responsible for developing the aerial torpedo. Maxim's futurism filled *Cosmopolitan Magazine's* opening article "Man's Machine-Made Millennium" in November 1908. His prophesies for the future included a time of resources so bountiful no one needed to work, when medicines could exterminate all diseases, and the "mastery of the air" through airplanes would allow people to travel without restriction.<sup>13</sup> Primarily interested in designing explosives, Hudson Maxim had filed patent applications for improvements to "aerial torpedo projectiles" by which he meant long-range ballistic explosives.<sup>14</sup> But with the outbreak of World War I the term "aerial torpedo" would increasingly be applied to a new flying war machine designed for self-propelled remote-control bombing.

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<sup>13</sup> Hudson Maxim, "Man's Machine-Made Millennium," *Cosmopolitan Magazine*, Vol. XLV, No. 6, November 1908, HathiTrust, original document from University of Michigan Archives.

<sup>14</sup> Hudson Maxim, "Improvements in Aerial Torpedo Projectiles, adapted to the Throwing of large Masses of High Explosives from Ordnance, and in Methods for Filling the same with High Explosives," application filed 1897, United Kingdom, patent record available through Google Patents:

<https://patents.google.com/patent/GB189706296A/en?q=aerial+torpedo&assignee=HUDSON+MAXIM&oq=HUDSON+MAXIM+AERIAL+TORPEDO>. A search of Google Patent's catalogued records shows many inventors from around the world had filed for "aerial torpedo" devices in the years before World War I.

The outbreak of war led the United States to engage in war “preparedness” efforts short of an official declaration of belligerency. Thomas Edison provoked the Naval Consulting Board’s creation after giving an interview in May 1915 with the *New York Times* that argued “Modern warfare is more a matter of machines than of men...” insisting soldiers were “perspiring in the factory of death at the battle line.”<sup>15</sup> Struck by Edison’s arguments about war’s mechanization in Europe, U.S. Navy Secretary Josephus Daniels asked him “as the one man who can turn dreams into realities” to help the Navy create “proper machinery and facilities for utilizing the natural inventive genius of Americans to meet the new conditions of warfare as shown abroad.”<sup>16</sup> The Naval Consulting Board’s members consisted of technological experts capable of devising new weapons and also evaluating the utility of designs for war materiel submitted by the general U.S. population. Demonstrative of the United States’ “associational state,” Naval Consulting Board members were often distinguished corporate inventors elevated by major technical societies to help direct state policy.<sup>17</sup> For example, Hudson Maxim represented the American Aeronautical Society, Elmer Sperry of the Sperry Gyroscope Company represented the American Society of Aeronautic Engineers, and Leo Baekeland of the Bakelite Company represented the American Chemical Society.<sup>18</sup>

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<sup>15</sup> Quoted from, Thomas P. Hughes, *Elmer Sperry*, 246.

<sup>16</sup> *Ibid*, 247.

<sup>17</sup> Brian Balogh, *The Associational State: American Governance in the Twentieth Century*, University of Pennsylvania Press, 2015.

<sup>18</sup> Hughes, 249.

Sperry and Baekeland served alongside Navy Lieutenant Colonel Bion J. Arnold as the three members of the Naval Consulting Board's torpedo subcommittee which animated the aerial torpedo's development.

Members of the United States Naval Consulting Board began developing an aerial torpedo in July 1915.<sup>19</sup> Naval Consulting Board member Navy Lieutenant Colonel Bion J. Arnold knew of pre-war devices akin to this new weapon project. He recollected that in 1912, Admiral Bradley N. Fisk patented an "aerial torpedo." But Fisk's device needed ferrying by a piloted airplane rather than being a self-propelled weapon. Arnold also knew of attempts to use wireless radio control to direct a flying-machine. But these efforts that preceded the Naval Consulting Board's work seemed of "suspect capability" to him. The first "practicable suggestion" for an "automatic flying machine" or "aerial torpedo," according to Arnold's contemporaneous account, came from Naval Consulting Board member Peter Cooper Hewitt, who approached Elmer Sperry with the idea and funded the weapon's initial development.<sup>20</sup>

Elmer Sperry seemed the right person to develop the aerial torpedo in 1915 because of his extensive pre-war experience designing automatizing devices. During the early 1910s, Sperry incorporated the gyroscope, a spinning device capable of maintaining its orientation in relation to the Earth's axis while in motion, into the

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<sup>19</sup> Bion J. Arnold, main text of "Secret Report," 1.

<sup>20</sup> Bion J. Arnold, main text of "Secret Report," 1.

piloting of both naval and aerial vessels. In 1913, the Sperry Gyroscope Company began selling gyroscopic-compasses to the admiralities of industrial nations pitching the device as a superior navigational tool for seafaring than the widely used magnetic compass. Elmer's shift from naval to aerial invention was in part spurred by his son Lawrence Sperry who had obsessed over airplanes since his childhood.<sup>21</sup> Lawrence helped his father devise a gyroscope-based airplane stabilizer, called the "gyro-pilot" or "auto-pilot" as in company advertising, which maintained an airplane's horizontal relation to the Earth's surface while in flight.<sup>22</sup> Widely considered a toy or teaching tool in preceding years, in Sperry's hands the gyroscope became a central component of machine war.

Historian and Elmer Sperry biographer Thomas P. Hughes characterized the inventor as a "brain mill for the U.S. military," accrediting his work as primarily contributing to U.S. military advancements. Hughes did not overlook Sperry's work as an international war contractor, including to Germany before the First World War, but his interpretation emphasized the inventor's Americanism over his transnationalism. Hughes also offered scant analysis of the violent fantasies attached to the inventor's war

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<sup>21</sup> Davenport, *Gyro!*, Chapter 3.

<sup>22</sup> Phrases "gyro-pilot," "automatic-pilot," and the shortened "auto-pilot" can be found in company advertising and internal company correspondence, see: "Magnetic Compasses for Air Craft," 1916, The Sperry Gyroscope Company Trade Literature Collection, Smithsonian Institution, National Museum of American History Library, Trade Literature Collection; "Automatic Pilots. Contract with French through J.P. Morgan & Co." March 8, 1916, National Air and Space Museum Technical Reference and Libraries, Lawrence B. Sperry Documents, Folder 5.

mechanisms. This lacunae necessitates examination of the work of Elmer Sperry, Lawrence Sperry, and Sperry Gyroscope Company officials not solely as U.S. war machine makers, but global weapon manufacturers whose dealings with military officials from many nations helped construct the attitudes of a militant “international society” of war planners.<sup>23</sup>

In October 1913, approximately a year before the First World War erupted, the managers of the Sperry Gyroscope Company began strategizing how to best sell their automating devices to the “various Navies” of the world. At the outset, Sperry company leadership anticipated obstacles to the adoption of their apparatus. Managers expressed anxieties in company memoranda that their potential customers, in this case the naval admiralities of Europe, would say that “the price is too high to permit of making installations on any but the very largest ships” because either “an unconscious comparison with the price of the magnetic compass” would be made or because “the selling price of our compass equipment is out of proportion to the probable manufacturing cost.”<sup>24</sup>

Company management constructed detailed arguments for salesmen to deploy when pitching the gyro-compass to European admiralities. Sperry Gyroscope Company

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<sup>23</sup> Erez Manela, “International Society as a Historical Subject,” *Diplomatic History*, No. 44, April 2020, 184–209.

<sup>24</sup> The Sperry Gyroscope Company, Bulletin of Information No. 1003, “Price,” October 13, 1913, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence Burst Sperry Documents, Folder 5.

managers insisted their gyro-compass so improved naval navigational efficiency over magnetic compasses that in-transit coal consumption would be dramatically reduced, passing along savings to the device's adopters. The company cited studies made by the U.S. Navy - already Sperry Gyroscope Company clients - that within two years use the cost of coal saved due to more accurate sea travel outweighed the expense of installing a gyro-compass upon a ship. The company insisted their device's directional accuracy enabled superior navigation over magnetic compasses during blind conditions like fogs that might cause ships to run aground resulting in crewmen deaths and destroyed ships. Sperry company sales pitches insisted that the "military efficiency of the ship" would see a "tremendous increase of efficiency" that "arises from the undoubted increase in the accuracy of gun-fire when using the gyro-compass" and promised the gyro-compass improved directional accuracy to better coordinate fleet movement amidst naval combat. In sum, reduced fuel consumption, more efficient navigation, saved lives, saved ships, and an improved killing capacity through more accurate direction of gun fire seemed to make the Sperry Gyroscopic-Compass an enhancement for the combat efficiency of any nation's navy.<sup>25</sup>

With arguments in-hand to explain why the Sperry gyro-compass ought to displace its magnet-based predecessor, Sperry Company leadership also constructed explanations for salesmen to combat foreign admiralities' suggestion that the gyro-

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<sup>25</sup> Ibid.

compass's price outweighed its manufacturing cost. To Sperry Company leadership, naval men might best be able to understand their company's manufacturing expenses by comparing the new apparatus to a mainstay of naval war, the torpedo. Sperry Gyroscope Company managers argued that where nearly all patent protections had expired on the torpedo, their new gyro-compass device required patent protection including costly legal advice. Where the torpedo was a simple device that could be mass manufactured without paying patent royalties, the gyro-compass was a more complex device that required a staff of designing engineers and a more intricate production process. The company even produced a diagram to illustrate their operations' complexity in design, manufacture, legal protection, labor, and sale:<sup>26</sup>

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<sup>26</sup> Ibid.

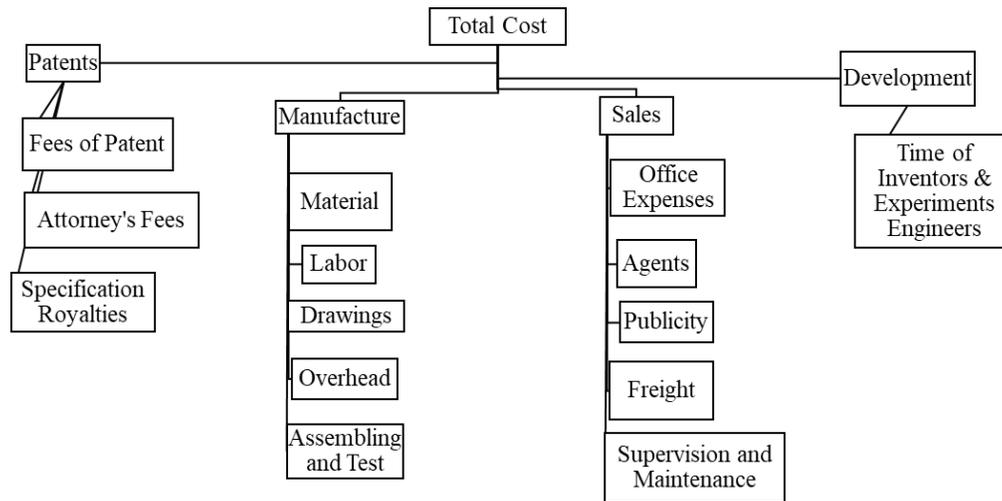


Figure 2: Sperry Gyro-Compass Company chart of naval gyro-compass production cost.

The gyro-compass's high price was thus rationalized to potential customers by the fact that it was a complex technical system produced by a interconnected network of lawyers, laborers, and engineers.<sup>27</sup>

Sperry Gyroscope Company sales operatives pitched the gyro-compass to foreign admiralties shortly before the war amidst a widely recognized arms race

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<sup>27</sup> Ibid. Thomas P. Hughes, "The Evolution of Large Technological Systems," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, ed. W.E. Bijker, T.P. Hughes, and T. Pinch, MIT Press, 1987, 51-82.

between the world's imperial powers.<sup>28</sup> In June 1914, the Sperry Gyroscope Company conducted a demonstration of their gyro-compass for the German Admiralty at the dockyard in Kiel. The German military's purchase of one Sperry gyro-compass, however, turned out to be a competition between the Sperry Gyroscope Company's gyro-compass and a rival gyro-compass made by the German arms manufacturer the Anschütz Company. During the trials in Kiel, the Sperry Company device recorded abnormal deviations from its straight-line directional path by several degrees, which the attending Sperry Company engineer blamed on an uncorrected imbalance of the device's internal mechanisms incurred amidst cross-Atlantic shipping from the U.S. Though the Anschütz Company's gyro-compass outperformed Sperry's, the Sperry Company engineer who demonstrated the device to the German naval officials suspected foul play. The Sperry sales representative and compass installer noted that Anschütz representatives were allowed to replace one malfunctioning gyro-compass with another device mid-trial, and were also allowed to have their initial unsatisfactory results stricken from the German admiralty's official records. A similar request for a clearing of the Sperry Company's unsatisfactory results and a retrial with a new device went ungranted leading to the conclusion that "It was quite obvious to us that the sole

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<sup>28</sup> Dirk Bönker, *Militarism in a Global Age: Naval Ambitions in Germany and the United States before World War I*, Cornell University Press, 2012.

purpose for making the trial was to obtain data for officially condemning the Sperry Gyro Compass..."<sup>29</sup>

Sperry company figures suspected that Anschütz Company representatives would publicize the trials' results to the British and Russian admiralties in order to boost their own sales and status at the expense of the Sperry Gyroscope Company. In order to counter the impending negative international publicity, the Sperry Company forwarded an "Information Bulletin" documenting the Kiel trials and perceived unfair treatment by German Admirals to British naval commanders. In their bulletin, the Sperry Co. managers emphasized key distinctions between the functioning of the competing American and German gyro-compasses suggesting the superiority of their own device. The Sperry Company information bulletin placed particular emphasis upon the labor saving quality of their gyro-compass compared to the competition's. The Sperry Company bulletin also emphasized its mechanism required only one engineer to operate compared to a team of ten engineers and mechanics needed to install and test the Anschütz Company's apparatus.<sup>30</sup> Reducing naval war's requisite labor through mechanical adoption thus appeared the chief selling point of the Sperry Gyroscope Company's gyro-compass on the world arms market.

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<sup>29</sup> Sperry Gyroscope Company Bulletin of Information No. 1015, "Tests of Sperry Gyro Compass Carried out by German Navy Department," June 4<sup>th</sup>, 1914, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence B. Sperry Documents, Folder 5.

<sup>30</sup> Ibid.

As the Sperry Gyroscope Company sought profits through the sale of seafaring mechanisms to European navies, the U.S. firm also held its eyes upon the sky. In June 1914, the same month that Sperry company representatives failed to impress the Germany admiralty in Kiel, the successful public exhibit of the company's gyroscopic-stabilizer, or "automatic-pilot," in France demonstrated a mechanism that reduced the labor of piloting a biplane on the eve of world war.

Elmer Sperry's son Lawrence Sperry travelled to Bezons, France to compete in the French Government's "Concours pour la Securite en Aeroplanes (Competition for Airplane Safety.)" René Quinton, a preeminent figure in French aviation who co-founded both the Aero Club de France and the world's first school for pilots - the Ligue Nationale Aerieenne - reported the results of the competition in spectacular terms on the front page of the major Paris newspaper *Le Matin*. Appearing under the headline "New Progress in Aviation. An Aeroplane that controls itself. The passenger walking on the wing." Quinton recounted his amazement in witnessing, then experiencing, the self-stabilizing airplane:

I attended the tests yesterday morning and then carried out the experiment myself with one of the most promising aeroplanes yet conceived. It is the Sperry aircraft with automatic stability, steering alone, without the assistance of any man. Imagine a plane in full flight. At some point the passenger gets up, gets out of their seat, gets on the wing and goes for a walk on it. At the same time, the

pilot got up and stretched both arms to the sky, to show clearly that he was not touching any of the mechanism. The plane, apparently thrown out of equilibrium and abandoned, continues to navigate regularly at 100 kilometers an hour. Here is the spectacle which we attended yesterday in Bezons, before the safety commission which came expressly to realize the value of this apparatus.<sup>31</sup>

Encouraging readers to “imagine” the display of “spectacle” while also recognizing the “value” offered by a device that remedied the difficulty of maintaining an airplane upon a straight course, Quinton’s write-up of the competition functioned as both exposé and advertisement.<sup>32</sup>

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<sup>31</sup> René Quinton, “Un aéroplane qui gouverne seul: le passager se promenant sur l’aile,” *Le Matin*, June 24, 1914, article originally found at the National Air and Space Museum, Technical Reference Files and Libraries, Lawrence B. Sperry Documents, Folder 1. A digitized copy of the article is available through Gallica, the digital library of the *Bibliothèque Nationale de France*. Translated from the original French text: “Un aéroplane qui gouverne seul: le passager se promenant sur l’aile. J’ai assisté hier matin aux essais et ai procédé ensuite moi-même à l’expérimentation d’un des aéroplanes les plus suggestifs qui aient encore été conçus. Il s’agit de l’avion à stabilité automatique Sperry, gouvernant seul, sans l’aide d’aucun homme. Imaginez un avion en plein vol. A un moment donné le passager se lève, sort de son siège, monte sur l’aile et va se promener dessus. Le pilote se lève en meme temps et tend les deux bras vers le ciel, afin de bien montrer qu’il ne touche à aucune commande. L’aéroplane, ainsi déséquilibré et abandonné, continue à naviguer régulièrement à 100 kilomètres à l’heure. Voilà le spectacle auquel nous avons assisté hier à Bezons, devant la commission de sécurité venue tout exprès pour se rendre compte de la valeur de cel appareil.”

<sup>32</sup> René Quinton’s article was translated and republished as an introduction to Lawrence Sperry’s lectures on Aerial Stability and the Sperry Gyroscopic Stabilizer in the popular English language aviation magazine *Aerial Age Weekly*. “Stability Devices: Resume of a Lecture on Stability and the Sperry Gyroscopic Stabilizer Given by Lawrence B. Sperry,” *Aerial Age Weekly*, May 17, 1915, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence Burst Sperry Documents, Folder 1.

Quinton's article dramatized how he personally flew with Lawrence Sperry during the windiest and most dangerous mid-day moment for flight thus further emphasizing the Sperry device's capabilities. Enhancing the drama of his tale, Quinton recalled the unfavorable weather with wind "so strong that there were waves on the surface of the Seine" during which "the leaves and branches of the trees were violently shaken." What's more, he and Lawrence Sperry suffered clouded vision due to "the smoke from nearby factory chimneys" drifting upon the horizon. Undaunted by wind and limited vision, Quinton described Lawrence's performance of mid-air stunts including an automatic volplane during which the pilot relied upon the automatic stabilizer to recover and straighten out the flying-machine after an abrupt dive caused by the stalling of the plane's motor. The moment provided a clear demonstration of the Sperry mechanism's capacity to aid, if not wholly replace, a human pilot's handling of a flying-machine in mid-air. The Sperry automatic-stabilizer seemed even more successful when compared to the fate of other competitors who failed in their pursuit of aerial stability and safety.<sup>33</sup>

The Concours pour la Securite en Aeroplanes, premised upon improving the safety of airplanes, in actuality proved dangerous and deadly. Lawrence Sperry won the competition's 10,000 Franc prize by demonstrating the viability of the automatic stabilizer he and his father co-developed. But other competitors wound up dead.

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<sup>33</sup> René Quinton, "Un aéroplane qui gouverne seul," 1914.

Quinton concluded his *Le Matin* article on the safety competition by commenting upon the crash of a Commandant Félix who perished when attempting to demonstrate his own “mechanical stability device.” To Quinton, Félix’s death seemed to grant the “enemies” of aviation a “triumph for a moment.” But ultimately, the Sperry system showed “the value of the cause....” suggesting airpower’s inevitable adoption.<sup>34</sup>

Lawrence Sperry’s demonstration of airpower’s increasing viability came at a fortuitous moment for his father’s war machine firm. Only four days after Quinton’s June 24, 1914 article appeared in *Le Matin*, the Bosnian Serb nationalist Gavrilo Princip assassinated Archduke Franz-Ferdinand, heir apparent to the throne of Austria-Hungary. Exactly a month after the June 28<sup>th</sup> assassination, Austria-Hungary declared war upon Serbia triggering a succession of war declarations from inter-allied nations, and initiating the confluence of global conflicts that made up the First World War.

Sperry’s victory at the Concours pour la Securite en Aeroplanes, and the corresponding onset of global war, further facilitated the Sperry Gyroscope Company’s raison d’être as arms merchants. The selling points of labor reduction, safety improvement, navigational efficiency, a resultant reduction in fuel consumption, plus an overall improvement to the lethality of military operations all made the Sperry Company’s devices for sea and air more alluring to war planners now facing war. Company information bulletins sent to the admiralties of several industrial nations

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<sup>34</sup> Ibid.

make clear the Sperry business was one of death dealing wrapped in the guise of technological modernization. Lawrence's victory at the French Government's competition for airplane safety facilitated his further publicizing of the gyro-stabilizer in 1914 and 1915. As the war in Europe developed, Lawrence Sperry wrote numerous articles in popular aviation publications and regularly performed his mid-air no-hands stunt to fawning audiences and reporters in the United States, and around the world.

By August 1914, Lawrence Sperry was touting the Sperry Gyroscopic Stabilizer itself as the "Winner of \$10,000 prize in the Concours pour la Securite en Aeroplanes" in the magazine *Flying*—the official publication of the Aerial League of America. This accreditation of the machine, not himself, as the agent winning the competition fit within Lawrence Sperry's argument about the gyro-stabilizer's innate agency. He opened his *Flying* article with an explicit reference to reducing the labor of flying:

When Edison defined flying as a matter of eighty-five per cent. human and fifteen per cent. mechanical element, three years ago, my father and I, who had come to the same conclusion through experiements which I conducted with an aeroplane, were considering a way of turning the scale, and make flying a matter

of eighty-five per cent. machine and fifteen per cent. human element by the application of the gyroscope.<sup>35</sup>

Lawrence Sperry thus cited an automating impulse as animating he and his father's initial co-development of their "auto-pilot" device. Lawrence Sperry recounted he and his father's technical development of the automatic gyro-stabilizer as well as their reliance upon airplane manufacturer Glen Curtiss, and the Flying Corps of the U.S. Army and Navy, for further technical assistance.<sup>36</sup>

Father and Son Sperry aimed to improve the safety of flying by automating the labor of piloting. In Lawrence's rendering of pilots' problems at hand he described how "The aviator must be constantly on the alert to maintain his machine" within the correct longitudinal and lateral relation to the horizon while struggling against the impact of wind currents upon an aeroplane. Maintaining control required the good "judgement" of an aviator. "This judgement involves, first, an estimate of the departure from the correct position of flight, and secondly, an estimate of the amount of correction which must be applied by means of the controls to restore his machine to the correct position, after it has once departed." Lawrence Sperry, however, doubted the judgement of most aspiring aviators. Maintaining control of flying machines required "estimates of angles

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<sup>35</sup> Lawrence B. Sperry, "The Gyroscopic Stabilizer. Winner of \$10,000 Prize at the Concours pour la Securite en Aeroplanes," *Flying*, August 1914, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence Burst Sperry Documents, Folder 1.

<sup>36</sup> *Ibid.*

and few aviators are capable of estimating these angles....” Citing the limitations of the human condition itself, Lawrence Sperry argued “Human judgement is always imperfect in such matters, because of the indifferent base of reference which the mind carries. This is especially true in the control of the aeroplane, because the pilot is not in his natural element and his sense of equilibrium is confused.” In addition to the limitations to personal perception and mental calculus capabilities of the average pilot, Lawrence also emphasized the handicaps of a fatigueable body, writing: “...our aim became to devise an apparatus which would operate and control an aeroplane automatically, with greater precision than an aviator can operate it manually, and thereby make flight safe and relieve the pilot of the fatigue of operating.” To Sperry, the inner mechanization of the flying-machine through automatic controls could stymie the mental and physical fallibilities of an errant human factor.<sup>37</sup>

Elmer and Lawrence Sperry saw their automatic stabilizer as a step in automating the labor of piloting an airplane. Yet, it is notable that even with an “auto-pilot” man still performed “fifteen per cent” of the flying labor equation in Lawrence’s calculation.<sup>38</sup> The gyro-stabilizer automated the act of handheld aerial stabilization but did not wholly automatize the flying-machine. Mechanical flight still relied upon significant human input for operation. The figure of the World War I era pilot perhaps

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<sup>37</sup> Ibid.

<sup>38</sup> Ibid.

presents the moment's pre-eminent embodiment of what Michel Foucault termed *l'homme machine* (the man machine.) Pilot academies like the Ligue Nationale Aerieenne headed by René Quinton emerged in many nations experimenting with airpower before 1914. Pilot schools provided potential airmen practice in merging themselves with the still emergent flying-machine technology. Teaching potential "bird-men" to discipline their minds and bodies in order to control flying-machines without crashing and dying was the most basic, yet most difficult, logistical aspect of airwar. Sperry's construction of the auto-pilot as a mechanical component that reduced the burdens of flying meant the work of training pilots to wield airplanes would also be lessened. Sperry suggested pilots whose airplanes included a gyro-stabilizer auto-pilot would benefit from no longer needing to fight wing gusts or figure complex calculations of landing angles while flying. These steps in automating pilots' labor proved significant to the eventual rendering of a wholly "automatic" or "pilotless" airplane.

But it is also notable that Lawrence Sperry described the internal mechanization of the flying-machine with an auto-pilot as the mechanical disciplining of machine itself. The Sperrys' gyro-stabilizer offered "stability" to what had previously been an untamed and unwieldy device. Where Michel Foucault's notion of *l'homme machine* focused on rendering man into machineesque form through the disciplining of mind and body, Sperry suggested the innate limitations to man's body and mind necessitated the automatic stabilizer do the work of disciplining an unwieldy airplane's unstable flight.

The gyro-stabilizer embodied the positivist notion that technology could tame natural impediments like wind gusts that posed the most difficult aerial interferences upon pilots' control of flying-machines. In the Sperrys' literal and figurative terms, the auto-pilot stabilized an unbalanced machine into following a straight and true path.

The Sperry Gyroscope Company's successful implementation of their automating devices was not limited to the air or to France. A company representative wrote directly to Elmer Sperry in late-1914 to "celebrate the finest little victory known to the history of the Sperry Gyroscope Company!" Between December 11<sup>th</sup> and 14<sup>th</sup>, 1914, several orders poured in from both the British and Russian admiralities for Sperry Company gyro-compasses. The British Admiralty requested "55 Submarine equipments, 10 Duplex Battleship equipments, and 2 sets of equipments to bring the 'WARSPITE' and 'QUEEN ELIZABETH' compasses up to duplex." The Russian Admiralty also ordered "1 submarine equipment and 4 battleship equipments to be shipped immediately, and 6 battleship equipments to arrive in Petrograd by the middle of February." The congratulatory letter noted that the British admiralty ordered their devices despite prices having risen considerably since their previous order of 30 Sperry gyro-compasses.

In sum, the British and Russian orders amounted to \$832,000 in revenue for the Sperry Company which the sales representative gloated was “Not bad for 48 hours.”<sup>39</sup>

This large sale was not the most significant aspect of the international exchange. Rather, the salesman insisted the purchase “means more to us than the order in itself, it means that the last stone of our foundation is laid, and that this foundation is strong enough to support any size of structure we care to build upon it. The only way we could stop this business now is to commit commercial or technical suicide....” In the salesman’s opinion, the Sperry Gyroscope Company had emerged as a pre-eminent war contractor for militaries around the world. His letter promised the technical descriptions and specifications for Britain and Russia’s gyro-compass orders were shipping to the Sperry Company’s New York headquarters on the Lusitania, on what turned out to be the British ocean liner’s final trans-Atlantic voyage.<sup>40</sup>

Opportunities to pitch the Sperry Gyroscope Company’s automating devices did not always occur during officially arranged tests, but also spontaneously, amidst cross-Atlantic travel. In September 1915, Lawrence Sperry wrote to his parents recounting his encounters with a “Mr. Yamanouchi,” Chief of the Japanese Flying Corps, who inhabited the room adjacent to his amidst a voyage from New York to London.

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<sup>39</sup> Letter to Elmer A. Sperry from a Sperry Gyroscope Company salesman, illegibly signed, December 11, 1914, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence B. Sperry Documents, Folder 4.

<sup>40</sup> Ibid.

Lawrence recounted to his parents how his friendship with the Japanese military commander blossomed through war talk while passing time onboard: “talked with Mr. Yamanouchi for many an hour on board, explaining every detail of the combined Stabilizer and Target Bearing Sighters.”<sup>41</sup> Lawrence’s connection with the Japanese military commander was only one early moment in a relationship between the Sperry Gyroscope Company and Japanese military that grew during World War I and the decade after despite U.S.-Japanese relations souring.<sup>42</sup>

Lawrence’s trans-Atlantic travels forced him into the deadly naval war zone that he and the Sperry family business in war mechanisms had helped animate. Approaching the militarized British coast, Lawrence detailed the preparatory lowering of life boats, the passing of a sunken ship’s tattered deck floating listlessly in the ocean, and sailing past several British destroyers. Despite clear signs of the ongoing sea war, Lawrence ridiculed “the people who stayed up all night in the event of explosion” who he suspected “would have had the smallest chances of getting through all right, cause they were so nervous that they would probably have got into lifeboats on the wrong side of the Ship....” As for himself, Lawrence boasted that though he suspected he “was going

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<sup>41</sup> Lawrence Sperry, Letter to Parents, September 21, 1915, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence Sperry Documents, Folder 5.

<sup>42</sup> Mourning Japanese military officials celebrated their relationships with Elmer Sperry at a time when the U.S. had imposed immigration restriction on Asian migration and anti-Japanese sentiments pervaded U.S. society, “Dr. Elmer A. Sperry Memorial Service,” program of funeral service, Tokyo Young Men’s Christian Association, Kanda, Tokyo, July 1, 1930, Linda Hall Library Archives.

to worry when we got in the War Zone” he actually “found that it did not concern me in the least, and I went to bed and slept.” Lawrence Sperry’s mockery of passengers juxtaposed to his sense of personal invincibility in a war zone demonstrates the cognitive dissonance needed of a professional war contractor spending his early twenties wheeling and dealing weapons of war. This same letter home from Lawrence reassured his father, and employer, Elmer that he was “going into the Aeroplane Stabilizer situation here to the fullest extent” by reviewing correspondence with foreign agents and managing the stabilizer’s tests with the British War Office.<sup>43</sup>

Lawrence’s international sale of Sperry Gyroscope Company war devices provided him a lens into war strategy straight from French high command. In early 1916, Lawrence reported home about his “marvelous demonstrations” of the automatic stabilizer “before some of the very high military officials” of France. Lawrence emphasized the machine’s abilities, “The control worked perfectly...” even in the face of poor weather conditions that made flying more difficult. Gleaming from the “high compliments” his French military audience paid upon the apparatus, he prophesized “the device is a great boon to the French who will be able to accomplish great things with it.” He expected “to do a great deal of business with them.”<sup>44</sup>

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<sup>43</sup> Lawrence Sperry, Letter to Parents, September 21, 1915.

<sup>44</sup> Lawrence Sperry to Parents, January 13, 1916, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence Burst Sperry Documents, Folder 5.

Lawrence's letter home reads more like a vacation experience mixed with a business trip than a visit to a war-torn country. Yet international politics was inescapable conversation for an American war contractor in Paris. Lawrence lamented that "Americans are not liked over here in the slightest way." He echoed criticism of President Wilson's inactions during the war expressed by French military leaders', writing "They say that America gave up the chance of gathering future international peace by allowing Germany to break bonds signed at the Hague treaty." Lawrence further ridiculed Wilsons' disregard of international law noting the President "made objections to Germany breaking any bonds which effect [sic] us, in a rather slow way, but we allow old Germany to do what she will in using asphyxiating gas etc. and etc." Shifting from blaming President Wilson, Lawrence concluded his reflection on the war's conduct by insisting upon the Allies' right to terroristic retribution:

This war may last a long time, but one thing is sure that is there will not be any Germany again as she was before the war for at least two years. The Allies certainly don't want peace, not until they have torn Germany down. Germany has given asphyxiating gases, the Allies have returned them. Germany has bombarded cities from the air, the Allies have returned by bombarding German cities many times stronger. Germany has employed terrorism with the object of scaring the Allies, the Allies will give a real touch of terrorism when they get into Germany note that Germany started it.

Lawrence enunciated his understanding of the war's strategy as having devolved into terrorism. German "terrorism" had necessitated British and French "terrorism" primarily through air bombardment of cities. Lawrence's understanding of war makers' embrace of terror bombing helps explain why this sort of indiscriminate violence became the primary imagined use for the pilotless airplane.<sup>45</sup>

Lawrence was in a privileged place to engage in war talk with his mother and father. His report home from Europe came from the relative safety of London and Paris while in talks with the British war office and French high-command. There is no account of the trench war in his correspondence. To him war was a money maker not a lethal danger. Lawrence's candid transparency about terror bombing with both parents likely stemmed from the Sperry family business in selling war mechanisms. This transparency with his parents also speaks to the significance of family correspondence as an archive of war making and candid violent fantasy.

Lawrence Sperry pitched the auto-pilot as improving pilot safety through labor reduction. But he held a high expectation of pilots' performance nonetheless. Lawrence Sperry expected U.S. pilots to obtain "mastery over machine." To him this included the capacity to perform a variety of aerial stunts—loops, flips, etc.—to be prepared for the rigors of both mechanical misfortune and combat surprise. Writing in popular aviation

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<sup>45</sup> Ibid.

journal *Aerial Age Weekly*, Lawrence Sperry insisted controlled stunting improved pilot safety:

Some of the best pilots in this country are opposed to 'stunting' because they fear to endanger their reputations as safe, sane, careful pilots. Abroad the reverse is true. The man who does not put his 'bus' through, as they say, is not fit to fly a machine at all. Instead of 'pussy footing' around in a machine in a closed field, what we need in this country is 'pep' in flying.

Gendering cautious pilots as lesser men who were "'pussy footing' around," Lawrence reached to the example of foreign pilots' "stunting" to justify his argument for the necessity of learning aerial acrobatics as part of U.S. pilots' training. Lawrence's critique of pilots being too scared to fly as he saw fit also suggests that pilots' fear or lacking flying ability amplified the pilotless airplane's allure.<sup>46</sup>

The Sperry Gyroscope Company emerged as a world wide war contractor in time to take financial advantage of the First World War's cataclysm of death. The immensity of slaughter involving the deaths of peoples from around the world built upon prior decades of industrializing nations' expansionary imperial coloniazation. The unrestrained violence entangled in European and U.S. imperial claims upon distant territory and peoples was certainly significant to many war planners purchasing Sperry

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<sup>46</sup> Lawrence Sperry, Alleged "Stunting," *Aerial Age Weekly*, February 12, 1917, National Air and Space Museum Technical Reference Files and Libraries, Lawrence Sperry Documents, Folder 2.

Company products. Yet, it is notable that war contractors who provided the technological mechanisms of the conflict's machine war, like Elmer Sperry and his son Lawrence Sperry, seemed to care more about company profits, than national allegiances. Biographer Thomas P. Hughes recognized Elmer Sperry and his company sought international clients yet primarily emphasized the engineers's work in "modernizing" the U.S. Navy.<sup>47</sup> But Sperry and company figures sought to make the militaries of near all of the imperial "world powers" their customers. Amidst a global race for arms and territory between industrialized states that had long appeared destined for a violent cataclysm, the Sperrys seemed to put dollars and cents above country. In 1914 alone, salesmen from the Sperry Gyroscope Company pitched or successfully sold gyroscope based naval compasses or airplane "auto-pilots" to military officials in Britain, France, Germany, Russia, and Japan.<sup>48</sup>

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<sup>47</sup> Thomas P. Hughes, *Elmer Sperry*, Chapter 8: "Brainmill for the Military;" and Thomas P. Hughes, *American Genesis: A Century of Technological Enthusiasm, 1870-1970*, Chapter 3: "Brain Mill for the Military," University of Chicago Press, 1989.

<sup>48</sup> Sperry Gyroscope Company sales to British and Russian militaries appear in Letter to Elmer A. Sperry from a Sperry Gyroscope Company salesman, illegibly signed, December 11, 1914, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence B. Sperry Documents, Folder 4; German sale and testing appear in "Sperry Gyroscope Company Bulletin of Information No. 1015, "Tests of Sperry Gyro Compass Carried out by German Navy Department," June 4<sup>th</sup>, 1914, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence B. Sperry Documents, Folder 5; Company discussion of a large French purchase of automatic pilots appears in "Automatic Pilots. Contract with French through J.P. Morgan & Co." March 8, 1916, National Air and Space Museum Technical Reference and Libraries, Lawrence B. Sperry Documents, Folder 5; Sales to Japan's military began during World War I and extended into the 1920s, see: Lawrence Sperry, Letter to Parents, September 21, 1915, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence Sperry Documents, Folder 5; and "Dr. Elmer A. Sperry Memorial Service," program of funeral service,

Lawrence Sperry described the auto-pilot as doing the bulk of flying's work without taking control of flying from pilots. But what if, instead of recruiting thousands of pilots for war, and instead of having to train those thousands of prospective pilots to fly, a "pilotless" airplane could be designed, weaponized, mass produced, and deployed to achieve victory? What if one took the automatic stabilization and controls integrated into flying-machines through the gyroscopic "auto-pilot" and sought to wholly substitute machine for man, automating the final "fifteen percent" of human involvement in flight? What destruction might killing machines disconnected from human agents wreak in war? These are questions the Sperrys and members of the Naval Consulting Board turned to as they made the aerial torpedo.

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It was "around July 1915," after demonstrating the military value of his company's automating devices to the world's imperial powers, that Elmer Sperry was approached with the idea of developing an "automatic flying machine." Fellow Naval Consulting Board member Peter Cooper Hewitt proposed the project to Sperry, and funded the weapon's initial development. Navy Colonel Bion J. Arnold, also a member of the Naval Consulting Board, and a co-member of the Board's torpedo subcommittee

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Tokyo Young Men's Christian Association, Kanda, Tokyo, July 1, 1930, Linda Hall Library Archives.

with Sperry, wrote in the definitive contemporaneous Naval report that “the object” of the project was:

the production of an automatic flying machine or aerial torpedo, i.e., one which could fly by means of a mechanical control, without the aid of a human pilot, capable of carrying a charge of high explosive, and so designed as to be flown from a given point to another given point, then made to dive suddenly and, upon impact, to explode its cargo of explosive, thereby not only destroying itself, but also causing heavy destruction at and in the vicinity of its point of contact.

From its outset as a state project developed by the U.S. Naval Consulting Board’s members, the automatic flying machine was envisioned as a massively destructive means of air war that substituted war machine for pilot and plane. Arnold reported Sperry’s previous technical developments with the gyroscope, notably “the automatic control of the aeroplane,” transferred into Sperry’s continued “use of gyroscopes to govern the horizontal and vertical movements of the torpedo in a manner similar to the plans he had developed for application to larger aeroplanes.”<sup>49</sup>

It was within pre-existing larger airplanes manned by an overseeing pilot that Sperry’s initial development of automatic directional controls for the aerial torpedo took place. Elmer Sperry and Navy engineers, including his son Lawrence then serving as an officer in the Navy flying corps, conducted experiments developing a self-directing

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<sup>49</sup> Bion J. Arnold, main text of “Secret Report,” January 1919, Kettering University Archives, 2.

control device at the Navy's airfield in Amityville, Long Island. The process of refining this automatic control device's directional accuracy involved allowing the gyroscopic-stabilizer to direct a Navy hydroplane's flight path. During testing, an attendant pilot let the automatic controls steer the aeroplane upon a straight path. When the control device veered from its pre-programmed straight path by a degree, or suffered a more serious malfunction, the attending pilot onboard took control of the plane. Having corrected the automatic control's mistake, the attendant pilot then logged the error to diagnose the problem and improve the mechanism's directional accuracy.<sup>50</sup>

The pursuit of pilotless airplanes required meticulous surveillance and disciplining by pilots before machine, alone, could fly. The Sperry-led testing regime relied upon an airman, often Lawrence Sperry, to survey and correct the errant automatic controls for a year before the device's kinks seemed worked out. Though father and son Sperry led the weapon's development, they received development advice and aid from fellow Naval Consulting Board torpedo committee members Col. Bion Arnold and chemist Leo Baekeland, as well as assistance from Navy engineers at the Navy's Amityville, Long Island airfield. During a demonstration test in early 1917, Lawrence Sperry and a representative from the Bureau of Navy Ordnance both flew in the modified Navy hydroplane for seven miles under automatic gyro-stabilized control

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<sup>50</sup> Ibid; the Elmer and Lawrence Sperry's development of the U.S. Navy's aerial torpedo device is also discussed in Hughes, *Elmer Sperry*, Chapter IX: "The Assumption of Leadership: The Naval Consulting Board and the Aerial Torpedo."

without serious malfunction or deviation from the preprogrammed straight path, solidifying the device's potential to its boosters.<sup>51</sup>

By April 14, 1917, after formal inspection by Navy Officers and consideration by the Naval Consulting Board, the automatic control apparatus was deemed "sufficiently promising" to warrant additional development funding. All testing up to mid-1917 involved "man-carrying machines" because of the need for a pilot to monitor and correct the automatic controls' directional deviations. But the recognized aim of the program was to remove man completely from flying-machine. Officials in the Navy's Bureau of Ordnance understood the automatic controls then developed as the primary yet most problematic component in producing "an automatic aerial torpedo, a passengerless aeroplane, capable of flying a desired distance on a course, true and predetermined, except to deviation due to direction by the wind, and of descending to earth and exploding a heavy explosive cargo upon impact with the ground." A resolution from the Naval Consulting Board requested the Secretary of the Navy "apportion from such funds as may be at his disposal the sum of \$50,000 to carry on experimental work on the subject of aerial torpedoes in the nature of automatically controlled aeroplanes or aerial machines carrying high explosives capable of being initially directed and thereafter

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<sup>51</sup> Bion J. Arnold, main text of "Secret Report," 2; Rear Admiral W. Strother Smith, "Aerial Torpedo or F.B. [Flying Bomb] Chronology," undated, Exhibit A compiled in Bion J. Arnold "Secret Report," January 31, 1919, Charles Kettering Office Files Collection, Kettering University Archives.

automatically managed." Within a month, Navy Secretary Josephus Daniels apportioned \$200,000 drawn from the Navy's Bureaus of Ordnance, Construction and Repair, and Steam Engineering, to continue experimentation in pursuit of the "passengerless aeroplane." The demonstrated feasibility and expanded financial support for the project's development encouraged violent dreams from the Naval Consulting Board's members. Board member W. L. Saunders, for instance, declared publicly in May 1917 that "the submarine was doomed because of a new weapon" subtly referencing the Navy's secret war machine.<sup>52</sup>

But before such destructive fantasies might come true, the U.S. Navy's Department heads met at Navy Secretary Daniels' home to discuss how to approach the next stage of the passengerless aeroplane's development. The Sperry's automatic control device had only been tested in a Navy hydroplane and did not yet amount to a new standalone "practical military weapon." Considering the aim of the program was to construct both a self-directed and self-sacrificing war machine, there was an apparent need for a less materially costly airframe. Naval commanders recognized that "Three main problems presented themselves: (a) The development of a small, light fast aeroplane. (b) A satisfactory launching device. (c) Adequate control mechanism." The U.S. Navy conducted additional experimentation to improve the Sperry developed

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<sup>52</sup> W. Strother Smith, "Aerial Torpedo or F.B. [Flying Bomb] Chronology," Exhibit A in Bion J. Arnold "Secret Report."

automatic control mechanism. It initiated the experimental use of wireless radio control during the summer of 1917 with supervision and assistance from the Naval Inspector of Ordnance. By November 1917, the Navy's automatic control device "showed sufficient promise to guarantee final success" leading to the conclusion that the project could be expanded and "developed into a comparatively inexpensive weapon for army use."<sup>53</sup>

General George O. Squier, Chief Signal Officer of the U.S. Army, had received informal briefings on the Navy's development of a passengerless aeroplane. But his first invitation to witness the device firsthand came on November 21, 1917. At the Navy's airfield in Amityville, Long Island, Squier met with primary engineers and Navy officers including the Chief of the Bureau of Ordnance, Elmer Sperry, and Glenn Curtiss, a close friend of the Sperry family and head of the Curtiss Aeroplane and Motor Company which manufactured the seaplanes on which the Sperry automatic controls had been tested. Squier was so impressed after examining the progress made towards the aerial torpedo he "immediately took the necessary steps to evolve and perfect an army type of aerial torpedo, that could be produced in large quantities at low cost with a view of getting it into action at the earliest practicable date."<sup>54</sup>

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<sup>53</sup> Ibid.

<sup>54</sup> Bion J. Arnold, main text of "Secret Report," 3-4.

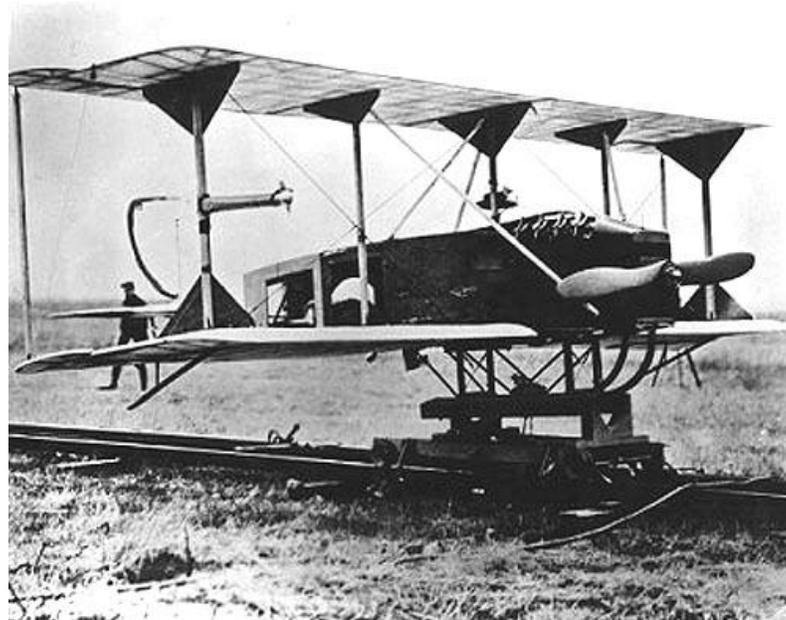


Figure 3: The aerial torpedo as developed by the U.S. Naval Consulting Board's members converted a Curtiss Aeroplane Company seaplane to test the automatic control system.

The U.S. Navy's developmental work towards an automatic airplane had advanced significantly before the beginning of Army involvement in late 1917. Yet, the Elmer and Lawrence Sperry led initiative had not taken certain key steps in producing a feasible automatic flying airplane. All of the Navy experiments preceding Army involvement had relied upon in-plane pilot oversight of automatically directed airplanes. Though Naval leadership had specified the creation of a cheap new airframe to serve as the body of the aerial torpedo the work conducted up to late-1917 had relied on Curtiss Aeroplane Company seaplanes. General Squier's induction into the aerial torpedo's development thus reflected a recognition of the weapon's utility for Army ground war and the need for Army resources to aid the project's development.

The U.S. Army, not the Navy, had been designated as the service branch responsible for responding to French Prime Minister Alexandre Ribot's request in May 1917 that the U.S. begin producing thousands of airplanes to aid the Allied war effort in early 1918.<sup>55</sup> General Squier had helped successfully lobby Congress to expand the Army's aviation budget by \$640,000,000 securing what then amounted to the single largest appropriation of funds in U.S. history to build approximately 17,000 airplanes for fighting and training.<sup>56</sup> A similarly sized appropriation sought for Navy aeronautics never materialized during the war. Building off the Naval Consulting Board's work, Squier hoped the additional resources of the Army Signal Corps and the U.S. Aircraft Board could animate the aerial torpedo "with all possible vigor."<sup>57</sup>

The expansion of the aerial torpedo project for Army-led ground war made tactical sense. Though members of the Naval Consulting Board imagined the device targeting submarines, the likelihood of the new flying apparatus landing a direct hit upon a possibly submerged or moving target held little viability.<sup>58</sup> The war's stalemated

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<sup>55</sup> *The U.S. Air Service in World War I*, Volume II, The Albert F. Simpson Historical Research Center, Maxwell Air Force Base, Alabama, 108.

<sup>56</sup> *Ibid.* On Squier's role in lobbying Congress for funding for airplane manufacture see: Clark and Lyons, *George Owen Squier*, Chapter 11 "The Biggest Thing of the War."

<sup>57</sup> George O. Squier, "F.B." to the Chairman of the Aircraft Board, November 26, 1917, Exhibit B compiled in Bion J. Arnold, "Secret Report," 1919.

<sup>58</sup> Though this sort of precision targeting was the ultimate hope for remote control, the use of wireless radio direction held its own significant technical limitations including limited broadcast range, the size and weight of additional radio control equipment, and the material cost of radio equipment which ran counter to the aim of designing a cheap and mass producible aerial torpedo.

trench lines as well as enemy cities, however, offered static targets for aerial bombardment by pilotless airplane. Squier issued a directive to the Chairman of the U.S. Aircraft Board five days after witnessing the Navy's demonstration of the in-development Sperry aerial torpedo, insisting the board "should immediately take up this project most energetically and push it so as if possible to supplement the air program for 1918."<sup>59</sup>

Squier imagined the pilotless airplane as a merger of the military sciences he knew best—artillery, airpower, and wireless communications.<sup>60</sup> Squier's recommendation for the weapon to the Aircraft Board argued:

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<sup>59</sup> George O. Squier, F.B. (Flying Bomb) to the Chairman, Aircraft Board, November 26, 1917, Exhibit B. compiled in Bion Arnold, "Secret Report," Kettering University Archives.

<sup>60</sup> Squier graduated from West Point in 1887 with an appointment in the Artillery corps. His military service led him to study physics, mathematics, and ballistics at Johns Hopkins University, where he earned his doctorate in 1893. He taught at the United States' Army Artillery School in Fortress Monroe, Virginia in the mid-1890s before deploying to the Philippines in 1898. There, he was instrumental in designing the Army's submarine telegraph network, a key means of communications underpinning the U.S. occupation's counterinsurgency efforts that suppressed the Filipino independence movement. Throughout his career as inventor and military officer, Squier helped establish the Aeronautical Division within the Army Signal Corps, pushed the U.S. Army to purchase its first flying-machine from the Wright Brothers in 1909, and was the only person with membership on both the National Advisory Committee of Aeronautics and the war-time U.S. Aircraft Board, in 1917-1918. After the war, Squier founded the Wired Radio company, renamed Muzak in 1934, which produced broadcast equipment to pump background music in department stores and elevators. On Squier's life, see: Paul W. Clark and Laurence A. Lyons, *George Owen Squier: U.S. Army Major General, Inventor, Aviation Pioneer, Founder of Muzak*, McFarland and Company, 2014; on the U.S. occupation of the Philippines, see: Paul A. Kramer, *The Blood of Government: Race, Empire, the United States, and the Philippines*, The University of North Carolina Press, 2006; Alfred W. McCoy, *Policing America's Empire: The United States, the Philippines, and the Rise of the Surveillance State*, University of Wisconsin Press, 2009.

It is believed that the modern high-power gun, as now designed and used ashore and afloat, has many disadvantages from engineering and technical standpoints, and that the time has come when serious attention should be given by this Board to the development of a new type of artillery based primarily upon the principles of the flying machine.<sup>61</sup>

Squier conceived of the aerial torpedo as a merger of artillery and flying machine. Yet he saw this combination of widely used war machines as forming something new and revolutionary. Gushing to the chairman of the Aircraft Board, Squier insisted “The time has come... when this fundamental question should be pressed with all possible vigor, with a view to taking to Europe something new in war rather than contenting ourselves as in the past with following the innovations that have been offered from time to time since the beginning of the war by the enemy.” Insisting “Wars are won largely by new instrumentalities...” Squier called for the U.S. Aircraft Board to “be a leader and not a follower” and embrace the aerial torpedo as a key instrument for achieving Allied victory.<sup>62</sup>

Squier’s request to the U.S. Aircraft Board for an Army-led aerial torpedo project centered the design and manufacture of the weapon in Dayton, Ohio. A famous city in the early 20<sup>th</sup> century, Dayton had birthed poet Paul Laurence Dunbar, the Wright

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<sup>61</sup> George O. Squier, F.B. (Flying Bomb) to the Chairman, Aircraft Board, November 26, 1917, Exhibit B. compiled in Bion Arnold, “Secret Report,” Kettering University Archives.

<sup>62</sup> Ibid.

brothers Orville and Wilbur, the cash register, and the airplane. Squier's order named the Dayton Wright Airplane Company and the Edsel Ford Motor Company in nearby Detroit, Michigan as the weapon's lead contractors. The Edsel Ford Motor Company contracted to design and manufacture the aerial torpedo's motor. The Dayton Wright Airplane Company's famous lead engineers Charles Kettering and Orville Wright were specifically mentioned in Squier's order as the designers of the weapon's airframe, control system, and other requisite components.<sup>63</sup>

Squier was not the only high-ranking figure in Army Aviation pushing for the aerial torpedo's development. Assistant Director of Military Aeronautics Colonel Henry Harley "Hap" Arnold also embraced the weapon project. Henry Arnold was among the first U.S. pilots trained for military aviation service, receiving flight instruction from Wilbur and Orville Wright in 1911. Despite a stellar flight record during the immediate pre-war years including his winning of the Mackay Trophy for "the most outstanding military flight of the year," Hap Arnold suffered an injurious and traumatic crash during a failed flight in 1912 which led him to request a relief from flight service. Hap Arnold overcame a fear of flying resultant from his crash yet was denied a request for a front-line position in the air war. Disappointed to not see war action, Hap Arnold lamented in his autobiography the denial of his dream to see air combat most likely stemmed from his psychological struggles to fly after his crash and because he had

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<sup>63</sup> Ibid.

gotten married.<sup>64</sup> Wielding his position as the highest-ranking pilot in Washington during the war, Hap Arnold's boosterism for the Army's aerial torpedo takes on a sense of vicarious violence in which the weapon served as an extension of his desire to be part of the war in the air.<sup>65</sup>

The shift from Army to Navy-led weapon development eventually created a rift between the new "pilotless airplane" makers Kettering and Wright versus the previous "aerial torpedo" makers Elmer and Lawrence Sperry. The U.S. government sponsored all these engineers and their companies' war work during the war years and prohibited secret weapons' international sale until after the war. Across late-1917 into late-1918, ownership rights remained a secondary concern to devising a cheap yet functional device, two aims at odds that contributed to the resulting machine's technical limits.

Elmer and Lawrence Sperry shared their work on the aerial torpedo and its automatic controls with the Army's engineers working out of Dayton, Ohio. Work on a Navy aerial torpedo including experiments with remote radio-control continued through the war alongside the Army's efforts to design a similar weapon in Dayton. Lawrence and Elmer Sperry alongside other members of the Naval Consulting Board including Leo Baekeland and Navy Lieutenant Colonel Bion J. Arnold frequently visited Dayton to consult on the weapon's development. This direct connection between the

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<sup>64</sup> Henry Harley Arnold, *Global Mission*, Harper, 1949, 43.

<sup>65</sup> *Ibid*, 75-76.

two weapon projects eventually resulted in Navy officer Bion Arnold being transferred to Army service by Assistant Director of Military Aeronautics Colonel Henry Harley “Hap” Arnold, another influential booster of the aerial torpedo.<sup>66</sup>

The aerial torpedo advanced from a pre-war fantasy into a war time state weapon project increasingly valued as war stretched into an attritional sacrifice of life. Engineers working on the inner mechanization of war machines through directional compasses for naval travel and auto-pilots for airplanes reshaped these devices into a new weapon of war. More and more state resources flowed into the aerial torpedo’s development across 1918 as the weapon’s designers reached for a seemingly revolutionary new instrument of violence to use in war.

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The Army’s lead aerial torpedo engineers Charles Kettering and Orville Wright sought to design a weapon fit for mass production and capable of wreaking mass destruction. Their jointly managed Dayton Wright Airplane Company was among the United States’ largest manufacturers of airplanes and airplane components.<sup>67</sup> Wright and Kettering were both materially intertwined with the war before their work on the

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<sup>66</sup> H.H. Arnold Assistant Director of Military Aeronautics U.S. Army Air Service to Director of Aircraft Production, September 21, 1918, National Air and Space Museum, Technical Reference Files and Libraries, Kettering Bug (Aerial Torpedo) – Correspondence Folder.

<sup>67</sup> Kettering boasted of the size of his operation in letters to friends. See: Charles Kettering to Clarence Day, May 22, 1918, Kettering Office Files Alphabetical 1918 “A”-“Z,” Box 1, 1918 “D” folder. Kettering’s quote was: “As you know, one of the largest aircraft plants in the country is located here in Dayton. It is known as the Dayton Wright Airplane Company and I happen to be Vice President and Consulting Engineer.”

Army's aerial torpedo. Wright had gained global fame by flying and selling airplanes across Europe before the war. Kettering was also a distinguished electrical engineer and machine maker. During the early 1900s, he electrified the cash register for the National Cash Register Company and designed the automobile "self-starter" an ignition system for cars which eliminated the need for motorists to hand-crank their engines.<sup>68</sup>

Kettering's fame as an engineer led to him assisting with the design of an ignition system for the "Liberty Engine" made for use in U.S. airplanes.<sup>69</sup> By the time Wright and Kettering became involved in the Army's aerial torpedo development they were already well connected to the productive war effort themselves deploying an army of thousands of laborers at the Dayton Wright Airplane Company to fulfill U.S. government contract #10,472 which called for the mass production of 21,260 Liberty Engine ignition systems.<sup>70</sup>

Wright and Kettering's government contracts in part stemmed from personal expertise but also personal associations. Their close friend and fellow Dayton, Ohio resident Edward A. Deeds went on leave as a National Cash Register Company executive when commissioned as a Colonel in the Administration Division of the Army Signal Corps and appointed a member of the U.S. Aircraft Board.<sup>71</sup> Deeds and other

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<sup>68</sup> Leslie, *Boss Kettering*, Chapter 3: "The Delco Years."

<sup>69</sup> *Ibid*, Chapter 4: "World War I."

<sup>70</sup> Response to District Exemption Board from Executive Secretary, January 3, 1918, Kettering University, Charles F. Kettering Office Files Alphabetical 1918 "A"- 1918 "Z," Box 1, Folder 1918-"D."

<sup>71</sup> "The Aircraft Production Board, Proceedings of the Academy of Political Science in the City of New York," Vol. 7, No. 4, Economic Conditions of Winning the War, February 1918, 105, JSTOR.

Dayton power brokers like banker Harold Talbot convinced Wright to lend his name and talents to the Dayton Wright Airplane Company following his sale of the original Wright Company in 1915. This social network of friendly business partners with high position within the government's production boards erupted in controversy over possible corruption by the end of the war.<sup>72</sup>

General Squier's push for the aerial torpedo to be mass produced as soon as possible to aid the Allied air offensive in 1918 emphasized the task was not simply one of engineering but also labor and its management. Kettering was known popularly as "Boss" an authoritative title he preferred his subordinates use when talking to him. "Boss Ket" first earned his managerial moniker driving a telephone pole installation crew across Ohio in the 1890s when he was purportedly prone to brawling with defiant workers.<sup>73</sup> Kettering's antagonisms towards laborers grew alongside his acquisition of managerial authority. He subscribed to and advertised in publications like the *Detroit Saturday Night* that railed against unions and pushed the "open shop" in factories.<sup>74</sup> He personally directed the "Americanization" of his workers within the American Legion's jingoist campaign for war-time patriotism under the banner of "100 percent

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<sup>72</sup> Leslie, *Boss Kettering*, Chapter 4 "World War I;" For a general history of the U.S. War Industries Board and its associated political controversies, see: *Robert D. Cuff, The War Industries Board: Business-Government Relations During World War I*, Johns Hopkins University Press, 1973.

<sup>73</sup> Leslie, *Boss Kettering*, Chapter 1 "The Early Years."

<sup>74</sup> Kettering's office files contain regular correspondence and solicitations with editors at the *Detroit Saturday Night*, see "D" Folder, Kettering Office Files, Kettering University Archives.

Americanism” that often fueled the violent suppression of labor rights.<sup>75</sup> The milieu of 100 percent Americanism at Kettering’s businesses produced instances where German immigrant workers were harassed by other factory workers, including instances that drew the American Protective League to warn Kettering about nativist “hounding” of immigrant workers causing an interference to war production.<sup>76</sup> Kettering’s fraught relationships with the people he employed and whose labor made him wealthy proved a sustained animosity lasting across his time as “Boss” within United Motors, then General Motors as the company was renamed after the war.<sup>77</sup>

Kettering was among the wealthiest and most influential corporate figures in the U.S. Kettering held major financial interests in the Dayton Wright Airplane Company, the Dayton Engineering Laboratories Company (DELCO), and the Dayton Metal Products Company which were all subsidiaries of the United Motors conglomerate. By the end of the war Kettering’s accountant valued his and business partner Deeds’ combined net worth at over one hundred million dollars.<sup>78</sup> Kettering’s stature as engineer and corporate figure elevated him to the Presidency of the Society of

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<sup>75</sup> On the American Legion during World War I, see: Christopher Capazolla, *Uncle Sam Wants You: World War I and the Making of the Modern American Citizen*, Oxford University Press, 2008.

<sup>76</sup> American Protective League Correspondence, May 29, 1918, Kettering University Archives, Charles Kettering Office Files - Alphabetical, Box 1, Folder “A” Jan-June 1918.

<sup>77</sup> Leslie, *Boss Kettering*, Chapter 3 “The Delco Years” and Chapter 9 “The Challenges of Management.”

<sup>78</sup> “Our Various Interests,” compiled by financial representative George B. Smith for Charles Kettering and Edward A. Deeds, April 24, 1918, Wright State University Archives, The Family Papers of Charles F. Kettering, Box 20, Folder 17.

Automotive Engineers in 1918. As one of Ohio's largest employers, Kettering was made an advisor to the State of Ohio on labor matters where he shared racist and patriarchal opinions on the effectiveness of and wages due to women who worked in war production.<sup>79</sup>

Kettering's business operations far surpassed the productive capacity of the Sperry Gyroscope Company. The Army's reliance on his Dayton based businesses thus signaled a definitive shift in focus from experimentation into a push for manufacture. Where the Sperry led Naval work had centered on developing the technology of automatic airplane control, the actual production of a useable weapon still seemed far off in late-1917. Official Army records of the project cited the need for: "speed, carrying capacity, reliability, ease of launching, economy of manufacture, economy of shipping space, and ease of assembly in the field."<sup>80</sup> Most of these logistical questions concerning weapon usability had been overlooked during the Sperry-led Navy work on the aerial torpedo.

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<sup>79</sup> Questionnaire sent to and responded to by Charles Kettering, "Questionnaire Relative to Women in Industry," Ohio Branch Council of National Defense Labor and Industrial Relations Committee, undated circa May 1918, Charles Kettering Office Files - Alphabetical, Kettering University Archives, Box 107, Folder "C" Correspondence, May-December 1918. Kettering's answers to this labor questionnaire delineated the wage disparities in place between men and women workers in his factory and also noted he did not hire any women of color to work in his businesses despite hiring many white women for factory work.

<sup>80</sup> Description and Partial History of the 'Kettering' Torpedo Airplane, Kettering University Archives, Box 107, Charles Kettering Office Files: Topical, Kettering Aerial Torpedo: 'Bug,' Feb.-May 1919.

On December 24, 1917, Kettering gathered key managerial and technical figures from the array of Dayton companies he managed to assign tasks towards designing the Army's war machine.<sup>81</sup> The aim of their work was "an automatic airplane—that is, one flown without pilot, which can be directed to a given spot and either drop bombs or crash, completely and automatically controlled from the time of launching to the time of crashing without human intervention" which would "be quite practicable to produce in large quantities." The emphasis placed on practicable mass produce-ability signaled Kettering's Dayton project aimed to resolve the logistical and material issues of the Sperrys' Navy work.<sup>82</sup> Elmer and Lawrence Sperry had also begun experimenting with "wire-less" radio control to enable better command of the aerial torpedo in the air and open the possibility of directing the device to drop bombs then make a return flight rather than crash itself. But these more complex radio controls increased the weapon's costs diminishing the feasibility of mass production. Kettering rejected radio control as too costly and unreliable. Instead, he and his team of technical experts imagined a self-guided apparatus that "could be crashed in enemy territory, using its component parts

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<sup>81</sup> Thomas Midgley Jr., "Report," undated, circa late 1918 or early 1919, Kettering University Archives, Charles Kettering Office Files – Topical, Box 108, Folder Kettering Aerial Torpedo: "Bug." Midgley writes that on December 24, 1917, Kettering brought together the following men from his companies to discuss the new war device they would co-produce: H. E. Talbott, Jr., Vice President and General Manager of the Dayton Metal Products Company; W. A. Chryst, Chief Engineer, Dayton Engineering Laboratories Company; F. O. Clements, Director of the Research Division, Dayton Metal Products Company; H. C. Mougey, Head Chemist, Dayton Metal Products Company; and Thomas Midgley Jr., Mechanical Engineer, Research Division, Dayton Metal Products Company.

<sup>82</sup> Ibid.

as shrapnel, instead of returning to its base..." Theirs was a vision of maximum destruction wrought for minimum dollar or material. The disposability of their splattering device was soon encapsulated in its nickname: "the Bug."<sup>83</sup>

Kettering's fellow lead engineer on the Army aerial torpedo, Orville Wright, was not a member of the Naval Consulting Board, but was associated with the board as an aeronautical advisor from its outset and therefore must have known something about the aerial torpedo's development before his induction into helping design the weapon for Army use.<sup>84</sup> Wright and Kettering likely also heard of the device's development from their close friend Leo Baekeland, a fellow member of the Naval Consulting Board's torpedo subcommittee alongside Elmer Sperry. A Belgian-born and educated chemist, Baekeland immigrated to New York city at the turn of the century where he devised the world's first synthetic hard-moldable plastic Bakelite. Baekeland met Deeds, Kettering, and Wright in 1909 when they invited him to lecture about synthetic plastics at the Dayton Engineers Club.<sup>85</sup> The foursome maintained a correspondence and working relationship into the war that helped shape the automatic airplane.

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<sup>83</sup> Cost per unit when mass produced in large quantities came down to \$575 per device. Each automatic airplane could carry 200 pounds of explosive or gas. The weapons were programmed to fly fifty miles before intentional self-circuit when they plunged to the ground to explode. Midgley, "Report."

<sup>84</sup> Hughes, Elmer Sperry, Chapter IX "The Assumption of Leadership: The Naval Consulting Board and the Aerial Torpedo."

<sup>85</sup> Leo Baekeland letter to Orville Wright, May 26, 1915, Library of Congress, Manuscript Division, Wilbur and Orville Wright Papers, Box 12, Folder 3 "Leo Hendrik Baekeland."

In July 1917, Baekeland helped connect the French Army's Scientific Commission with Kettering and Wright in Dayton. The preeminent men of French military science, mostly physicists and chemists, toured notable technological spaces in the U.S. including the plants of General Electric and Eastman Kodak at Niagara Falls. As the French scientists ventured into the mid-west to see Pittsburgh and Chicago, Baekeland directed them to also visit Dayton, Ohio which he thought "ought to give them a good example of what a city of engineers appears like."<sup>86</sup> According to the 1900 U.S. census, Dayton's residents held the most patents per-capita of any city in the U.S., making it known for invention even before Wright or Kettering had made their machines.<sup>87</sup> Because the French scientists expressed a distinct interest in aviation, Baekeland implored Kettering and Wright to meet with them: "These gentlemen would be very happy if, on this occasion, they could meet Mr. Orville Wright and yourself [Kettering]. In fact, it is a pity that Mr. Deeds should be so busy in Washington, going to Dayton without meeting these men is like going to Rome without seeing the Pope."<sup>88</sup> Considering Baekeland's years of friendship with Wright, Kettering, and Deeds, it is no

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<sup>86</sup> Leo H. Baekeland to Charles F. Kettering, copied to Orville Wright, July 12, 1917, Library of Congress, Manuscript Division, Wilbur and Orville Wright Papers, Box 12, Folder 3 Baekeland, Leo Hendrik.

<sup>87</sup> Irwin Feller, "The Urban Location of United States Invention, 1860-1910," *Explorations in Economic History* 8, no. 3, 1971, 285-303.

<sup>88</sup> Leo H. Baekeland to Charles F. Kettering, copied to Orville Wright, July 12, 1917, Library of Congress, Manuscript Division, Wilbur and Orville Wright Papers, Box 12, Folder 3 Baekeland, Leo Hendrik.

wonder that he so meticulously documented their mutual work on the aerial torpedo in his diary.

On January 31, 1918, Leo Baekeland tried to train his mind upon his work—a trip to Dayton, Ohio on U.S. Naval Consulting Board business—but could not help but think of his pilot son George then flying in Italy. News of pilot deaths made Leo worry for his son George’s safety, writing “Monday papers gave us account of funeral of three of Georges fellow fliers in Foggia, no statement how they were killed.”<sup>89</sup> The news of three dead U.S. airmen in Foggia, Italy explained to Leo why “George cabled on Sunday that he was well as ever.”<sup>90</sup> Even in survival, a soldier’s reassurance he was not among the dead could remind his family of danger’s proximity. For the Belgian-American Leo Baekeland, whose mother country languished under German occupiers, worry for his homeland and son’s survival amplified the war’s emotional toll. A few days prior to George’s message reassuring his parents he was alive, Leo complained to his diary “My heart is not in my work. Feel tired and unable to concentrate my attention on my work.

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<sup>89</sup> Leo Baekeland Diary Volume 24, December 8, 1917-June 18, 1918, Entry for January 31, 1918, pg. 59, Archives Center, National Museum of American History. (Hereafter cited as Leo Baekeland Diary Volume 24, 1917-1918, Leo Baekeland Papers, Archives Center, NMAH.) I am grateful to the Smithsonian Institution’s National Museum of American History for digitally scanning Leo Baekeland’s diary. I am indebted to the National Museum of American History’s archivists for photographic replication and digital volunteers who transcribed Baekeland’s handwritten diary. Leo Baekeland regularly underlined certain words in red within his diary entries seemingly for added emphasis. All red underlines appear in the original text.

<sup>90</sup> Ibid, pg. 59.

Depressing news from everywhere.<sup>91</sup> Anxieties concerning occupied homeland, combatant son, and news of the war's fighting distracted Leo Baekeland from war work that not only included the aerial torpedo, but also his company's production of 100 million pounds of picric acid, a key ingredient to manufacture explosives for the U.S. government's war effort.<sup>92</sup> Baekeland's donations to the Commission for Relief in Belgium may have alleviated some stress for homeland.<sup>93</sup> But Baekeland increasingly placed his faith in the aerial torpedo to help end the war and resolve the mortal danger his son faced.

A train carrying Leo Baekeland and Elmer Sperry departed New York City at 6:02 P.M. on January 31, 1918, headed for Dayton, Ohio.<sup>94</sup> Arriving in Dayton at mid-day the next day, the Army Signal Corps' Chief of Aviation Construction at Dayton's McCook Field invited Baekeland and Sperry to dine with university professors, military officers, and local magnates to discuss the Army's automatic airplane work in Dayton.<sup>95</sup>

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<sup>91</sup> Ibid, January 23, 1918 entry, pg. 56., Leo Baekeland Diary Volume 24, 1917-1918, Leo Baekeland Papers, Archives Center, NMAH.

<sup>92</sup> Leo Baekeland Diary Volume 24, 1917-1918, Entry for December 18, 1917, pg. 11, Leo Baekeland Papers, Archives Center, NMAH.

<sup>93</sup> See correspondence with Commission for Relief in Belgium and the American Red Cross, Leo H. Baekeland Papers, Smithsonian Institution, National Museum of American History Archives, Box 3 Personal Correspondence, Folder 3 Belgian (Miscellaneous) 1890-1916.

<sup>94</sup> Leo Baekeland Diary Volume 24, 1917-1918, Entry for January 1, 1918, 60, Archives Center, NMAH.

<sup>95</sup> Ibid, 61. The lunch of militant luminaries brought together in Dayton, Ohio by the aerial torpedo included: a "Professor Sabin" from Harvard, a physicist serving as a special advisor at the Signal Corps' McCook Field; U.S. Signal Corps Major Carthy; Mr. Talbot, a manager at the Dayton Wright Airplane Company; the "boyish looking" Lawrence Sperry dressed in a new

Following lunch, Dayton Wright Airplane Company manager Harold Talbot led the crowd on a tour of the company's factory floors. The company grounds appeared to Baekeland "a busy place well planned." As Talbot showed his guests the factory's offices and tool shops, he remarked the company then employed 5,500 workers, both men and women, an army of laborers Talbot expected to soon expand by "considerably more" with war production efforts growing.<sup>96</sup> Talbot's directed tour included an exhibition of the recently designed twelve-cylinder Liberty Engine for U.S. airplanes "...entirely packed with tings and fuselage, everything compactly folded in two big square boxes. Ready to be loaded on car or steamer and ready to be speedily unpacked...."<sup>97</sup> Perhaps taking pride in aiding the war effort, recognizing impending profits from war production, or both, Baekeland "was glad to see Bakelite insulation on timers of Liberty Motor."<sup>98</sup> Talbot concluded the day's activities by taking Baekeland and the group to his "beautiful roomy house" where Orville Wright joined them for dinner, though Baekeland noted it was "~~interesting~~ no ladies" attended the meal.<sup>99</sup>

Leo Baekeland witnessed several technology tests across four days spent touring Dayton, Ohio's war manufacturers and the Army's local McCook airfield. He conversed

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uniform reflecting his rank of Second Lieutenant of Navy Aviation; and Navy Commander McCormick "who came specially to see progress on Sperry's Aerial Torpedo."

<sup>96</sup> Ibid, 62.

<sup>97</sup> Ibid, pg. 63.

<sup>98</sup> Ibid, pg. 63.

<sup>99</sup> Ibid, pg. 64.

with chemist Thomas Midgley Jr. about progress made in the DELCO laboratory towards developing a “no-knock” gasoline replicating Germany’s airplane fuel.<sup>100</sup> He saw the Army’s hangar held “Every kind of machine and model. Some french, some british, also German...” for “test and study” exemplifying how U.S. aviation was playing catch up to technological developments in Europe. Witnessing a display of a German airplane equipped with a Mercedes engine, Baekeland marveled as the plane “...maneuvered beautifully making all kind of difficult evolutions and flying fast and climbing high” but he must have grown worried for his aviator son George when an Army engineer told him Allied planes’ speed lagged behind German airplanes.<sup>101</sup> Baekeland even witnessed Lawrence Sperry personally test a new parachute design by jumping out of an in-flight airplane despite objections from his father Elmer and commanding officers.<sup>102</sup>

What most excited Baekeland from the whole trip was seeing the developments made upon “Sperry’s scheme” in Dayton. Witnessing “the new smaller unfinished first specimen” Baekeland gleamed upon learning the aerial torpedo “will carry 200 lbs. of explosive” as here seemed a mechanical solution to a war threatening both his homeland and progeny.<sup>103</sup> Baekeland noted to his diary “I was so much impressed with the

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<sup>100</sup> Ibid, 64.

<sup>101</sup> Ibid, 68-69.

<sup>102</sup> Ibid, 71.

<sup>103</sup> Ibid, 75.

possibilities that I took Col. Deeds aside to request him to impress the onlookers (18 in all) with the gravity of the situation so that this clever invention may not become a boomerang to the Allies, thru indiscretion as well as thru spies."<sup>104</sup> The prototype design of a new standalone pilotless airplane, as opposed to the converted seaplane the Sperry's used for the Navy's aerial torpedo, made Baekeland believe in the project's potential like never before.

Retiring to Colonel Deeds' house after viewing the Army's aerial torpedo prototype, Baekeland took in Dayton's sights, and reflected upon what he had witnessed. He recounted the view juxtaposing the "beautiful sight of surrounding landscape all in snow" to "the aviation testing fields and the great Dayton-Wright Airplane factory in the distance with all its activity and problems...." Veering beyond, Baekeland contemplated the war and recorded:

...before me over this white landscape is a vision, those plants in which the nearby history of the present europ struggle of the human race was to be decided. Will the Germans outdo us or will America ~~eradi~~ by her engineering talent ~~eradicate~~ bring the final stroke to ~~er~~ eradicate this anachronism from the civilized world and let justice rule instead of brutal force?<sup>105</sup>

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<sup>104</sup> Ibid.

<sup>105</sup> Leo Hendrik Baekeland Diary, Entry February 3<sup>rd</sup>, 1918, pgs. 76-77.

Baekeland imagined American technical ingenuity might prove the “final stroke” to “eradicate” the German “anachronism” then occupying his Belgian homeland by “brutal force” and endangering the life of his pilot son. Baekeland saw himself and associates as America’s “engineering talent” whose work to automate air war might provide a deciding weapon in an existential “struggle of the human race.” The aerial torpedo offered Baekeland hope through blood lust. America’s superior killing technology, ostensibly the mark of civilization, might return the rule of justice to the world through a wholly mechanized violence construed clean compared to Germany’s “brutal force.”<sup>106</sup> From the early days of the autonomous killing machine’s development the weapon was oxymoronically rendered a tool of eradication somehow construed “just” and “civilized.”<sup>107</sup>

A final conversation between Baekeland, Kettering, Sperry, Deeds, and military officers concerning the “problems involved” with the automatic airplane’s design and the “details of construction” left Baekeland convinced the “project is realizable and that the men of Dayton are exactly the class of men to carry it out promptly.”<sup>108</sup> Intimate conversation and growing confidence in the pilotless airplane’s potential contribution to war lifted Baekeland’s depressed spirits, and made him feel Americanized, “I felt that at

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<sup>106</sup> Ibid. For analysis of the western illogic that those wielding advanced killing technologies were engaged in a more “civilized” form of war, often enabling mass violence against enemies deemed “savage,” “barbarous,” or “brutal,” see: Michael Adas, *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance*, Cornell University Press, 1989.

<sup>107</sup> Leo Hendrik Baekeland Diary, Entry February 3<sup>rd</sup>, 1918, pgs. 76-77.

<sup>108</sup> Ibid, 77-78.

that moment in the quiet little corner were discussed problems which dealt with the mighty issues now at stake. I felt elated that I born as a poor boy in a foreign country, should be the only foreign born American allowed to participate in this momentous discussion...<sup>109</sup> For Leo Baekeland, the promise of the pilotless airplane's utility in war extended to a loving concern for pilot son, his transnational identity, and hopes of ending the German occupation of his Belgian homeland.

Despite expectations in early 1918 that corporate and military engineers in Dayton could make prompt work developing the aerial torpedo for mass manufacture, a semi-functional device was not made until September. Baekeland knew the model he saw in Dayton had been a rushed job – a design completed in just twelve days not capable of flying.<sup>110</sup> Testing showed the necessity of design reconfigurations. The nature of mass production's reliance upon disparate subcontracting firms providing standardized parts also slowed design work. While several interconnected companies in Dayton worked with on major aspects of the pilotless airplane's design, other components like the motor were subcontracted to subsidiaries within the Ford Motor Company.<sup>111</sup> Other components were subcontracted to smaller producers. The Aeleron Company made Aelerons for installation on the airframe to maintain in-flight stability.

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<sup>109</sup> Ibid, pgs. 77-78.

<sup>110</sup> Ibid.

<sup>111</sup> The contract for engine manufacturing was granted to the Edsel Ford Company, Bion Arnold, main text of "Secret Report, 3.

A player piano company contracted to make the parts for the pilotless airplane's pneumatic self-guidance system.<sup>112</sup>

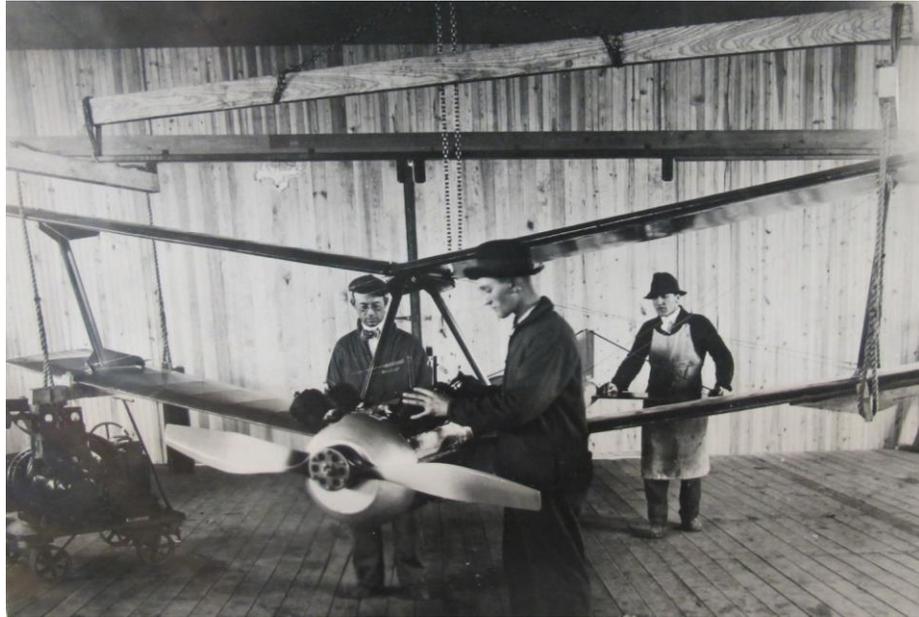


Figure 4: Workers in Dayton, Ohio construct an “aerial torpedo” or “pilotless airplane” nicknamed “the Bug” in 1918.<sup>113</sup>

It took nine months for workers to manufacture the requisite parts and form them into pilotless airplanes. Colonel Bion J. Arnold took credit for the rapid progress made on the Dayton device in September 1918.<sup>114</sup> That month, Assistant Director of Military Aeronautics Henry Harley “Hap” Arnold approved Bion Arnold’s transfer from the Navy’s aerial torpedo work in Long Island to assist the Army’s development of

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<sup>112</sup> Ibid.

<sup>113</sup> Charles F. Kettering Family Papers, Wright State University Archives, Box 55.

<sup>114</sup> Bion Arnold Report; distinguishes his work from previous officers in charge handling of situation.

the weapon in Dayton.<sup>115</sup> Upon Arnold's arrival in Dayton he discovered only a handful of the twenty-five ordered aerial torpedoes had been constructed for testing. Arnold "diplomatically urged" Kettering and those in charge of the Army's work to prepare the remaining devices as "promptly as possible" resulting in their availability for flight tests by mid-September.<sup>116</sup>

The pilotless airplane's flight testing in Dayton from September through October 1918 encountered struggles yet provoked a requisition for the weapon's mass production. The Dayton based devices underwent a series of flight tests in late-September with dissatisfactory results including crashes amidst attempts to launch the apparatus down a railroad track. On October 2<sup>nd</sup>, however, the Army aerial torpedo's first "successfully accomplished" flight occurred, though it flew only momentarily before stalling and crashing to the ground.<sup>117</sup> A test on October 4<sup>th</sup> seemed more promising when the pilotless airplane not only managed to fly but remained flying for forty-five minutes. Even though the apparatus soared over Dayton completely out of control, flying "large horizontal circles and gradually drifting with the wind," it managed to fly approximately sixty to seventy miles before crashing.<sup>118</sup> Arnold sent a telegram to the Director of Military Aeronautics on October 5<sup>th</sup> detailing the prior day's

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<sup>115</sup> H.H. Arnold, to Director of Aircraft Production, transfer order, September 21, 1918, Smithsonian Institution, National Air and Space Museum, Technical Reference Files and Libraries, Folder: Kettering Bug (Aerial Torpedo) Correspondence.

<sup>116</sup> Bion Arnold, main text of "Secret Report," 4.

<sup>117</sup> Bion Arnold, "Secret Report," Exhibit K.

<sup>118</sup> Bion Arnold, main text of "Secret Report," 5.

test insisting the problems of control could be fixed thereby enabling “the device to be handled with reasonable accuracy.” Insisting on his faith in the weapon, Arnold’s message declared “I believe this device has military value and that if it should be decided by the proper authorities that such is the case and that it is to be used, no time should be lost in getting it into production....” He requested the immediate production of seventy-five more devices for testing purposes while recommending that “steps be promptly taken for the placing of a contract for ten thousand to one hundred thousand....” of the Dayton-made automatic airplanes.<sup>119</sup>

General Squier responded to Arnold’s news of success in Dayton by writing immediately to the Army’s Chief of Staff. Squier explained the “aerial torpedo” weapon as an apparatus “designed fundamentally on the principles of the flying machine, suitable for carrying high explosives, gas, or other material, and to be operated mechanically and automatically, without the presence of a man.”<sup>120</sup> After detailing the work done so far to solve “practical problems” including a gyroscopic automatic control device, a proper motor, and an airframe fit for “quantity production, on a large scale” Squier proclaimed the weapon a revolutionary step in war making, writing:

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<sup>119</sup> Bion Arnold, main text of “Secret Report, 6.

<sup>120</sup> George Squier to Chief of Staff of the Army, “Automatic Carrier for the Signal Corps (Liberty Eagle),” October 5, 1918, 1, Exhibit F, Letter compiled in Bion Arnold Secret Report, Kettering University Archives.

the development of this new weapon, which has now demonstrated its practicability, marks an epoch in the evolution of artillery for war purposes, of the first magnitude, and comparable, for instance, with the invention of gun-powder in the fourteenth century. The development is not known to our Overseas Forces, nor to the Forces of our Allies, it comes as a distinct product of American genius, as applied to the present methods of warfare.

He recommended a General Staff committee investigate the weapon “with a view to its transfer to the proper War Department Agency for immediate quantity production.” He requested a more suitable proving ground be found for the weapon’s continued flight testing while advocating for the weapon’s immediate mass manufacture. He also advocated that U.S. forces overseas and Allied military commanders be immediately notified of “this new instrument of war” now officially codenamed the “Liberty Eagle.”<sup>121</sup>

Arnold and Squier’s recommendations to move into mass production were accepted and financial responsibility for the Dayton aerial torpedo shifted from the Department of Military Aeronautics to the Bureau of Aircraft Production.<sup>122</sup> Yet the production of the “Bug” as designers in Dayton increasingly called their pilotless airplane was cut short by the German surrender in November 1918. Some scholars have

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<sup>121</sup> Ibid, 3.

<sup>122</sup> Exhibit R, Bion Arnold Secret Report – img 9179

dismissed the significance of the Army's aerial torpedo work noting no weapons made it to combat and that only 25 devices were produced before the war. While only 25 complete machines were made, the hope for thousands of pilotless airplanes had pushed workers at the Dayton Wright Airplane Company and Dayton Metal Products Company into a short lived mass production effort that had made thousands of some component parts by war's end.<sup>123</sup> A tendency to dismissively interpret the weapon project as something "ahead of its time" ahistorically gestures towards a future of more capable weapons while dismissing the immense efforts put into the pilotless airplane during the First World War. The violent discursive imagination surrounding the device constructed by its makers and boosters has largely been overlooked. Yet, while the pilotless airplane never made it to war, the fantasies for its uses survived into the post-war years shaping popular attitudes about the next "war in the air."

. . .

Military officials and corporate engineers remained interested in the aerial torpedo project for years after the war's end. Testing of the two devices produced for the U.S. Army and Navy continued through 1919 and into the next decade. An attempted sale of one of the 25 existing "Bug" devices to the British Royal Air Force in the early

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<sup>123</sup> The U.S. Army reclaimed the Bug devices and component parts produced during the war. A complete registry of reclaimed materials shows many components had been made by the hundreds or thousands, see: "Parts for Aerial Bomber," June 6, 1919, Dayton Wright Airplane Company and Dayton Metal Products Company, Kettering University Archives, Charles Kettering Office Files: Topical, Kettering Aerial Torpedo: "Bug," Box 107, Folder Kettering Aerial Torpedo: "Bug" June 1919.

1920s incited a patent dispute between Charles Kettering and Elmer Sperry. Patent claims also pushed father and son Elmer and Lawrence Sperry into legal agreements for patent ownership over war technologies including the aerial torpedo. The two major state funded efforts to design and manufacture an aerial torpedo or pilotless airplane increasingly gained popular attention through the active publicization of the weapons by their makers and boosters.

In the post-war period Kettering's major financial interest in United Motors and control of significant subsidiaries like DELCO soared in value and societal influence following a post-war investment by the DuPont Corporation. Executives at Dupont, a chemical company and munitions producer, grew more interested in United Motors in significant part due to the car conglomerate's record of war production. Renamed "General Motors," Kettering served as corporate Vice President and head of research as the company grew into the largest industrial corporation in the world. Kettering's time as the so called "wizard of General Motors" saw him often share patent rights to major new machines and materials including home appliances like refrigerators, in-door "air conditioning," and leaded gasoline. These new consumer products reshaped peoples' lives even as their use poisoned the environment and motorists.<sup>124</sup>

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<sup>124</sup> David Rosner and Gerald Markowitz, "'A Gift of God'?: The Public Health Controversy over Leaded Gasoline during the 1920s," in eds. David Rosner and Gerald Markowitz, *Dying for Work: Workers' Safety and Health in Twentieth-Century America*, Indiana University Press, 1987; see also William J. Kovarik, "The Ethyl Controversy: How the News Media Set the Agenda for a Public

Even as Kettering turned to consumer products over war machines the pilotless airplane he helped devise gained popular attention. Though the “Bug” Kettering and others developed was self-directed without remote controls, a journalist writing for *Radio Broadcast* wrote about the possibility of applying radio control to the device.<sup>125</sup> Seeing radio-controlled airplanes as a “New Field for Radio” with utility for a future war in the air he quoted a recent speech given to the Franklin Institution by the Chief of the U.S. Army Air Service that claimed the Army “already had an ‘automatic pilot’ device which flies airplanes without anyone onboard” and suggested radio control was a short step away. The author quoted the Army Air Service Chief’s further predictions that “within a short time...” one would see “our military forces flying whole fleets of these planes, operated by a few men in a central control station.” Predicting fleets of remotely controlled airplanes the article quoted the Army Air Service General pronouncing the possibility that these “fleets could be maneuvered to carry on attack against enemy cities and military units.”<sup>126</sup> At the same Franklin Institution event, General George Squier stretched the plausible possibilities of the weapon even further

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Health Controversy Over Leaded Gasoline, 1924-1926,” PhD Dissertation, University of Maryland, 1993.

<sup>125</sup> D.C. Wilkerson, “New Fields for Radio: The Next War Will Be a ‘War in the Air’ – A consideration of the Possibilities that Radio Has Brought About,” *Radio Broadcast*, Vol. 6, No. 5, March 1925, Wright State University Archives, Family Papers of Charles Kettering, Box 16, File 13, 851-856.

<sup>126</sup> Major-General Mason M. Patrick, Chief of the U.S. Army Air Service, quoted by D.C. Wilkerson, “New Fields for Radio,” 853.

expressing his belief that “within a short time, ‘manless planes’ carrying sleep-producing gases sufficient to put to sleep a whole nation for forty-eight hours, could be sent into action as a means for stalemating war.”<sup>127</sup> These discussions of city bombing and gassing entire nations speak to the indiscriminate violence imagined for the weapon’s place in war. Squier’s softening of gas attacks to be just “sleep-producing gases” nonetheless suggested the feasibility of also using asphyxiating gases. His fantasy situation of inducing entire nations to sleep spoke less to the stalemated situation he suggested but rather evoked the creation of a defenseless target ripe for bombing.

Lawrence Sperry’s efforts testing the aerial torpedo and its control mechanisms for the U.S. military saw a mix of failure and success in the early 1920s. A final test in 1922 resulted in a demonstration of a remotely-controlled airplane dropping bombs on targets and flying back to its starting point without destroying itself but still faced reservations from evaluating officers who questioned the weapon’s feasibility.

One of Lawrence Sperry’s final flights in late-1923 was an effort to publicize aviation and the Sperry Company’s auto-pilot in England. He dropped leaflets from the sky overhead London advertising first for the Conservative candidate then the Labour candidate for Prime Minister. Shortly after this publicity stunt his plane crashed amidst an attempted solo-flight over the English Channel and he drowned.

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<sup>127</sup> Major-General George O. Squier, Chief Signal Officer of the Army Air Corp, quoted by D.C. Wilkerson, “New Fields for Radio,” 853.

Despite his death, Lawrence Sperry's ideas about the war machine he had devoted his life to lived on. A treatise he composed and distributed to aviation boosters within the U.S. military in the wake of the Navy's final rejection of his aerial torpedo in 1922 was read and later published by Army Air Officer Billy Mitchell. Mitchell had led all U.S. air combat units in France during World War I and gained infamy in the post-war years by lobbying for an independent U.S. Air Force through public efforts that antagonized other military leaders and led to his court martial in December 1925. Amidst the publicity of his courtmartial and campaign for an independent U.S. Air Force Mitchell turned to the aerial torpedo to bolster his claims for airpower's future.

Mitchell wrote an introduction for and posthumously published Lawrence Sperry's treatise on the aerial torpedo in the military aviation magazine *U.S. Air Services*. The article appeared in the January 1926 issue only a month after Mitchell's court martial trial concluded in his dismissal. Mitchell introduced Sperry as the aerial torpedo's "great developer" and claimed "every air power in the world today is spending a great deal of money and using a great deal of time in the development of this instrument" in an apparent effort to cite foreign investment in the aerial torpedo as proof the U.S. should do the same.<sup>128</sup>

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<sup>128</sup> Colonel William Mitchell, introduction "Lawrence Sperry and the Aerial Torpedo," to article "The Aerial Torpedo," Lawrence Sperry,

Lawrence Sperry's argument opened by citing the U.S. War Plans Division of the Air Service estimating high losses of flying personnel in the case of a future war like the First World War. He offered the aerial torpedo as a solution to these mortal anxieties. Lawrence claimed there had been "successfully operated by gyroscopic control an airplane in flight with all the reliability of a human pilot plus a mechanical methody and quickness which no human can hope to achieve." He recounted bombing target practices conducted by the aerial torpedo "under radio control" announcing his device "scored three bulls eyes on targets 60 miles distant" while relying on gyroscopic controls that "permits a plane to take off, turn, and return to the starting point." Lawrence claimed "Human pilots could do no more." His violent fantasy led readers to think "it is easy to imagine a fleet of these weapons, loaded with deadly gas or explosives, launched against an objective without endangering one human life of the side so employing them." Sperry pitched the aerial torpedo as a pilotless airplane remotely controlled from afar to mass bombard U.S. enemies in war.<sup>129</sup>

Not only a means of bombing, Lawrence pitched the aerial torpedo's use as a surveillance machine as an even greater potential saver of life and labor for the U.S. Air Services. He led readers to "consider the possibilities of automatic control as a substitute for a human pilot" then asserted "there are some missions that it can perform better than

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<sup>129</sup> Lawrence Sperry, "The Aerial Torpedo," with introduction "Lawrence Sperry and the Aerial Torpedo," Colonel William Mitchell, *U.S. Air Services*, Vol. 11, January 1926, National Air and Space Museum, Technical Reference Files and Libraries, Lawrence Sperry Documents, Folder 1.

the manned planes, thus releasing for other duties a great many human pilots." This especially applied to photography as he foresaw the aerial torpedo "eliminating the exposure of the photographer, and it would be possible to make a close-up of an important enemy fortification without risk of human life."<sup>130</sup>

All Lawrence Sperry's predictions for the aerial torpedo's uses in future war seem visionary. Yet they were a long stretch of the limited capabilities within then existing technologies. The need for line of sight in the direction of a remote-controlled airplane alongside short range of radio control necessitated an accompanying piloted airplane to control mechanisms and operating crews. Similar to other air theorists of the time, including Mitchell and Italian air theorist Giulio Douhet, Sperry ignored the likelihood of bombing victims defending against air bombings and shooting down the attacking war machines flying overhead.

Military figures prone to fantastic exaggerations of the pilotless airplane's capabilities in public pronouncements helped sustain interest in the weapon during the interwar period. During the 1930s in the U.S. and Britain, remotely controlled airplanes found wide use as targets to be shot down in training exercises for Naval gunners and fighter pilots. The primary vision of the pilotless airplane's use for city bombing remained a fantasy until the Second World War when key figures including Kettering and "Hap" Arnold again pushed for the weapon. By 1940, their influence had increased

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<sup>130</sup> Ibid.

as Kettering was Vice President of General Motors and Hap Arnold rose to be the Commanding General of the Army Air Force, high positions that enabled them to again animate the pilotless airplane. During the Second World War the long-fantasized use of the pilotless airplane as a weapon of indiscriminate mass destruction would be realized in bombing raids against German cities.

## Harvesting Militant Brainpower: The U.S. National Inventors Council and Push-Button Violence During the Second World War Era



Figure 5: Newspaper cartoons publicizing the U.S. National Inventors Council signaled the institution's desire for the public to imagine "new ideas" for destructive war technologies. Council members' violent fantasies of chemical formulas entertained the macabrely suicidal idea of blowing up the whole world.<sup>1</sup>

General Electric's head of research and development William D. Coolidge joined the editor of popular magazine *Science Service* Watson Davis on his radio broadcast *Adventures in Science* two months into the United States' belligerency in the

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<sup>1</sup> National Inventors Council Cartoons, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council General Subject File, 1940-1972, Box 1, Folder: Cartoons.

second world war. Coolidge used his guest appearance on the popular radio show to promote the U.S. National Inventors Council, a recently created government agency on which he and Davis both served. Coolidge spoke to the WABC listening audience about harnessing the nation's "man power," "productive power," and a less recognized militant resource: "brain power."

Victory in modern war requires an all-out effort of a whole nation, the mobilization of all its resources. If, in this war, the victory on which we are resolved is to be won with the minimum sacrifice of blood and treasure, we must bring all our national resources to bear. Those resources include not only man power and productive power, but also brain power, and an important exercise of brain power is invention. As a nation, we have always been blessed with a high degree of inventiveness, as typified in the traditional 'Connecticut Yankee.' If the inventive brains of the nation can be brought to bear effectively on our war problems, we shall have mobilized an asset of great potential value. The more highly mechanized war becomes, the more numerous and complicated are the technical problems, and the greater the opportunity for invention.<sup>2</sup>

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<sup>2</sup> William Coolidge, "Adventures in Science with Watson Davis," radio address by guest William Coolidge, script, Columbia Broadcasting System, Washington D.C., WJSV and WABC, February 7, 1942, Smithsonian Institutional Archives, Box 388, Folder: "Adventures in Science—February 7, 1942 Dr. Wm. D. Coolidge."

Coolidge encouraged the listening audience to exercise their “brain power” by submitting an invention to aid the U.S. war effort. Wrapping his pitch in the rhetoric of American technological exceptionalism down to the trope of the Connecticut Yankee, the GE executive’s speech was one message amidst a torrent of propaganda created by members of the U.S. National Inventors Council’s public relations staff. Articles in newspapers, academic journals, and popular magazines, accompanied newsreel films and radio broadcasts like Coolidge’s, all encouraging audiences to “Invent for Victory” in one way or another.

The U.S. government’s open call for war materiel stimulated violent imaginings in people from around the world. Despite the nationalistic name and rhetoric of the U.S. National Inventors Council, by the time Coolidge’s message beamed out from radios a year and a half into the Council’s existence it had already received blueprints and weapon descriptions from many people living in the world outside the United States. Russian émigrés to Brazil, New Zealanders, Brits, Frenchmen, and other non-Yankees learned of the U.S. government’s call for war inventions and mailed in their ideas for war materiel to the Department of Commerce. The supposedly “national” inventors council turned out a transnational endeavor.

Coolidge’s jingoist invocation of the “Connecticut Yankee” as exemplar of the American scientific genius he hoped would invent for victory held another irony. At the climax of Mark Twain’s 1889 satire, *A Connecticut Yankee in King Arthur’s Court*, the

protagonist, a time-travelling engineer mysteriously transported from a late-nineteenth century Connecticut machine-shop to mythic Camelot, winds up destroying the ancient world he had attempted to modernize. A lampoon of romanticist pining for ancient times while also a warning of the violent catastrophes enabled by late-nineteenth century technologies, the climactic horror in Twain's tale was an immense explosive destruction wrought by simple push-button.<sup>3</sup> This search for war machines capable of simplifying and distancing bombing's violence to something enabled through push-button was among the types of weaponry most valued by leaders of the National Inventors Council like Charles Kettering, whose designs for a "robot airplane" through General Motors Research labs preceded then coalesced with his work as chair of the Council and its "Remotely Controlled Devices" subcommittee.

Scholars have extensively analyzed why airplanes and aerial bombing became a preferred means of killing amidst a succession of wars raged between 1936 and 1946 that formed humanity's deadliest decade. Aiming to explain the immense embrace of air bombing during the second world war some historians point to transnationally circulated discourses that emanated from European and U.S. military strategists. Other scholars more explicitly examine the practices of aerial bombing imposed by European

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<sup>3</sup> In the novel's final battle pitting the protagonists' band of teenaged soldiers against the Armies of Camelot the decisive weapon is an immense explosion detonated through distant, supposedly safe, push-button: "We shan't have to leave our fortress, now, when we want to blow up civilization." ... "I touched a button, and shook the bones of England loose from her spine!" Mark Twain, *A Connecticut Yankee in King Arthur's Court*, 1889, 256, 263.

colonial regimes in spaces like British “Arabia” especially Iraq, the Italian invasion of Ethiopia, German air bombing in support of Franco amidst the Spanish Civil War, and other violent moments that formed military actors’ thinking on “airpower” in the 1920s-1930s.<sup>4</sup>

Yet, the significance of the “drone” during the second world war for airpower is often overlooked or misunderstood in much existing historiography. Texts that remain key to forming a critical cultural and intellectual history of United States aerial bombing like Michael Sherry’s *The Rise of American Air Power: The Creation of Armageddon* did not recognize the place of remotely controlled airplanes within the second world war and only treated the pursuit of a “manless Air Force” as a post-war endeavor.<sup>5</sup> New longue-durée studies of air bombing still treat “drones” as twenty-first century devices rather than old relics.<sup>6</sup> New and old work by scholars and popular writers have detailed a succession of flying objects deployed in 20th century wars that too often construct

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<sup>4</sup> Richard Overy, *The Bombing War: Europe 1939-1945*, Penguin Books, 2013; Thomas Hippler, *Governing From The Skies: A Global History of Aerial Bombing*, Verso Books, 2017; 19); Michael Sherry, *The Rise of American Air Power: The Creation of Armageddon*, Yale, 1987, Chs. 2-4; Russel F. Weigley, *The American Way of War: A History of United States Military Strategy and Policy*, Indiana, 1973; Priya Satia, *Spies in Arabia: The Great War and the Cultural Foundations of Britain’s Covert Empire in the Middle East*, Oxford, 2008, pgs. 253-254, 333; Priya Satia, “The Defense of Inhumanity: Air Control and the British Idea of Arabia,” *The American Historical Review*, Vol. 111, No. 1, February 2006, pp. 16-51, 42-43.

<sup>5</sup> Sherry recognized a late-war interest in automating air war for future wars among U.S. military commanders like Henry Arnold but did not analyze the general’s war-time pursuit of such technology. Sherry, *The Rise of American Airpower*, pg. 186-187.

<sup>6</sup> See Hippler, *Governing From The Skies*, which only deals with drones as contemporary devices in a final chapter on bombing in the 21st century.

teleological tales triumphing technological “evolutions” across time, space, and historical actors thereby simplifying what was really a contingent process of disparate developments in the making of missiles and “robot” airplanes.<sup>7</sup> Scholarship that analyzes the figure of the “drone” as a distinct discursive shift in weaponry emerging in the late-1930s fails to adequately recognize how older ideas from the first world war concerning devices termed “aerial torpedoes” and “pilotless airplanes” still figured in historical actors’ thinking as they lent meaning to devices dubbed a “drone” during the war.<sup>8</sup> It is time, I think, to re-examine received wisdom about the relatively new nature of the drone within the history of U.S. war-making and begin to consider how long the technology has played roles in the actual violence of fashioning an American empire in the world.<sup>9</sup>

This chapter seeks to interrogate the violent fantasies of lay-inventors, pre-eminent strategists, and corporate materiel producers who pursued the idea of automating aerial bombardment with weapons that operated automatically or through push-button during the second world war. It does not aim for a comprehensive history

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<sup>7</sup> Kenneth P. Werrell, *The Evolution of the Cruise Missile*, Air University Press, 1985; H.R. Everett, *Unmanned Systems of World Wars I and II*, MIT Press, 2015.

<sup>8</sup> Katherine Chandler, *Unmanning: How Humans, Machines, and Media Perform Drone Warfare*, Rutgers University Press, 2020.

<sup>9</sup> Anders Stephanson, “A Most Interesting Empire,” in *The New American Empire: A 21st Century Teach-In on U.S. Foreign Policy*, ed. Lloyd C. Gardner and Marilyn Young, *The New Press*, 2005, 253-275; Ruth Oldenziel, “Islands: The United States as Networked Empire,” in *Entangled Geographies. Empire and Technopolitics in the Global Cold War*, ed. Gabrielle Hecht, Cambridge University Press, 2011, 13-42.

of all pilotless airplane, drone, or missile technology developed during the war but instead seeks a better understanding of how the pilotless airplane emerged as a bombing weapon. Independent inventors working outside military institutions as well as military officers and corporate engineers all imagined the “aerial torpedo” or “pilotless airplane” a means to revolutionize war’s violence. The recently declassified records of the United States National Inventors Council offer a new archive to analyze the warfare state of World War II America.<sup>10</sup> An agency headed by members of the nation’s technological intelligentsia drawn from academia, industry, and the military, the National Inventors Council hailed the civilian population of the U.S. and the world to “Invent for Victory.” Drawing hundreds of thousands of submissions from people around the world who devised war machines, medicines, and an array of materiel needs, the National Inventors Council placed particular interest upon “Remote Control Devices,” particularly “robot airplanes.” The violent imaginations of civilian inventors inside and outside the U.S. as expressed in submissions to the Council influenced the development work of weapon makers and the strategic thinking of military commanders who were among the first to deploy “robots” in war.

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<sup>10</sup> The National Inventors Council’s records were first made available at the U.S. National Archives and Records Administration in 2011 after decades of successive classification by the Department of Commerce.

The classification of the National Inventors Council's records by the U.S. Department of Commerce until 2011 presents problems and possibilities for the construction of the agency's history. Little historiography focusing on the U.S. National Inventors Council exists.<sup>11</sup> Approaching the Council's still unprocessed archives from the 1940s in the 21<sup>st</sup> century presented a methodological question at the outset: how does one synthesize and narrate the disparate experiences of historical actors ranging from Council chairmen, staff, and the thousands of independent inventors who mailed in a design for war? A comprehensive analysis of the U.S. National Inventors Council's war work is beyond the scope of this study. But a survey of the Council's creation and operation as the U.S. approached and entered war is necessary before turning to an investigation of how significant the pursuit of "robot airplanes" was to Council leaders and the lay-technologists from around the world who tried to invent for victory.

The successful effort to create a National Inventors Council within the U.S. government began through the boosterism of Lawrence Langner, an international patent attorney, and co-founder of the Theatre Guild in New York City. A socially and professionally distinguished British-American émigré, Langner served as an advisor on

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<sup>11</sup> Among the few existing studies that analyze the National Inventors Council are: Stuart W. Leslie, *Boss Kettering: Wizard of General Motors*, Columbia, 1983, Ch. 12: World War II, 296-313. Leslie only had newspaper records to draw from due to the inaccessibility of council records which led to false conclusions in his analysis. A more recent study of the National Inventors Council can be found in, Eric S. Hintz, *American Independent Inventors in An Era of Corporate R&D*, Ch. 6 "Invent for Victory," MIT University Press, 2021, 169-206.

patent law to the Woodrow Wilson administration amidst the drafting of the Treaty of Versailles at the cessation of the first world war, then worked for decades aiding European inventors secure U.S. patents and assisting Americans obtain patent rights in Europe. Passionate about the theatre alongside patent law, Langner and his wife Armina Marshall, a playwright and actress, worked with their high-society friends on New York City's Theatre Guild production company helping stage significant dramatic works of the early twentieth century including Czech writer Karel Čapek's R.U.M. (Rossumovi Univerzální Roboti, or Rossum's Universal Robots) the dramatic work accredited with introducing the word "robot" to the English language and science fiction writing.<sup>12</sup>

Appointed the Secretary of the National Advisory Council to the U.S. House Committee on Patents in the late 1930s, Langner claimed in Senate testimony that after 35 years of practicing international patent law he was convinced Americans possessed an exceptional capacity for technological ingenuity. Comparing European inventiveness to that of Americans, he insisted "I have noted that, while we can get relatively few patents that are good from the other side, there go out of this country numerous relatively fine inventions, so I felt that we should have a body – I might say, I thought it was a possibility – that there should be a body which represents, so to speak, an open door for

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<sup>12</sup> Ace G. Pilkington, *Science Fiction and Futurism: Their Terms and Ideas*, Macmillan & Company, 2017, pg. 5, 78; Norman Nadel, "Theatre Guild" entry in *The Columbia Encyclopedia to Modern Drama*, ed. Gabrielle H. Cody and Evert Sprinchorn, Columbia, 2007; Lawrence Langner, *The Magic Curtain: The Story of A Life in Two Fields, Theatre and Invention*, Dutton, 1951.

the American inventor and which would take care of him and get his ideas to work on inventions for national defense.”<sup>13</sup>

In mid-May 1940, amidst the German invasion of Belgium and France, Langner wrote to President Franklin D. Roosevelt proposing an “Inventions Council for National Defense” that would “mobilize for the purpose of national defense the inventive genius of the United States.” The proposal Langner mailed the President argued that “It must be remembered that the inventions which are now making possible the terrible slaughter in Europe were mostly of American origin, namely, the airplane, submarine, torpedo, machine gun, armored battleship, and so forth.” He insisted “The European situation is sufficiently alarming to make responsible persons in this country realize that we, ourselves, must be fully prepared defensively to meet aggression, as well as so-called fifth-column activities.” Langner thought that “By mobilizing the inventive talents of America at this time for purposes of national defense we shall be in a position to put our best minds to work on the problems of defense against the new weapons and methods of destruction developed during this European war.”<sup>14</sup> Referring to the U.S. Naval Consulting Board created during the first world war, he reminded the President “A

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<sup>13</sup> Lawrence Langner, January 19, 1942, testimony before National Inventors and Engineers Commission: Hearing before a Subcommittee of the Committee on Military Affairs United States Senate, Seventy-Seventh Congress, Second Session, U.S. G.P.O., HeinOnline.

<sup>14</sup> Lawrence Langner to The President of the United States, May 14, 1940, letter entered into U.S. Congressional Record, National Inventors and Engineers Commission: Hearing before a Subcommittee of the Committee on Military Affairs United States Senate, Seventy-Seventh Congress, Second Session, U.S. G.P.O., 1942, HeinOnline.

council of this type was formed during the last war, but my position is that we should not wait for a war before mobilizing the inventive genius of America to meet problems of national defense at this time.”<sup>15</sup>

A day after writing the President, Langner wrote to the U.S. Commissioner of Patents Conway P. Coe suggesting he head up an “Inventors’ Council.” He hoped the new government agency could “mobilize our inventors for the defense of the United States... to ‘out-invent’ the inventors of any other country whose forces attempt to invade these shores.” Langner spoke more candidly with his associate Coe than the President. He summarized in his letter a phone conversation he had just had with Thomas Midgley, a General Motors research chemist and corporate officer. Langner claimed Midgley “...agrees with me about this particular emergency. He also feels with me that most of the great inventions of war value were made by civilian inventors, and that it should be possible to weld immediately all the scientific organizations of the country into a body which would cooperate with you in this regard.” Langner relayed that Midgley was willing to “drop everything else he is working on to cooperate...” with the creation of a national inventors council and insisted the matter “should be given immediate consideration.” Langer concluded his letter to Patent Commissioner Coe writing “Mr. Midgley and I will be glad to meet you in Washington” where he hoped

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<sup>15</sup> Ibid.

they could begin reaching out to the members of “the organization of scientific bodies which supported the Patent Office at the recent sesquicentennial dinner....”<sup>16</sup>

The recent celebration for the 150<sup>th</sup> anniversary of U.S. patent law had gathered engineers and scientists from around the United States and the world for a gala event in Washington D.C. Government officials and luminary inventors made speeches at the event, but all attendees took an audience seat to listen to the final talk, and only address that was radio broadcasted, by General Motors head of research and corporate vice-president Charles Kettering.<sup>17</sup> Kettering’s name appeared on over 100 U.S. patents by 1940. He had designed National Cash Register’s first electric cash registers, made Cadillac’s first electric transmission “self-starters” that eliminated the need for motorists to hand-crank their engines, and held intellectual property rights to advances made in consumer appliances for refrigeration, air conditioning, and indoor heating. Chemists like Thomas Midgley that had worked under “Boss” Kettering at the General Motors Research Corporation, the umbrella subsidiary overseeing the corporation’s many research divisions, often jointly filed patent applications with Kettering and their employer’s legal representatives. This included designs for tetra-ethyl-leaded gasoline

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<sup>16</sup> Lawrence Langner to Conway P. Coe, May 15, 1940, letter entered into U.S. Congressional Record, National Inventors and Engineers Commission: Hearing before a Subcommittee of the Committee on Military Affairs United States Senate, Seventy-Seventh Congress, Second Session, U.S. G.P.O., 1942, HeinOnline.

<sup>17</sup> United States Patent Law Sesquicentennial Celebration: A Record of the Proceedings Commemorating the One Hundred and Fiftieth Anniversary of the Signing of the First United States Patent Law, 1790, April Ten, 1940.

and early chlorofluorocarbons like “Freon” that proved extremely lucrative as consumer products yet harmful to the health of people and the planet.<sup>18</sup> Midgley’s invocation of the inventive genius gathered at the Patent Commission’s recent anniversary celebration suggested a selection of scientists were available for a new national institution while implicitly suggesting his associate Kettering might also be interested in a national inventors council.

A day after Langner wrote Patent Commissioner Coe, Coe replied to the patent attorney’s proposition for an inventors’ council with his positive reception to the idea. Coe proposed Langner and Midgley meet him in Washington D.C. where they could also meet with Dr. Vannevar Bush, president of the Carnegie Institution and head of the National Advisory Committee for Aeronautics, whose “official connection and familiarity with an organization closely identified with the national defense would seem to make his participation very helpful.”<sup>19</sup>

Conversations about a national inventors council carried on between Langner, Midgley, Bush, and Commerce Secretary Harry Hopkins over the early summer months

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<sup>18</sup> David Rosner and Gerald Markowitz, “‘A Gift from God’?: The Public Health Controversy over Leaded Gasoline during the 1920s,” and William Graebner, “Hegemony through Science: Information Engineering and Lead Toxicology, 1925-1964, both in *Dying for Work: Workers’ Safety and Health in Twentieth-Century America*, ed. David Rosner and Gerald Markowitz, Indiana, 1989. For a biographical study of Kettering’s history as an inventor, see Stuart Leslie, *Boss Kettering*.

<sup>19</sup> Conway Coe to Lawrence Langner, May 16, 1940, letter entered into U.S. Congressional Record, National Inventors and Engineers Commission: Hearing before a Subcommittee of the Committee on Military Affairs United States Senate, Seventy-Seventh Congress, Second Session, U.S. G.P.O., 1942, HeinOnline.

of 1940.<sup>20</sup> By July 11, 1940, Commerce Secretary Hopkins wrote Charles Kettering requesting he lead the National Inventors Council “With the object of stimulating inventions by members of our civilian population and subsequently to evaluate these in relation to national defense....” Hopkins explained “It is planned that the National Inventors Council shall function in close constant collaboration with the military and naval branches of the Government, bringing to their attention all such discoveries and mechanisms as appear to have defensive value.” In his request to Kettering, Commerce Secretary Hopkins promised his personal active cooperation with the council’s technical work, to provide funds for a clerical staff, and to allocate office facilities for the Council’s staff within the Department of Commerce building along the D.C. mall. Commerce Secretary Hopkins asked the corporate leader and scientist Kettering to form the Council’s membership from “outstanding American inventors and businessmen having experience in the development and utilization of inventions” who were to serve on the Council without compensation. Concluding his message, Hopkins wrote “I feel that in the present exigency, as never before in the life of this country, we should muster American inventive genius in the cause of national welfare, defense and security.”<sup>21</sup>

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<sup>20</sup> Administrative History of the National Inventors Council, 1946, Department of Commerce, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council: General Subject File, 1940-1972, Box 1, Folder: Administrative History, 1946, pg. 2.

<sup>21</sup> Harry Hopkins to Charles Kettering, July 11, 1940, letter entered into U.S. Congressional Record, National Inventors and Engineers Commission: Hearing before a Subcommittee of the

President Roosevelt approved Commerce Secretary Hopkins's creation of the National Inventors Council as a war "preparedness" measure in August 1940. The codification of a national inventions board in U.S. state policy came amidst a series of emergent global conflicts referred to as the second world war. Already by late-summer 1940, the German and Italian militaries had intervened in the Spanish Civil War supporting Francisco Franco's regime, Japanese soldiers had violently expanded their empire's occupation of China and Southeast Asia, Italian forces attacked Ethiopia, Libya, and Egypt, while the German military was bombing Britain and occupying spaces in Europe and North Africa. The Council's creation at this moment – still eight months prior to more studied preparedness measure like the Lend-Lease Act and more than a year before the U.S. declaration of war - signaled the importance placed on creating an avenue between the state and the public that could gear would-be inventors' minds towards the wars engulfing the world.

The founding members of the National Inventors Council devised the form of their new agency in late-1940. Council chair Kettering and secretary Langner claimed to draw inspiration from the first world war's Naval Consulting Board. Luminary scientists from industry, academia, and the military were asked to serve as chairmen of

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Committee on Military Affairs United States Senate, Seventy-Seventh Congress, Second Session, U.S. G.P.O., 1942, HeinOnline.

technical subcommittees focused on an aspect of war materiel relevant to their respective expertise.<sup>22</sup> Engineers, physicists, and chemists were recruited to work as the Council's technical staff. Clerical workers were hired to sort submissions mailed to the Council's offices. Publicity writers began producing propaganda and public relations materials in newspapers, radio broadcasts, and science publications. The quick arrival of foreign language submissions necessitated adding translators to the Council's staff.<sup>23</sup>

Twelve subcategories of war materiel including but not limited to ordnance and firearms, land transportation and armored vehicles, aircraft and aeronautics, and naval warfare were among the broad categories of war's materiality around which Council members formed analytical technical committees. Technical subcommittee #4, focused on "Remote Control Devices" and led by Kettering, stands out as a less-established

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<sup>22</sup> Many people in the initial group nominated by Commerce Secretary Hopkins to President Roosevelt in August 1940 for membership in the National Inventors Council served in support capacities without chairing a technical subcommittee. For instance, National Advisory Committee for Aeronautics official Hugh L. Dryden was among the initial Council membership list but did not chair a subcommittee instead working as a technical liaison to the Council who analyzed promising designs concerning aircraft and aeronautics. Orville Wright was also included on the Council's initial member list, but he rarely attended Council meetings and primarily assisted the Council by publicizing its work in radio broadcasts. Membership turnover was common across the Council's 30 year history leading to new representatives from different corporations, universities, or military branches. For the initial list of nominees to the US National Inventors Council, see: Harry Hopkins to Franklin Roosevelt, Letter, August 26, 1940, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council: General Subject File, 1940-1972, Box 1, Kettering, Dr. C. F. Correspondence Folder.

<sup>23</sup> Administrative History of the National Inventors Council, 1946, pg. 4.

component of war materiel than all the other categories raising the question of why such significance was placed on remote control technology by those leading the Council.

No.	Technical Subcommittee	Chairman	Chairman Affiliation
1	Ordnance & Firearms	William H. Tschappat	14 <sup>th</sup> Chief of Ordnance, U.S. Army (Retired)
2	Land Transportation and Armored Vehicles	Fred Zeder	Vice President, Chrysler Corporation
3	Aircraft & Aeronautics	George Lewis	Director of Aeronautical Research, U.S. Navy
4	Remote Control Devices	Charles Kettering	Vice President, Director of Research Laboratory, General Motors Corporation
5	Geometrical & Optical Instruments	William D. Coolidge	Director of Research Laboratory, General Electric Company
6	Naval Warfare	George W. Codrington	General Manager, Diesel Engine Division, General Motors Corporation
7	Signals and Communications	William D. Coolidge	Director of Research Laboratory, General Electric Company
8	Chemicals & Chemical Warfare	Fin Sparre	Director of Development, DuPont Corporation
9	Mechanical Power Plants and Internal Combustion Engines	Charles Kettering	Vice President, Director of Research Laboratory, General Motors Corporation
10	Metals and Metallurgy	Webster N. Jones	Director, College of Engineering & Science, Carnegie Institute of Technology
11	Building Structures, Fortifications and Camouflage	Frederick M. Feiker	Dean, School of Engineering, George Washington University
12	Clothing, Sanitation, Health & Commissariat	Watson Davis	<i>Science Service</i> editor

Figure 6. U.S. National Inventors Council Subcommittees and Chairmen, 1941.<sup>24</sup>

<sup>24</sup> Members of Technical Committees of National Inventors Council, August 1, 1941, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and

A year before President Roosevelt confirmed Charles Kettering to preside over the National Inventors Council, Kettering had begun revitalizing the war weapon he first developed in 1918. Kettering wrote his longtime friend turned Commanding General of the U.S. Army Air Force Henry Harley “Hap” Arnold in September 1939 inquiring what had come of “aerial torpedoes” since the “last war.”<sup>25</sup> Kettering and Arnold’s interest in making an “aerial torpedo” or “pilotless airplane” extended back to the first world war. Kettering had helped design a small aircraft meant to fly explosives or poison gas across the trench lines of Europe while Arnold had supported the project from his high position in the U.S. Army Air Service. Officially known as the “Liberty Eagle,” but nicknamed the “Bug,” the small aircraft had entered mass production in October 1918 but went unused following the November armistice. As war gripped the world in 1939 Kettering and Arnold again pondered the violent utility of their dream weapon from the “last war.”

Arnold responded to Kettering’s inquiry about what developments had been made with the “aerial torpedo” since the early 1920s with a lengthy analysis of the development work conducted by the U.S. Army and Navy with remote controlled

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Technology, National Inventors Council: General Subject File, 1940-1972, Box 1, Folder: Committees & Procedures for Committees.

<sup>25</sup> Henry Arnold to Charles Kettering, letter, November 3, 1939, pg. 1, National Air and Space Museum, Technical Reference Files, Folder: Kettering Bug (Aerial Torpedo) – Development.

airplanes.<sup>26</sup> Arnold explained that Army engineers continued experimenting into the early 1920s with the weapon Kettering helped develop during the first world war. Army personnel installed radio-wave based remote-controls onto Kettering's device to improve the flying patterns of his pilotless airplane originally guided in 1918 only by "purely mechanical" direction "independent of ground control." Even with the aid of remote control, this early experimentation's best flight test spanned 16 miles, 4 miles short of the 20-mile requisition for the project that aimed to outrange artillery gun fire.<sup>27</sup>

Arnold then bemoaned the lack of success developing an aerial-torpedo despite a decade and a half of the Army's "spasmodic attempts" to design a low-cost radio-control equipment for use with remote-controlled airplanes. Disappointed with results from the Army's laboratories, he directed that Army Air Force personnel "canvass the entire industry with proposals." The Army Air Force general hoped some "enterprising designer" might design a cheap plastic airplane suitable for mass production at a unit cost of \$700. But as work progressed "questions of patent rights and other legal difficulties" paused all development. Only aerial targets – obsolete airplanes retrofitted with remote controls and shot down as targets in anti-aircraft training – had proven useable by the Navy. Despite the high cost of \$10,000 per radio control equipment used in these devices, an advisory board representing the Artillery and Air Corps

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<sup>26</sup> Ibid, pg. 2.

<sup>27</sup> Ibid, pg. 2.

recommended the procurement of the technology “on a fairly large scale at the earliest possible date.” Shifting from radio control’s use for aerial targets used in training exercises to the possibility of an aerial torpedo used for bombing an enemy, Arnold insisted to Kettering that “I am convinced that we must continue the development of this weapon; however, we must harness our research efforts to definite military objectives.” He then detailed the “Military Characteristics” desired for the device with short descriptions of the mission’s aim, desired aircraft structure, and expected control equipment capabilities that should inform any research and development work Kettering and the General Motors research labs might undertake.<sup>28</sup>

This conversation between one of the United States’ most powerful military officers and a director of the world’s largest industrial corporation hints at the two men’s close relationship and long-shared hope to make remote controlled airplanes a useable bombing weapon for air war. It demonstrates Kettering’s efforts to revitalize the aerial torpedo pre-dated the beginning of the National Inventors Council by nearly a year and surely shaped his interest in the government agency’s work as he presided over the Council and its remote control devices committee. His initiation of a second “Bug” in 1939 meant that by the time he began analyzing lay-inventors’ submissions to the National Inventors Council’s Remote Control Devices subcommittee in the Fall of

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<sup>28</sup> Ibid, pg. 2-3.

1940 he was in position to learn from others' ideas about the type of apparatus he was actively designing for the U.S. Army.

The National Inventors Council not only functioned as an evaluative board, but also as a significant psychological tool that geared hundreds of thousands of minds towards the Allied war effort. Out of the torrent of ideas submitted to the Council from people around the world during the second world war only a small fraction of militant imaginings proved useful and entered production. But lay-inventors' attempts to aid the Allied war effort through their brainpower revealed an array of motivating fantasies and anxieties. Some civilian submitters hoped to avoid the draft by designing a useful weapon of war.<sup>29</sup> Others sought the payment promised by the Council for useable devices granted a government contract.<sup>30</sup> Refugees in war-torn countries attempted to trade weapon designs for the right to immigrate to the U.S.<sup>31</sup> One woman who lost her son in a submarine attack wrote a grief-ridden proposal for a netting strung across the Atlantic Ocean which she hoped might spare other mothers the sorrow she felt for her dead son.<sup>32</sup>

The bulk of the Council's labor was performed by the clerical workers who organized incoming mail and the Council's subsidiary technical staff who graded lay-

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<sup>29</sup> Administrative history, pg. 14

<sup>30</sup> Administrative history, pg. 14, claims "A few inventors simply wanted money."

<sup>31</sup> Administrative History, pg. 12-14

<sup>32</sup> Administrative History, pg. 13-14.

inventors' submissions along an 'A' to 'F' scale.<sup>33</sup> All 'A' and 'B' designs were considered of potential value and forwarded to the chairman of the relevant technical subcommittee who analyzed the submission's feasibility then presented designs seeming worthwhile at the Council's meetings for additional group analysis. The designs that made it through this evaluative process were finally forwarded by Council staff to technical experts at another part of the U.S. government – engineering branches of the Army and Navy, the National Advisory Committee for Aeronautics, the National Defense Research Committee, and the Office of Scientific Research and Development, among other agencies – for further review to determine the design's potential for production and use on war fronts.

Enemy efforts also spurred action from Council members. Early in the Council's formation, Langner clipped a quoted speech from the *New York Times* by Adolf Hitler on the importance of German civilians turning their minds to imagine war technology and circulated the text to council members as proof that what made strategic sense to the Nazis must be embraced by the U.S.<sup>34</sup> Similar efforts by Japan's military leaders to draw

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<sup>33</sup> The NIC standardized its review process through a universal review form. Particularly useful examples of the review process can be found in the NIC Administrative History, pgs. 16-18, and in National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology National Inventors Council General Subject File, 1940-1972, Box 4, Folder: Evaluation of Inventions.

<sup>34</sup> Lawrence Langner to Members of the National Inventors Council, December 11, 1940, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology National Inventors Council General Subject File, 1940-1972, Box 1, Member Correspondence, Folder: Mauborgne, Joseph O. (Gen.)

the Japanese populace into generating war-material for their nation's military also captured NIC members' attentions, though commentary on Japan's capabilities were often accompanied by racialized discourse that self-assuredly dismissed the possibilities of the Japanese people's technological brilliance.

The "National" Inventors Council turned out a misnomer for the U.S. government agency. Despite the prevalence of rhetoric in Council propaganda exceptionalizing "American" or "Yankee" ingenuity, people from around the world mailed in their scientific and technological imaginings to the Council. Council propaganda reached international audiences through U.S. publications with global readerships like the *New York Times*, *Readers Digest*, *Popular Science*, and *Saturday Evening Post*.<sup>35</sup> Articles in academic journals including the *Journal of Applied Physics* and *Electrical Engineering* solicited designs for war technologies from trained scientists inside and outside the United States.<sup>36</sup> Latin America emerged as a key space for wartime U.S. propaganda efforts attempting to counter Axis influence. Articles detailing the National Inventors Council's work while requesting Spanish language submissions appeared in magazines like *En Guardia: para la defensa de las Americas*, a publication produced by the

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<sup>35</sup> For a list of NIC publicity articles, see: "National Inventors Council Publicity File Index," National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology National Inventors Council General Subject File, 1940-1972, Box 6, Folder "NIC Publicity File Index."

<sup>36</sup> Ibid.

John D. Rockefeller Jr. led U.S. Office of the Coordinator of Inter-American Affairs."<sup>37</sup>

Before the United States' formal declaration of war, the Council's propaganda campaign to "Invent for Victory!" had engaged distant public spheres, drawing blueprints from technologists living in Latin America, Europe, Polynesia, and many other spaces outside the U.S.

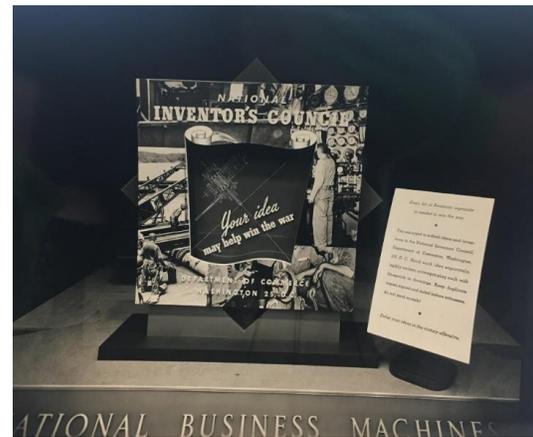
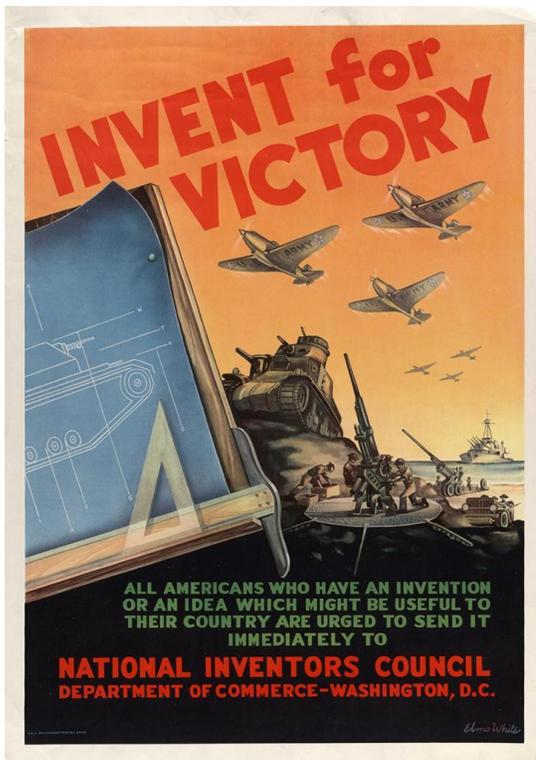


Figure 7. Council publicity included mass produced war posters urging the public to "Invent for Victory" and installations at workplaces like this display at the International Business Machines (IBM) New York City headquarters.<sup>38</sup> The U.S. Office of the Coordinator of Inter-

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<sup>37</sup> *En Guardia: Para la defensa de las Americas*, Year 3, No. 4, pg. 30, Records of the National Institute of Standards and Technology, National Inventors Council: General Subject File, 1940-1972, Box 6, Folder: Publicity 1941.

<sup>38</sup> National Inventors Council display at IBM, Display and Exhibit Department, International Business Machines Corporation, Madison Avenue, New York City, 7/20/44, National Archives

American Affairs published magazines like *En Guardia: para la defensa de las Americas* to popularize the Allied War effort in Latin America. This clipping from an *En Guardia* article on the National Inventors Council emphasized staff member Leonora Kuhn's work translating Spanish language submissions.<sup>39</sup> Council staff members Mildred Steinmetz and E.E. Smith are depicted sorting mail in early 1942 "when the ideas poured in" following the U.S. declaration of war.<sup>40</sup>



Many listed problems pointed to the difficulties involved in waging the air war so enthusiastically embraced by the United States. Desires for a "simple, practical and accurate field method of measuring the moisture content of oxygen" in the oxygen containers aviators used to breathe suggested the complications of keeping aviators alive while flying-high at low-oxygen altitudes; whereas the need for "A liquid or paste good for at least 12 hours' service which will prevent the formation of ice on airplane

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and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council: General Subject File, 1940-1972, Box 4, Folder: Photographs.

<sup>39</sup> *En Guardia*, pg. 30.

<sup>40</sup> "National Inventors Council in 1942 when the ideas poured in," National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council: General Subject File, 1940-1972, Box 4, Folder: Photographs.

surfaces” emphasized the environmental hazards encountered during high-altitude or cold-weather bombing raids.<sup>41</sup> Complications for manned air war like limited oxygen for pilots and the icing of airplanes due to their high flying altitude in part to avoid anti-aircraft fire help explain the allure of seeking remote controlled airplanes imagined capable of bombing targets from a further, supposedly safe, distance.

Major U.S. materiel needs during the war spurred Council members to form focus groups seeking technological solutions to the emergent problems of war. The Japanese military’s advance across the Pacific cut off the bulk of the United States natural rubber supply leading Council members to seek a suitable artificial replacement.<sup>42</sup> As the war’s fighting produced a growing number of dismembered veterans, President Roosevelt specifically requested Council chairmen form a task force that aimed to solicit and develop designs for better quality prosthetic limbs.<sup>43</sup>

The breadth of council propaganda constituted, yet complicated, the agency’s ability to find useable war devices. 208,975 formal submissions flooded the Council’s mailbox at the Department of Commerce in Washington D.C. between 1940 and mid-1946. 13,859 face to face oral presentations occurred between lay-inventors and Council staff during the war. An additional 151,887 informal inquiries were also received and

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<sup>41</sup> Ibid.

<sup>42</sup> See report to Charles Kettering on important inventive problems facing the Council, Kettering correspondence folder, in NIC General File, Box 1.

<sup>43</sup> Administrative History of the National Inventors Council, 1946, pg. 7.

responded to by Council personnel. This influx of submissions created a situation where separating the useful design from the half-baked apparatus became immensely onerous for subsidiary technical staff working under committee chairmen.<sup>44</sup> As submissions from technically unskilled armchair generals mixed with ideas from knowledgeable scientists and engineers, the work of grading a submission's military value and responding to the inventor was complicated by Council staff having to repeatedly write boiler-plate rejection letters by the tens of thousands. Designs that seemed outlandish to Council staff often met with privately notated ridicule.<sup>45</sup> Alternatively, promising proposals might need supplemental exposition in blueprint or model device. Congressional appropriation in 1942 created a model fund for the Council to help independent inventors produce prototypes to prove their device's value to the council's experts.<sup>46</sup>

Council chairmen took steps to target their solicitations to skilled scientists.

General Electric's William Coolidge and General Motors' Charles Kettering had

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<sup>44</sup> Council submission statistics are detailed most explicitly in: Appendix K: Statistics and Results, DRAFT National Inventors Council Historical Administrative Information, June 1946, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council: General Subject File, 1940-1972, Box 1, Folder Administrative History, 1946.

<sup>45</sup> Ridicule of unusable submissions appeared regularly on the Council staff's private grading reports, for one example see the submission report for B.C. Stevenson's remote controlled balloon bomb design he imagined as a means of bombing "Tokio" while avoiding the danger of approach imposed upon airmen in traditional bombing runs. The idea was labeled "unoriginal" and mocked as a "total waste of time." B.C. Stevenson submission, 1942, National Archives and Records Administration, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, RG 167, Entry P-7, Box 86, Folder B.C. Stevenson.

<sup>46</sup> See NIC Administrative History, pg. 6.

hundreds of the Council's "Invent for Victory" posters plastered in their companies' factories.<sup>47</sup> Council chairmen frequently delivered speeches at universities and trade schools encouraging student engineers to submit their designs for war mechanisms. A list of the nation's top research laboratories and "worthwhile inventors" was compiled to whom Council information bulletins were sent in hopes of drawing in war devices designed by skilled inventors.<sup>48</sup>

The National Inventors Council helped develop devices that redefined soldiers' battlefield agency. Historian Craig Cameron argues the flamethrower's integration into U.S. marine squads overturned the preceding individualism surrounding a rifleman's singular capability to kill, transforming soldiers into co-dependent fighting groups whose lives and fighting effectiveness revolved around the movement of flaming death.<sup>49</sup> A design for a mass producible hand-held metal detector - among the most impactful of the technologies the NIC evaluated and helped develop for battlefield use - aided the U.S. Army mechanize the subterranean discovery of buried land-mines.<sup>50</sup> Where flamethrowers functioned exclusively as instruments of violence, portable metal detectors helped protect American soldiers from death or dismemberment, thereby enabling their militant advance to kill, and take territory. The portable metal detector

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<sup>47</sup> Charles Kettering correspondence, December 16, 1941., NIC General Subject Files, Box 1.

<sup>48</sup> See "Information Bulletins" folder in NIC General Subject Files, Box 2.

<sup>49</sup> Craig M. Cameron, *American Samurai: Myth and Imagination in the Conduct of Battle in the First Marine Division, 1941-1951*, Cambridge University Press, 1994, 176-183.

<sup>50</sup> Administrative History, pg. 16.

shared the flamethrower's quality of making soldiers' more co-dependent upon each other for combat effectiveness as combatants' ability to fight often depended upon an initial spatial sweep for buried explosives. The handheld metal detector proved key to Allied campaigns in North Africa, beach landing invasions in Italy and France, and the "island-hopping" adopted in the U.S. Navy's campaign against the Japanese Navy across the Pacific Ocean.<sup>51</sup>

Lay inventors submitted no shortage of "weird and fantastic" ideas for war. One inventor, whom Council staff speculated was a fan of *Buck Rogers* comics and radio broadcasts, sent in a design for an enormous spherical tank supposedly fit for both land and water combat. A renowned zoologist purportedly proposed equipping bats with incendiary bombs for release over enemy cities at night. Testing suggested the living bat-bombs naturally sought dry and dark spaces ideal for starting fires. The zoologist argued that prevailing superstitions concerning bats would amplify the psychological impact of the "furry Kamikazes." But the immense destruction wrought by the Allies' bombing campaigns against Germany and Japan rendered the notion of deploying bat-bombs absurd.<sup>52</sup>

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<sup>51</sup> Office of Technical Services, Report on Council work from 1941-1947, 1950, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology National Inventors Council General Subject File, 1940-1972, Box 3.

<sup>52</sup> Administrative history, pg. 15-16.

Some Council chairmen took outlandish war ideas seriously. For instance, the potential development of a death ray captured Council Secretary Lawrence Langner's imagination. Even though technicians at the National Defense Research Committee had already rejected the idea of developing a death ray, Langner sought evaluative aid from two Council chairmen - the Chief Officer of the Army Signal Corps Major General J.O. Mauborgne and General Electric research head William Coolidge - to assess the death ray's war utility. In October 1940, Coolidge had a technician who lived near the inventor of the supposed death ray analyze the device and report on its feasibility. Nothing seems to have come of the effort.<sup>53</sup>

Many inventors' submitted designs appeared potentially worthwhile for future wars, if not in the then raging conflict. The Council formulated a library of top submissions that had gone undeveloped to retain for later reconsideration. Ideas relating to emerging sciences like atomic power were earmarked as potentially useful in wars to come. Council members' claims that many submissions retained militant value helped justify the agency's maintenance as a state institution for decades after the end of the second world war.

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<sup>53</sup> Lawrence Langer to J.O. Mauborgne, October 15, 1940, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology National Inventors Council General Subject File, 1940-1972, Box 1, Member Correspondence, Folder: Mauborgne, Joseph O. (Gen.)

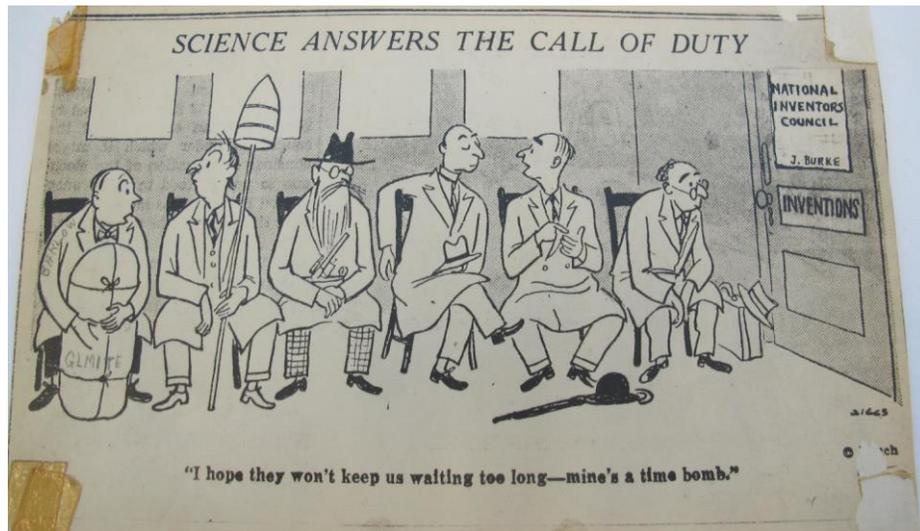
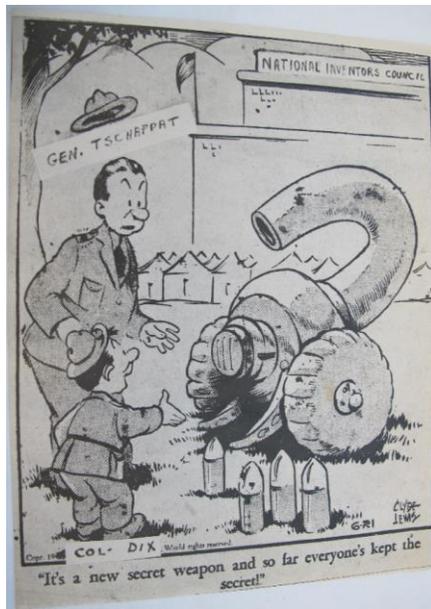


Figure 8. The abundance, ridiculousness, and regular rejection of submissions to the National Inventors Council became fodder for newspaper cartoonists.<sup>54</sup>



<sup>54</sup> National Inventors Council Cartoons, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council General Subject File, 1940-1972, Box 1, Folder: Cartoons.

The popular imaginings of weapons of war collected by the NIC for the U.S. military coincided with an expanded human rights discourse in political rhetoric from Roosevelt, Churchill, and the emergent United Nations. Below high politics, requests for human rights like free movement across national borders, or at least political asylum for war refugees, appeared in proposals sent to the National Inventors Council by people in war-torn spaces.<sup>55</sup> Inventive refugees often hoped to trade their militant ideas for a U.S. visa.<sup>56</sup> Though most submissions from refugees were rejected as unusable, the Council emphasized select success stories, such as a French expert on remote control equipment who fled German occupation and was connected to the U.S. Navy Bureau of Research and Development through the Council.<sup>57</sup>

Between 1940 and 1946, hundreds of thousands of people from around the world spent time imagining something they thought useful for waging war then wrote about it and mailed a submission to the United States National Inventors Council. The variety of voices whose designs ranged from medicines to firearms, airplanes, or aerosols, are no longer wholly apparent in the applications that survive in the Council's archives.<sup>58</sup> From those whose blueprints or chemical compounds remain in the Council's library of lay-

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<sup>55</sup> Examples of refugees from Axis and Allied nations seeking asylum in exchange for their weapon designs appear in the NIC Administrative History, pg. 10-11.

<sup>56</sup> NIC Administrative History, pg. 11

<sup>57</sup> Ibid, pg. 12.

<sup>58</sup> Most submissions catalogued and saved in the Council's submissions library received an "A" or "B" grade whereas lower grade submissions appear to have been thrown out and are rare in the National Inventors Council's surviving records.

inventors' submissions emerge frequent fantastical promises of the submitted design's supposed viability and potential impact upon war. Yet, few weapons seemed to hold the potential to alter battle quite like the violent fantasies ascribed to remote or automatically controlled bombs and "robot airplanes."

. . .

Propaganda solicitations for war technologies from the National Inventors Council helped make air power theorists out of people outside military ranks. Many people from the U.S. and around the world submitted their ideas for remote control bombs, aerial torpedoes, and pilotless airplanes to the Council before and after the U.S. declaration of war. The most promising of these submissions made their way to Charles Kettering for his analysis, and potential utilization, as he developed his own robot airplane.

The Council's active encouragement of civilians to imagine war technologies occasionally led to unforeseen, potentially dangerous, situations. One inventor mailed a live bomb to the office without warning.<sup>59</sup> A South American botanist trying to demonstrate the military utility of an itching powder derived from a noxious weed mailed unsolicited powder samples to the Council's D.C. office which spilled upon staff

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<sup>59</sup> NIC Administrative history, page 12.

to their great discomfort.<sup>60</sup> Perhaps of most potential danger, when independent inventor Donald Scott pushed for the Council to develop his remote-controlled bomb he sought permission to test his model device - not at a military airfield - but over his hometown in Arizona. His request was quickly rejected by NIC staff. But the instance highlighted how fantasies for war invention inflated average Americans' militarism to the point of turning their backyards into artillery testing grounds. Throughout the Fall of 1940, an undeterred Scott insisted his remote-control bomb device could be used defensively against invading naval ships. A skilled lobbyist, Scott managed to persuade Senator Carl Hayden of Arizona to petition the National Inventors Council staff on behalf of his proposed remote-controlled bomb. Scott even managed to have Senator Hayden go up the chain of command by sending his RC bomb proposal directly to Commanding General of the Army Air Forces Henry Arnold. Scott's engagement with the NIC thus highlighted how want-to-be war contractors could create potential dangers on the U.S. homefront, while also suggesting the Council did not always complete one of its most basic tasks of preventing "crank ideas" from distracting military experts' limited attention.<sup>61</sup>

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<sup>60</sup> Ibid.

<sup>61</sup> Donald C. Scott submission, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Records Relating to Inventions, 1940-1946, Box 86, Folder Donald C. Scott.

The reality that Council chairmen actively worked as corporate weapon designers and state war contractors, while simultaneously analyzing civilians' submitted designs to the Council, gave rise to legal controversies concerning conflicts of interest, and the poaching of ideas. Congressional hearings investigated lay inventors' claims of being underpaid for their accepted ideas or for having their ideas supposedly rejected but really developed.<sup>62</sup> Revitalizing the Kettering Bug project from the previous World War, Charles Kettering directed the intellectual and material resources of General Motors' research lab to design a "Bug II" airplane bomb. Kettering regularly spoke of his own "robot plane" development at monthly Council meetings while simultaneously discussing the usability of lay-inventors' similar weapon designs.<sup>63</sup> Whenever a submission held promise, the possibility arose that Kettering might integrate someone else's useful design or component into his own device then being pitched by General Motors to the Army Air Forces.

Take for example Philip G. Stout's April 1941 submission for a remote-controlled bomb. An engineer with connections to both the Radio Company of America and the

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<sup>62</sup> Council members admitted to instances where ideas were "rejected" but secretly developed insisting national security necessitated keeping certain war work secret even from lay inventors whose submissions prompted government development, see pg. 17 "Relations with Inventors," in the NIC Administrative History; see also National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Box 2, Folder: Court Action, Claims, Litigation.

<sup>63</sup> National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Box 2, National Inventors Council Minutes, 1940-1943.

DuPont chemical company, Stout imagined a remote guided bomb that relied upon television cameras for guidance. As an armchair air power theorist, Stout suggested the use of TV cameras could both help guide bombs with better control and accuracy while also enabling the simultaneous photographing of targets. Echoing rationales for pilotless airplanes that extended back to the First World War Era, Stout suggested his device amplified soldiers' safety enabling them to control the bombs from a safe distance outside the range of anti-air defenses. He argued his designs enabled control planes to fly at high altitudes above cloud cover keeping the airmen operating remote controls safe while also claiming the use of television for guidance would enable more accurate bombardment. Promising a "less hazardous" and more precise bombing method, Stout went so far as to suggest his device also offered greater protection to the enemy's civilian population while facilitating more accurate destruction of military targets. Acting as the Council's chief Remote Control Devices analyst, Kettering reacted negatively to Stout's bomb design, but positively to the possibilities of "a low cost highly sensitive light weight television camera." Analysis by the Director of the Aircraft Radio Laboratory at Wright Field in Dayton, Ohio ultimately rejected the feasibility of such a camera.<sup>64</sup> Yet, despite Stout's rejection, the possibility of using television cameras to

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<sup>64</sup> Philip G. Stout submission, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Records Relating to Inventions, 1940-1946, Box 86, Folder Philip G. Stout.

better direct Kettering's Bug eventually appeared in Kettering's pitches to the U.S. Army following an initial design that lacked television guidance.

Far from a one-time instance, Kettering found promise in many designs for a remote-controlled airplane or bomb sent to the Council. Kettering often relied upon additional expert analysis from military officials stationed at his hometown Dayton, Ohio's Wright Patterson Air Force Base to help decide the value of others' inventions. Sergio Usun, a Russian émigré to Brazil working as a "cinematographista" in Rio de Janeiro, submitted a design entitled "Television and Radio Control for Aerial Torpedo" in May 1941. Written in Cyrillic, then translated into English by a begrudging state department official, Usun's proposal emphasized the military advantages his apparatus could provide including improved bombing accuracy and the protection of U.S. servicemen. Usun also theorized his device as a means of labor reduction suggesting his invention capable of "reducing the number of necessary personnel" required for air bombardment. He argued the ability of control airplanes to fly above clouds at tremendous heights created a safe space between attacker and defender. He also suggested this automation of air war lessened the reliance upon pilot's physical prowess and personal bravery to face anti-air defenses which he deemed a near suicidal act for attacking airmen. Claiming numerous technological advantages - simple design, easy mass manufacture - Usun positively contrasted his remotely controlled torpedo to a normal "swarm" of airplanes that scattered bombs indiscriminately, insisting his

apparatus enabled greater accuracy and destruction at a cheaper price. Interestingly, he admitted this loss of indiscriminate bombardment sacrificed the psychological effect upon the enemy populace so valued by adherents of strategic bombing theory.

Kettering's analysis of Usun's proposal reveals he considered it an outstanding idea full of novel ideas that could be further evaluated by experts at the Army's Wright Field.

Navy tech experts, however, doubted Usun's suggestion that his device would be useful for targeting submarines and rejected its potential utility. Yet, Kettering must have seen something he liked as he requested Usun still produce blueprints and a model device for the Council's review, though the Council ultimately rejected the Russo-Brazilian's proposal.<sup>65</sup>

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<sup>65</sup> Sergio Usun submission, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Records Relating to Inventions, 1940-1946, Box 86, Folder Sergio Usun.

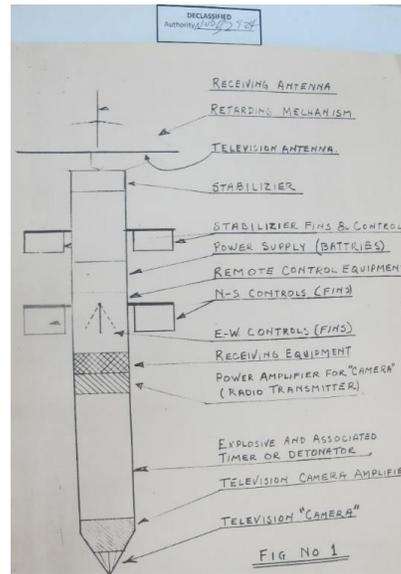
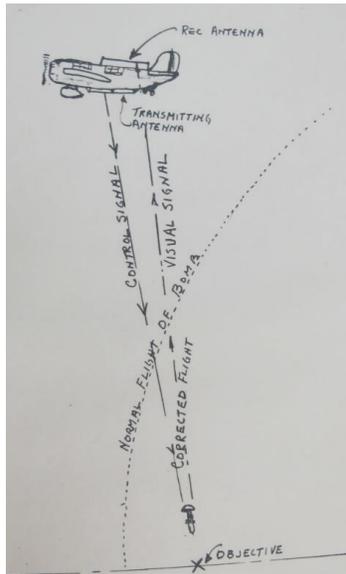
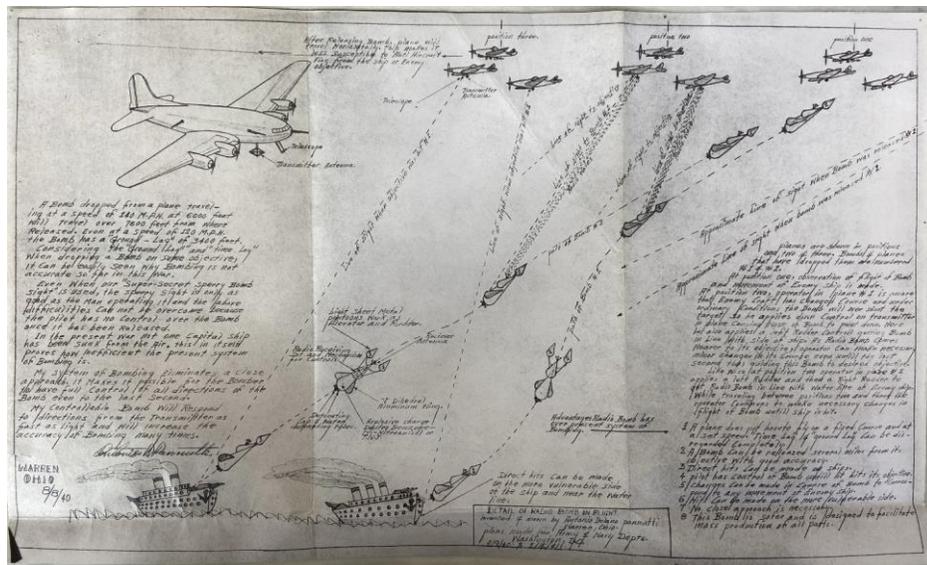


Figure 9. In their proposals to the National Inventors Council, many inventors like Philip G. Stout, above, or Antonio Pannutti, below, illustrated their remote-control device's design alongside written claims of the supposed advantages of "Radio bombs" over manned bombing practices.<sup>66</sup>



<sup>66</sup> Philip G. Stout submission; Antonio Panutti submission, National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Records Relating to Inventions, 1940-1946, Box 86, Folder Antonio Panutti.

Many inventors, likely hoping for a government contract pay day, wrote with the utmost confidence about their designs. A submission for an “Airplane Remote Control System” from an engineer named Everhard H.B. Bartelink also proposed the use of television within a remote controlled and distanced “robot” plane. Introducing his pitch, Bartelink claimed “The remotely controlled “robot” plane system supplies a picture of the scene ahead of, or beneath, each ‘robot’ plane to an operator in the control plane.” To him “The desirability of such remotely controlled planes for defense is obvious.” Among the possible uses Bartelink ascribed to his robot airplane were suggestions for “mapping or reconnaissance,” “controlled collisions with enemy planes,” “controlled dives into collision with objects on land or sea, such as battleships, ammunitions dumps, or the like,” or simply for “normal bombing.” Bartelink claimed the “great advantage” of his design “is that no pilot is exposed to loss, while the plane may be very cheaply constructed to be purposely expended.”<sup>67</sup> Despite his compelling assertions, Bartelink’s proposal appears to have remained unread for over a year, falling victim to the Council’s backlog of submissions. Impressed by his proposal in early 1942, Council staff and Kettering gave the pitch a high grade, then forwarded Bartelink’s designs to experts

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<sup>67</sup> Everhard H.B. Bartelink, Airplane Remote Control System, September 30, 1940, U.S. National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Records Relating to Inventions, 1940-1946, Box 86, Accession number 54A-736, Folder: Bartelink, Everhard H.B.

at the National Advisory Committee for Aeronautics, the National Defense Research Committee, and the Radio Company of America. The review of Bartelink's work written by an RCA expert then actively working on television and remote control technology noted Bartelink might have been ahead of the field back in 1940 when he first submitted his design, but in the intervening years "RCA have already gone far beyond the stage of development envisaged" in his proposal.<sup>68</sup> Hugh L. Dryden, who examined the device through the National Defense Research Committee, also bemoaned the late review of the apparatus noting the Army's development work on similar technology had advanced past Bartelink's design.<sup>69</sup> Victim to delay and the research capacities of state and corporate research labs Bartelink's ultimate rejection by the National Inventors Council proved to be the fate of most people who tried to invent for victory.

While inventors like Bartelink pitched their designs as revolutionary, engineers like William Ferdon showed their due diligence as researchers by placing his remote-control device in relation to other developments in the field. Rather than submitting a new proposal, Ferdon collated 43 patent filings relating to remote control, wireless communications, or aerial torpedoes, including four of his own patent filings, and Kettering's old patent filing from 1919, then simply mailed the collected patents to the

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<sup>68</sup> Donald H. Loughridge to Hugh Dryden, February 5, 1942, U.S. National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Records Relating to Inventions, 1940-1946, Box 86, Accession number 54A-736, Folder: Bartelink, Everhard H.B.

<sup>69</sup> Ibid.

National Inventors Council. Insisting in a subsequent letter that he was not trying “to boost” his own patents, he instead claimed to have compiled the suggested technical reading “at considerable expense and time, because of my patriotic and sincere desire to call this matter to your attention I have assembled all of these 43 patents that have to do with the art” of remote control. Council Secretary Lawrence Langner wrote to Ferdon thanking him for the collection of patents and information contained within, but it is unclear what use the package of patents served.<sup>70</sup>

As Kettering analyzed the submissions to the Remote Control Devices subcommittee of the U.S. National Inventors Council he simultaneously oversaw the efforts of technicians within General Motors’ research and development division to produce a second “Bug,” the nickname attached to his World War I era aerial torpedo. Over twenty years had passed between the first world war’s Bug and the new weapon made in the 1940s necessitating the adoption of new technology. The old Bug’s wood and cloth airframe was replaced with one made of steel. The early Bug’s 40-horsepower engine was replaced by a new “8-cylinder 2-cycle 200 horsepower liquid cooled engine”

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<sup>70</sup> William Ferdon submission, U.S. National Archives and Records Administration, RG 167, Records of the National Institute of Standards and Technology, National Inventors Council, 1940-1946, Records Relating to Inventions, 1940-1946, Box 86, accession number 54A-736.

that increased the Bug's speed from 50mph to 200mph and enabled it to carry 500, rather than 200, pounds of explosives.<sup>71</sup>

Yet initially Kettering tried to hang onto much of his old design. The first models of the Bug 2 still relied on a rudimentary pneumatic targeting system that allowed missile firers to input a certain distance for the device to fly at which point the engines shut off and the device plunged to the Earth to explode. Analytical test flights conducted by the Army-Air Force, however, showed this method to be wildly inaccurate. If the weather were properly forecast, and the Bug only had to travel 50 miles, then it could strike within a half mile of the target. However, Army-Air Force projections said that in uncertain weather conditions, or when traveling longer distances, the Bug could end up landing up to 20 miles away from the target.<sup>72</sup> There was also a basic problem of the robot airplane often crashing while attempting to take off.

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<sup>71</sup> Mr. Kettering's "Flying Bug", Report to Gen. Arnold, April 16, 1942, From Library of Congress, The Henry Harley Arnold Papers, 1903-1989, Microfilm, reel 128, pg. 2.

<sup>72</sup> Ibid, 2-3.



Figure 10. Photos from a secret 1942 testing of Charles Kettering's "robot airplane" or "Bug" in California. Top left, the remade weapon. Top right, the remote operator "Cal" pushes buttons to control the device. Bottom left, the limits of the Bug's distanced control. Bottom right, crumpled remains of the Bug during a failed test flight.



Even when flown for short distances, the Bug's preset-data targeting seemed too inaccurate to fit into America's emergent strategic bombing campaign in 1942. An April 16, 1942, Army Air Force analysis prepared by Colonel Grandison Gardner of the Army Air Force Proving Ground at Commanding General Hap Arnold's request rejected the idea of using Kettering's aerial torpedo to indiscriminately bomb Germany, fearing it

would incite animosity and increase German resistance.<sup>73</sup> Arnold underlined the section of the report that suggested no Bugs be produced using the pneumatic targeting system, further damning the program. However, Arnold was optimistic that Kettering's Bug could still be adopted for war if its flying capabilities and the accuracy of its targeting improved.<sup>74</sup> Gardner's critique of Kettering's Bug included suggestions to improve the weapon's functionality with new technologies. He noted the potential implementation of homing devices, or controls that used heat, light, sound, or radar transmissions. But these technologies were still under active development and unavailable for immediate installation on the robot airplane. Instead, improvements to the remote control equipment under use and the implementation of television cameras to help distant operators guide the airplane were the basic conditions for improvement suggested by Gardner to make the Bug a useable weapon. Increasingly familiar with these technologies through his work on the National Inventors Council Kettering agreed to these technical specifications on behalf of General Motors. General Arnold's copy of the report showed his support for the Bug's continued development upon which he added a hand-written note that accuracy would be "very much" improved through television imagery.<sup>75</sup>

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<sup>73</sup> Gen. Arnold, Mr. Kettering's "Flying Bug", Report Request from Gen, Arnold to Gen. Harmon, April 7, 1942, Library of Congress, The Henry Harley Arnold Papers, 1903-1989, Microfilm, reel 128, pg. 1.

<sup>74</sup> Ibid, 3.

<sup>75</sup> Ibid, 3.

Despite suggesting means of improvement for Kettering's Bug, Gardner highlighted other problems with the weapon that ultimately stymied the project. Special facilities and squadrons would need to be created for the Bug's operators. Operators needed training to hone the skills required to remotely operate the Bugs accurately. Control airplanes would be needed to carry operators as they remotely piloted the Bugs. The Bugs would require storage space, and their design was more cumbersome than the traditional ordinance it was meant to replace. Ultimately, the fact that the Bug only carried 500 pounds of explosives with a limited range of 400 miles led the Army-Air Force to label it "inadequate" as then designed.<sup>76</sup>

In response to the critique of the Bug's size and limited capabilities, Kettering proposed making a "Double Bug." The Double Bug would be able to travel 1,000 miles and carry 2,000 pounds of explosives. However, Gardner deemed these the bare minimum capabilities to "warrant the trouble and expense."<sup>77</sup> Recognizing his pet project was under threat of losing military support Kettering tried lobbying Gardner directly. He argued the Bug devices General Motors had produced fit the original specifications requested by the Army Air Forces, specifications originally "thought to be sufficient" for the bombing war. Kettering insisted his weapon was efficient because it "uses no strategic material and consists of only the essential parts necessary to fly." Yet,

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<sup>76</sup> Ibid, 4.

<sup>77</sup> Ibid, 4.

the requisite addition of television cameras and more advanced remote controls upon the weapon designed to destroy itself undercut his claims to cheapness. Kettering reminded Gardner that the small engine designed for the Bug was also a sophisticated research project that cost over 1,000 man-hours and had achieved, he claimed, "characteristics never before obtained."<sup>78</sup> Kettering requested Gardner forward his letter defending the Bug to General Arnold.

Gardner forwarded Kettering's letter lobbying for the Bug to Arnold, but he also included an even more critical report of the Bug to his superior. Gardner told Arnold that out of five Bugs tested only one had performed well. He noted takeoff was still a basic issue for the devices. Attempted launching methods using catapults had not significantly improved the Bug's flying ability. The implementation of television cameras to aid guidance had still not proven effective at improving targeting accuracy. Gardner's annoyance with Kettering seeped through his writing to Arnold, "Although those connected with the development of this weapon are highly optimistic as to the results they expect to obtain, it is felt that any decision to put it in production should be withheld pending the demonstration of its practicability."<sup>79</sup>

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<sup>78</sup> Charles F. Kettering to Grandison Gardner, May 12, 1942, Library of Congress, The Henry Harley Arnold Papers, 1903-1989, Microfilm, reel 5.

<sup>79</sup> Grandison Gardner, Kettering Power Bomb, Report, Library of Congress, The Henry Harley Arnold Papers, 1903-1989, Microfilm, reel 5.

Despite the immense advantages Charles Kettering possessed as director of General Motors Research, with personal friends in high military rank, and former General Motors associates like William Knudsen in positions of power over government war production, the robot airplane he had tried to make in two world wars was ultimately a failure. Having rejected numerous inventive designs for war weapons sent to the National Inventors Council from around the world, Kettering received a similar rejection from General Arnold, himself among the longest supporters of the weapon. In his autobiography, Arnold recalls meeting with Kettering and Knudsen to discuss the prevailing issues for the Bug's adoption including "the availability of bases; of targets; the cost; production; comparison of production between the Bugs and heavy bombers;" and finally the "raw materials needed for the two types of weapons." The three men agreed to end the project because even with extensive technical improvements, the Bug's short flying range only allowed it to hit occupied cities in France, Belgium, and Holland; not the desired target of interior Germany.<sup>80</sup> For the time being piloted bombers outperformed pilotless airplanes.

The staff and chairmen of the National Inventors Council continued working through the war, and for decades after. Though most submissions to the Council received rejections, 106 different designs for war materiel evaluated by the Council and forwarded to other government agencies for additional development went into

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<sup>80</sup> Henry Harley Arnold, *Global Mission*, 1949, 260-261.

production and made it to war fronts. Suggestions considered of potential future use – especially concerning topics like atomic power, bacteriological warfare, proximity fuses, or self-guided torpedoes – were retained by the military services and saved in the Council’s classified files. Beyond material influence, the agency geared civilian minds to the U.S. war effort before and after the U.S. declaration of war. It drew foreign inventors to support the American war effort. Even if neither Kettering nor lay-inventors managed to put robot airplanes into the air war, the work of analyzing their designs was often performed by scientists at the Radio Company of America, the National Advisory Committee for Aeronautics, or military officers at the Army Air Force’s Wright Field. Some of these analysts whose ideas about pilotless planes were shaped by working with the National Inventors Council remained involved in pilotless and robot airplane development through the war and directly contributed to the technology’s eventual use in bombing operations before the war’s end. Council analysts like Hugh L. Dryden went on to help author key war reports on the use of pilotless aircraft and guided missiles that shaped U.S. military policy in the post-war era.<sup>81</sup> But most immediately, Kettering’s efforts to make the robot airplane a useable weapon of war, had sustained the idea’s plausibility in Commanding General Henry Arnold’s mind. In June 1944, when the German V-weapon bombardment of London began, Arnold was present in the city, and

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<sup>81</sup> “Toward New Horizons: A Report to General of the Army H.H. Arnold by the Army Air Forces Scientific Advisory Group,” Theodore von Karman, Hugh L. Dryden, et. al, May 1946, Headquarters Air Materiel Command.

shaken by the indiscriminate bombing wrought by Germany's weapons first called "pilotless" or "drone" aircraft.<sup>82</sup> In response, Arnold would once again push for the U.S. to use pilotless airplanes, finally making the weapon he had longed for a reality within U.S. war making.

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A single segregated battalion of African American soldiers deployed to Normandy beach on "D-Day." Out of these hundreds of men many tooted passenger-less barrage-balloons into the battle. Rather than rifles these men gripped tethers that held down explosive balloons at a low altitude. The devices functioned as protective air-mines guarding the ships unloading soldiers from enemy air attack. Any low-flying German pilot who attempted to strafe or bomb the forces invading the beach had to fly at a low altitude thereby risking a crash with the floating balloon bombs. As these men invaded occupied France controlling passenger-less aircraft racial oppression infused their combat experience in a war ostensibly fought for freedoms. Two interlinked wars against totalitarianism appeared for African Americans who fought fascism abroad and at home. The medic in the barrage balloon battalion, Corporal Waverly B. Woodson, exemplified the U.S. military's disparate treatment of black and white soldiers. Woodson tended wounded soldiers on Normandy beach for over 30 hours until he collapsed from

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<sup>82</sup> Henry Arnold, June 13, 1944, war journal, Library of Congress, The Henry Harley Arnold Papers, 1903-1989, reel 3.

exhaustion. He earned a nomination for the Congressional Medal of Honor. But Woodson was denied his nation's highest military decoration, as were all other nominees of color during the war.<sup>83</sup>

Pilotless aircraft soon made a less forgotten history. On June 13, 1944, a week after and in retaliation for the Allied invasion of Normandy, France, Nazi Germany's Luftwaffe launched hundreds of their first Vergeltungswaffen - "vengeance" or "retaliatory" weapons - from occupied France into London. The swarm of hundreds of small jet airplanes fired as automatically guided missiles collectively carried thousands of pounds of explosives from Northern France to crash and explode upon London and its surrounding suburbs. These instruments of violence developed by Nazi Germany's military scientists terrorized those living in Britain's capital city, including many officers in Allied High Command, turning London's inhabitants into targets of random bombardment. The Germans' unmanned V-weapons achieved the long-sought capacity of distanced bombardment accomplished solely through a war machine. Some who had long dreamed of such weaponry's use in war were among those first made the target of a "drone."

U.S. Army Air Force Commanding General Henry "Hap" Arnold was stationed in London alongside many other British and U.S. military commanders when the V

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<sup>83</sup> Linda Hervieux, *Forgotten: The Untold Story of D-Day's Black Heroes, at Home and at War*, Harper Collins, 2016.

weapons exploded on and around London. Arnold recounted his experience of the German military's new means of bombardment in his war journal. Writing in timeline form, he noted "5:30 this morning a long series of explosions. Many within a very short period." Each weapon carried a "quite heavy" charge. He wondered whether the explosions came from "Rockets? Ski pilotless planes? Bombs? There were some delayed fuses. What were they?" Answering his own question with the knowledge of hindsight, he wrote: "They were pilotless planes – over 200 of them have landed in and around London." One of the pilotless planes had flown directly overhead his host's home. He described the device "come down out of the clouds in a dive" where it "leveled off and then started a slow turn and finally crashed into the ground" exploding approximately 1 ¼ mile away. The explosion's force "just about lifted us all out of bed." shaking everyone in the house awake before dawn.<sup>84</sup>

In a screed of detail, Arnold recounted his day touring the damage done to the city and the reactions top Allied military leaders had to the weapons. Taking stock of his personal proximity to danger he noted "27 pilotless planes landed within 5 miles" of his house. As he ventured around London inspecting bomb craters Arnold learned a new name for the weapons spoken by Royal Air Force officers: "'Drone.'" Seemingly introduced to the term, Arnold adopted it into his vocabulary, but always wrote the

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<sup>84</sup> Henry H. Arnold, war journal, Library of Congress, The Henry Harley Arnold Papers, 1903-1989, microfilm reel 3.

foreign word with parentheses signaling his unfamiliarity with the phrase despite decades of work with “aerial torpedoes,” “pilotless airplanes,” and “robot airplanes.” Arnold wrote his memories of the day recalling the regularity of bombing slowing from a surge of missiles in the morning to one pilotless plane arriving around every five minutes in the afternoon. One ““drone”” flew low overhead Arnold while he investigated a bomb crater. Recounting his initial terrified reaction Arnold worried if the Germans were capable of mass producing and launching the devices at Britain. If so, he anticipated “That will cause consternation, concern, and finally break the normal routine of life even in Britain and dislocate the war effort. No one can predict where they will hit - you can hear them coming with a swishing noise - they are hard to dodge.” Fearing these new weapons’ potential for causing psychological terror upon the British people he resolved something must immediately be done to destroy the weapons’ launching sites and production spaces. As Arnold met with members of Allied high command that day including Dwight Eisenhower, George Marshall, Carl Spaatz, British Royal Air Force Commanders, and Prime Minister Winston Churchill, their conversation focused on the day’s “drone” attack and plans for retaliation.<sup>85</sup>

Officers in the United States Army Air Forces initiated a “robot” bombing program in July 1944 that started as a means of bombing the German V weapons but wound-up expanding air war’s mass destruction. Military officials codenamed the

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<sup>85</sup> Ibid.

project with the divine designation “Aphrodite.” An ancient Greek deity, Aphrodite had been worshipped two millennia prior as the goddess of sexual love and reproduction while also celebrated as an emblem of seafaring and naval war. This mythical codename proved both symbolic and irrelevant to how U.S. “robot” airplane operations against German military targets and living spaces unfolded across mid-1944 into early-1945.

A formal report to the headquarters of the U.S. Army Air Force’s 3<sup>rd</sup> bombardment Division explained “What ‘Aphrodite’ Is.” Submitted on July 14, 1944, amidst the operation’s initiation, the report’s author Army Air Force Major General E. E. Partridge described what the US Army Air Force aimed to accomplish with Operation Aphrodite. Always writing in a passive, prospective, voice that projected expectations for an operation in the making, the general explained “The ‘Aphrodite’ project is concerned with a system of bombing in which a robot aircraft loaded with explosives is directed to a suitable target by remote control from a mother aircraft flying above.” Beat-up B-17 and B-24 airplanes deemed too “war-weary” were repurposed and “modified with the necessary control equipment” to be “used as robots” with the aim of each robot airplane carrying “a load of 20,000 pounds of bulk nitro starch” explosives. These “robot” airplanes still required a pilot onboard for takeoff and initial flight direction towards the chosen target. Having taken off and directed the plane to a predetermined point the pilot was expected to shift the airplane’s control to an attendant “mother ship” flying overhead that beamed radio signals to the control equipment on the robot “baby”

airplane. After establishing remote control with the mother plane the pilot's penultimate job was to arm the fuse of the explosives packed onboard the now remotely controlled airplane before bailing out and parachuting at a predetermined point along the bombing route. As the explosive-laden robot airplane approached its target the controlling operator on the mother ship was to remotely direct the aircraft to "descend to 300 feet for the run to the target" when at the "proper instant the robot will be made to dive into the target." Controlling airmen flying on the "mother" aircraft controlled their robot "babies" from a high altitude of approximately 20,000 feet making the method of remote control fundamental for the operation's success. A radio control method code named "Double Ason" enabled the vertical and horizontal direction of the robot airplane through the radio transmission of audio frequencies.<sup>86</sup>

In his operational report, Partridge speculated that Aphrodite's robot planes might be "used for a wide variety of targets" but specified that the operation was "primarily intended for the destruction of those targets which are comparatively impregnable to bombs..." Potential targets needed to be sufficiently "above the surface of the earth or water to permit guiding the robot against it." Yet, he worried a target must not be so heavily defended that anti-air defenses might destroy the robot airplane along the route. Specific examples of "suitable targets" included "rocket gun

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<sup>86</sup> E.E. Partridge to Commanding General of Eighth Air Force, July 15, 1944, John F. Kennedy Personal Papers, Correspondence, 1943-1952, Subject File, Folder: Joseph P. Kennedy Jr.: Naval Career: Aphrodite.

installations" referring to the V-weapons launching sites, "submarine pens, which are difficult to destroy by bombing from above," and "aqueducts and bridges." At its outset Aphrodite's explosive robot babies were imagined as a unique weapon enabling a new method of bombing military targets and enemy infrastructure.<sup>87</sup>

General Partridge shifted from imagining Aphrodite's future operations to an explanation of the "intensive program of experimentation... and preparation" underway at Station 140 under the command of the 388<sup>th</sup> Bombardment Group. He explained that "Personnel of all types, both officer and enlisted, and aircraft and equipment have been provided in the necessary quantities to carry on all phases of the work." The General allowed himself to further fantasize what might be accomplished with Operation Aphrodite. He speculated the television cameras positioned in the front nose of the robot's airframe might possibly eliminate the hindrance of poor visibility from inclement weather. He stressed the necessity of "thorough preparation, practice and study" through test flights. Sliding into the language of man-machine, Partridge insisted "Every detail of the operation must be so familiar to the personnel taking part that they hardly need refer to the field order and instructional material.... These must be indelibly impressed on the minds of the combat team in the mother aircraft by long hours of painstaking target study under the supervision of the best available instructors."

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<sup>87</sup> Ibid.

Militant robot handling demanded human discipline, muscle memory, and practiced reflexes.<sup>88</sup>

Soldiers unnamed in General Partridge's report controlled the robots he wrote of in the summer of 1944. The work of preparing robot airplanes for war included the stripping of excess armor and weaponry from bullet-riddled "war weary" airplanes, the installation of remote control and television equipment, and the repeated flight testing of the robot airplanes by Navy pilots and Army radio engineers. During flight tests, pilots flew in airplanes being controlled from afar, awaiting a malfunction or turbulence to take over flying control, monitoring the robot's flight patterns from the cockpit, and adjusting the mechanisms of radio controls and television screens in preparation for a bombing run.

The best records of these happenings emerge outside official reports in remembrances of airmen killed in the preparation of robot airplanes written by enlisted friends of the deceased. U.S. Navy Ensign John W. Simpson recalled with delight the day he was ordered to ship out to England alongside his fellow members of the Navy's Special Air Unit Number 1. Experts concerning the design and operation of remote-control equipment for airplanes, Simpson reflected he and his compatriots ecstasy at being called to the front "This was the action for which we had trained for two years.

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<sup>88</sup> Ibid.

Two years of development, flying, testing and experimenting. We were more than ready to go, and could hardly wait to get started.”

Simpson and other Navy engineers arrived at a secret Army air field North of London and “set up shop” to test equipment. Taking tactical command from Army officers because the operation was a “land to land operation,” the Navy engineers waited until mid-July for planes to arrive in Dunkeswell, at which time they modified “the drone to carry the unusually heavy load of explosives” by stripping turrets and extra equipment from the beat-up airplane. On July 30<sup>th</sup>, Simpson and fellow Navy airmen flew one drone and several control planes to Firsfield for testing. After sand-loading the drone to a gross weight of 63,000 pounds to mimic the weight of its explosive load, Simpson and his fellow Navy airman Lieutenant Joseph P. Kennedy Jr. “flew for hours testing and radio controlling the huge drone in unfamiliar territory. Lieut. Kennedy and I spent a total of eleven hours in that drone, most of it actually under radio control at about three hundred feet altitude.”<sup>89</sup> Explaining the experience of flying in an airplane being remotely controlled, Simpson detailed “All we had to do was sit there and watch. The flying was controlled from another plane, and the altitude was automatically controlled by the modified radio altimeter.” By August, after extensive testing, Simpson gloated “At last everything was ready.” A joint Army and Navy crew

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<sup>89</sup> J. M. Simpson to Joseph P. Kennedy Sr., Joseph P. Kennedy Personal Papers, Family: Subject Files: Joseph P. Kennedy Jr., Box 16, Folder: Death: Ensign Simpson Report of last mission (1944), pg. 3.

loaded around 25,000 pounds of Torpex explosives aboard the drone for Operation Aphrodite's first bombing operation. Noting Torpex was "one and seven tenth more powerful than TNT" Simpson claimed, "This was to be the largest airborne load of explosives of its time."<sup>90</sup>

Despite his performance of flight and control testing the drone for over a month, at the last moment before the first operational flight on August 12, 1944, Ensign Simpson was ordered off the plane by a superior officer who insisted on accompanying Joseph Kennedy Jr. on the inaugural Operation Aphrodite flight instead. Miffed at missing what seemed like the making of history, Simpson took his bump from the flight in stride, and recollected "it was nice to watch the precision flying" of the P-51 airplanes that took off before the drone to provide fighter cover. But Simpson's fondness for Operation Aphrodite was struck short minutes after the drone's takeoff.<sup>91</sup>

Simpson recalled that as the "mother ship" control plane attempted to center the "baby" drone with a right radio signal "the drone exploded in midair, killing both of the pilots." Describing the macabre scene in the air he wrote "There just wasn't anything left but a cloud of smoke and a hail of small pieces about the size of a tennis ball. One second the drone was there and the next second there was nothing but smoke." The immense explosion forced one plane flying over five hundred feet away down into a

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<sup>90</sup> Ibid, pg. 4.

<sup>91</sup> Ibid, 4.

field after sustaining damages. Operators on the control plane “could hardly believe their eyes” worrying that the pilots had not bailed out of the drone as planned and that “the explosion had come without warning....”<sup>92</sup>

The death of Joseph P. Kennedy Jr. in an experimental bombing operation sparked controversy as his father Joseph P. Kennedy Sr. sought answers from the administration he had once worked for as Ambassador to the United Kingdom. Army Air Force Generals like Jimmy Doolittle who had once supported the drone project became ardent critics of Operation Aphrodite. But for soldiers like Simpson who animated Operation Aphrodite’s drone war the best way to mourn Joe Jr. seemed to be launching another drone attack. Within days of the first failed mission another was successfully conducted. Simpson described his bird’s eye view of the operation from the observation plane he flew on enunciated a mesmerizing effect from the massive bomb’s explosion:

We took motion pictures of the screen and when the television picture disappeared, I ran aft to the waist hatch and watched the impact. The waist gunner took motion pictures of the explosion and it was awe inspiring. The column of smoke was above us and we were at two thousand feet. The

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<sup>92</sup> Ibid, 5.

mushroom appeared to be above five thousand feet and was still there when I looked back ten minutes later.<sup>93</sup>

Awed at the vision of what he recognized as the largest aerial explosion yet wrought Simpson gloated at what he considered a job well done. He noted the drone hit a fuel dump and several barracks “which were later found to be officer’s mess halls” a destruction he qualified as accomplishment “since it was dinner time, we hit a good target.” Relishing the violence he helped cause, Simpson nevertheless bemoaned that the mission missed its target, a submarine pen, and was therefore deemed a failure.<sup>94</sup>

Operation Aphrodite originally aimed to attack the most defended German military targets. But Aphrodite’s drones quickly became terror weapons. Mission reports reveal that when “trouble was experienced with the control equipment” operating crews resorted to uncontrolled indiscriminate targeting. During a mission on October 31, 1944 when the remote controls malfunctioned due to poor weather the drone “was set on a course for Berlin and abandoned” by the control crew.<sup>95</sup> It is unclear where the drone landed and whether it exploded upon impact. Weather proved a recurrent obstacle to drone operations due to interference with the radio wave based remote controls leading frustrated operating crews to repeatedly engage in the practice of abandoning their

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<sup>93</sup> Ibid, 7-8.

<sup>94</sup> Ibid, 7.

<sup>95</sup> Army Air Forces Air Technical Service Command, Memorandum Report, November 20, 1944, Smithsonian National Air and Space Museum Archives, Wright Field Technical Documents Library, Series D, Box 657.

original military target and instead directing the drone to fly towards the nearest German city.<sup>96</sup>

By November 1944 U.S. Army Air Force commanders no longer seemed interested in the drone bombardment of military targets. Two months into Operation Aphrodite's bombing operations, Commanding General Arnold wrote Carl "Tooney" Spaatz, Commander of Army Air Operations in Europe, about a strategic shift for the drone bombings. Arnold forwarded Spaatz a report on the "operation of war weary airplanes as an irritant and possibly a means of breaking down the morale of the people of interior Germany." Despite the ongoing technical issues with remote controls, alongside the unintended deaths of operating airmen, Arnold claimed "the technique for the employment of these war weary planes is pretty well solved." He explained to Spaatz that he was still waiting for the Combined Chiefs of Staff to give permission to use war weary airplanes turned drones as terror weapons. Sharing his opinion on the matter, Arnold invoked a right to retaliation, writing "I can see very little difference between the British night area bombing and our taking a war weary airplane, launching it, at say, 50 or 60 miles away from Cologne and letting it fall somewhere in the city limit of Cologne." Promising Spaatz he was ready to "draw up an organization to handle

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<sup>96</sup> Ibid.

these war weary planes for you” he requested “enough pilots, crews, and experts” to prepare and operate the war weary airplanes.<sup>97</sup>

Concluding his letter with another pitch for terror bombing, Arnold explained “My idea would be to turn them loose to land all over Germany so that the Germans would be just as much afraid of our war weary planes on account of not knowing just where they were going to hit, as are the people in England from the buzz bombs and rockets.” Having experienced the deadly fear imposed by the German “drone” bombing of London Arnold sought psychological retaliation against the German people. Emphasizing his rationale for inflicting terror he explained “I think that the psychological effect on the morale of the German people would be much greater this way, not knowing where they were going to fall, and they would have to be constantly on the alert with fighters and aircraft to knock them down.” Fantasies for drone bombardment had shifted from the original visions of controlled and accurate bombing to exacting the greatest possible destruction upon the enemy.<sup>98</sup>

In total, the U.S. Army and Navy soldiers involved with Operation Aphrodite launched fifteen bombing raids against German targets between August 1944 and January 1945. These missions could include between one to four of the “baby” “robot”

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<sup>97</sup> Arnold to Spaatz, November 23, 1944, The Papers of Henry Harley Arnold, Library of Congress, microfilm, reel 128.

<sup>98</sup> Arnold to Spaatz, November 23, 1944, The Papers of Henry Harley Arnold, Library of Congress, microfilm, reel 128.

drones each filled with a massive load of 18,000 pounds of Torpex explosives – payloads so large they were considered the largest aerial explosions ever wrought in war. Targets varied from U-boat pens at Heligoland, to oil refineries at Heide and Hemmingstedt, a power station at Oldenburg, or spaces connected to the V weapons including the fortress of Mimoyecques and a bunker in Siracourt.<sup>99</sup>

For six months in late 1944 through early 1945 the U.S. Army Air Force and its top commanders embraced drone war as a method of launching a singular massive bomb against enemies. This experience in drone war was demonstrative of the logics operating in the minds of U.S. air commanders engaged in the mass bombing and firebombing of German and Japanese cities. As a “technological fanaticism” guided the U.S. air war its key leaders Arnold and Spaatz saw the use of “war weary” airplanes repurposed into drones as an ideal method of recycling war material into a new terror weapon. General Arnold is often accredited for pushing for the development of long-range bombers which increasingly carried out the U.S. air war up to its conclusion with atomic bombs dropped against Japan. A deeper understanding of key air commanders’ draw to a singular massive bomb as deployed in Operation Aphrodite helps better

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<sup>99</sup> The most detailed study of Operation Aphrodite, those involved, and its bombing run is: Jack Olsen, *Aphrodite: Desperate Mission*, Putnam, 1970; Operation Aphrodite’s bombing runs are also discussed in Kenneth P. Werrell, *The Evolution of the Cruise Missile*, Air University Press, 1985, 32; and Donald L. Miller, *Masters of the Air: America’s Bomber Boys Who Fought the Air War Against Nazi Germany*, Simon & Schuster, 2007, 300; The official combat chronology of the U.S. Army 8<sup>th</sup> Air Force also list Operation Aphrodite’s missions, see: Jack McKillop, “Combat Chronology of the U.S. Army Air Forces: 8<sup>th</sup> Air Force 1944 Chronicles,” USAF Airways and Communications Service, 1955.

contextualize the rationales and operative logics of mass destruction which soon culminated in the atomic bombings of Hiroshima and Nagasaki.

General Arnold was also in part responsible for the post-war construction of pilotless airplanes as a needed weapon. Unlike the First World War's end when military leaders fantasized about the pilotless airplane's uses in war but lacked significant state interest and funding, Arnold used his influence as Commander of the Army Air Forces to champion air war's automation. He sponsored studies for a future "manless air force." In his post-war official recommendations to the Joint Chief of Staff he wrote a great deal about how the war showed the necessity of bridging relationships between the military services, corporate war producers, and universities to be better prepared for future wars. These recommendations made specific emphasis of the pilotless airplanes' place in recent war making. Outside official channels, Arnold spoke publicly about pilotless airplanes including during his Victory over Japan Day speech. He told his listening audience of soldiers "We have just won a war with a lot of heroes flying around in planes" then pontificated "the next war may be fought with airplanes with no men in them at all. It certainly will be fought with planes so far superior to those we have now that there will be no basis for comparison."<sup>100</sup> Far from the sole booster for drones and pilotless airplanes, Hugh L. Dryden, once a member of the National

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<sup>100</sup> Jay M. Shafritz, *Words on War: Military Quotations from Ancient times to the Present*, Prentice Hall, 1990, 104.

Inventors Council and a regular technical analyst for the council concerning remotely controlled devices, wrote the “Guided Missiles and Pilotless Aircraft” section of the important treatise *Towards New Horizons* a prediction of war’s future.<sup>101</sup> As influential military figures imagined the uses of drones to come the technology was put to use in the immediate post-war moment.

Plants and animals lived amidst atoll islands in an ocean for millions of years before sailors deemed the surrounding waters “pacific” as if calm and peaceful. A geographical marvel, the atoll islands’ formation stretched over time, beginning as oceanic volcanos that output magma and minerals which stimulated coral reef colonization. Slowly, water currents eroded the tops of the volcanos leaving 23 ring-shaped coral reef islands. Marine life circulated through the atolls’ open pools of salt water. Migratory birds’ gift of excreted-seed sprouted fruit trees atop the land.<sup>102</sup>

Carbon dating places human settlement on the atolls back four thousand years. The people who settled the island chain named their homeland a phrase closer to the sound “Pikinni” a combination of the Ebon words “Pik” (surface) and “Ni” (coconut). The island’s abundant produce also included papaya, banana, breadfruit, pumpkin,

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<sup>101</sup> Hugh L. Dryden, “Guided Missiles and Pilotless Airplanes,” in “Toward New Horizons: A Report to General of the Army H.H. Arnold by the Army Air Forces Scientific Advisory Group,” Theodore von Karman, Hugh L. Dryden, et. al, Headquarters Air Materiel Command, May 1946.

<sup>102</sup> Han Hu et. Al., “Earliest evidence for fruit consumption and potential seed dispersal by birds,” *eLife*, 2022.

taro, arrowroot, and limes. For thousands of years a natural bounty of fish, fruit, and vegetables fed the Pikinni people.<sup>103</sup>

European sailors, including John Marshall for whom the “Marshall Islands” refer, made note of Pikini. But European imperial interest did not begin until the nineteenth century when Baltic Germans began harvesting the atoll’s coconuts to produce copra oil. Soon following the Germans, Cristian missionaries from the United States arrived to evangelize, eventually displacing the local belief systems after years of ideological imposition.<sup>104</sup>

Among the few territorial concessions granted to imperial Japan after World War I, the Marshall Islands, including Pikinni/Bikini Atoll, became strategically significant to the expanding Japanese empire. The islands lay in the Pacific Ocean approximately halfway between Hawaii and the Philippines, an ideal strategic space to surveil the U.S. Navy’s movements between territorial possessions in the Pacific. Fighting on the Gilbert and Marshall Islands initiated U.S. Naval forces’ “island hopping” efforts to retake the Pacific from Japan. By mid-1946, the fate of Bikini atoll was intertwined with U.S. militarism like many other Pacific Islands. But Bikini’s fate differed from Pacific Islands turned into airfields. Its irrevocable alteration by atomic bomb testing rendered the tropical paradise into a radioactive danger zone.

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<sup>103</sup> Jack Niedenthal, *For the Good of Mankind: A History of the People of Bikini and the Islands*, Bravo Books, 2001.

<sup>104</sup> Ibid.

The United States' use of Bikini Atoll as a test site for the atomic bomb constituted a war crime without a name. It merged the old colonial practice of land dispossession with the burgeoning practice of environmental desolation wrought by nuclear weapon blast. One atrocity committed by the United States' military forces - the forced removal of Bikini's indigenous population - was soon codified at the Nuremberg trials that punished German war criminals. No criminal charges were ever stuck to those responsible for the devastation of Bikini Atoll and the removal of its people.

The U.S. Army committed more crimes upon the Bikinian people following their removal from Bikini Atoll. The explosive experiment's most significant finding - that the atomic bomb was much more than a gigantic detonation but also a producer of radiation at gargantuan, toxic, amounts - re-demonstrated the weapon's absurd destructiveness by irradiating the atoll and surrounding sea.<sup>105</sup> U.S. ships carried the Bikinian people to nearby Rongerik island, a barren place devoid of their homeland's bountiful supply of fruits and fish. Soon after they were removed from their homeland many Bikinians started to starve while sea creatures and jungle life at Bikini faced atomization. Lore

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<sup>105</sup> Japanese doctors had already asserted the atomic bomb carried devastating radiological effects for bombing victims and the Strategic Bombing Survey of the atomic bombings of Hiroshima and Nagasaki contained studies of radiation burns and poisoning. Yet, U.S. military officials still sought to repeatedly test the destructive potential of their new nuclear arsenal at Bikini Atoll and spaces in the Pacific Ocean. "The United States Strategic Bombing Survey: The Effects of Atomic Bombs on Hiroshima and Nagasaki," June 30, 1946, The U.S. Government Printing Office, Roger Williams University Archives and Special Collections, digital access through History Commons.

Kessibuki, among the relocated Bikinians, expressed his people's plight in an epitaphic anthem bemoaning the loss of their homeland and way of life:

I jab ber emol, aet, i jab ber ainmon ion kineo im bitu kin ailon eo ao im melan ko ie	No longer can I stay, it's true No longer can I live in peace and harmony No longer can I rest on my sleeping mat and pillow. Because of my island and the life I once knew there.
Eber im lok jiktok ikerele kot iban bok hartu jonan an elap ippa	The thought is overwhelming Rendering me helpless and in great despair.
Ao emotlok rounni im lo ijen ion  ijen ebin joe a eankin iken jikin ao emotlok im be rim mad ie	My spirit leaves, drifting around and far away. Where it becomes caught in a current of immense power– And only then do I find tranquility <sup>106</sup>

Relocated to a desolate new living space, yet unable to return to their irradiated homeland, the Bikinian people were reduced to what legal scholar and counsel to the people of Bikini Jonathan Weisgall termed “nuclear nomads” – a people forced again and again to move to another place to survive.<sup>107</sup>

Combining the forced removal of a population with the spoilation of that peoples' homeland, what does one call such an eradicated, earth-damaging, act? Scientific sociopathy might fit in this instance – the U.S. was conducting a science experiment, attempting to study its new weapon on another “virgin” target as

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<sup>106</sup> Jack Niedenthal, *For the Good of Mankind*; The text and an audio recording of the Bikini anthem being sung is available here: <https://www.bikiniatoll.com/anthem.html>

<sup>107</sup> Jonathan M. Weisgall, “The Nuclear Nomads of Bikini,” *Foreign Policy*, Summer, 1980, No. 39, pp. 74-98.

Hiroshima and Nagasaki were constructed, while simultaneously destroying a society's way of being, both in the immediate moment and for decades to follow. But this pathological terminology is more a diagnosis of exhibited symptoms, rather than a codification of criminality. By purposefully relocating the Bikinians before dropping the bomb the U.S. avoided a genocidal act in its primary sense, yet the destruction of a people's living space that helped constitute their identity seems tantamount to a resulting cultural genocide. If terms like forced removal and cultural genocide only graze the edges of U.S. Army actions at Bikini Atoll, the legal categories fail to encapsulate the extent of environmental damage done to the Atoll, nor the suffering inflicted upon Bikini's people rendered homeless, starved, and transient.

Contemplations of the atrocity wrought upon the Bikini people are absent within many histories of "Operation Crossroads." The weapon test has been remembered as a moment of inter-service rivalry between the Army Air Force and Navy, a chance for the Truman administration and U.S. military officials to test their new weapon of mass destruction, an opportunity to impress the world's onlookers with a highly publicized display of the atom bomb's devastating capacity, and an experiment to learn more about the bomb's devastation to better dictate the terms of "peace" with the rest of the world. But rarely recognized are the "drones" that took center stage as knowledge producers in this act of scientific sociopathy.

The same drone technology designed originally for Operation Aphrodite became key tools of knowledge production used during the post-war U.S. atomic bomb testing at Bikini Atoll. The drone flight component to “Operation Crossroads” drew upon the technologies developed during Operation Aphrodite that transformed war-weary airplanes into remotely controlled robot planes. The bomb exploded at Bikini Atoll targeted a small fleet of decommissioned Navy ships as well as animals that were purposely exposed to the blast to study its effects upon flesh. Amidst the atomic explosion, drone operators flying in mother control planes pushed buttons to directing their remotely controlled airplanes to fly through the atomic bomb’s explosive mushroom cloud. The drone airplanes performed an impossible task for a manned flight toting Geiger counters and flying through the bomb’s blast to measure radiation levels.

An unofficial, soldier-made, report describing Operation Crossroads provides first-hand, graphic insight into the atomization of Bikini Atoll.<sup>108</sup> Primarily a collection of drawings and photos, the report’s author celebrated what Army soldiers considered a job well done. He listed the names of a small army of soldiers involved in the action in a sort of accreditation for the “successful” deployment of drones as an instrument of scientific discovery. U.S. drones had managed the humanly impossible – flying through the atomic bomb’s radioactive fireball – and returned to base seemingly unscathed. After

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<sup>108</sup> *A.A.F. Drone Unit*, booklet, 1946, Brian J. Donnelly Bikini Atoll Collection, The Museum of Flight Archives (Seattle, Washington).

the drones flew through the atomic blast and landed back at the Army base on Eniwetok, soldiers doused the drones in a chemical solution in an attempt to reduce the radiation levels onboard.<sup>109</sup> The soldiers who climbed on the drones to retrieve the radiation monitors encountered toxic radiation levels spurring cancers later in their lives.<sup>110</sup>

The soldier-made graphic archive made of the mission included a crude geographic mapping and depiction of the space, its technologies, and the soldier's military experience. A hand-drawn map of the U.S. Army's operating base on Eniwetok Atoll noted the location of military stations including "where the A-bomb is stored."

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<sup>109</sup> National Air and Space Museum Image Number NASM USAF-40540AC, Domestic Weapons Test, Crossroads, Drones, 1946, National Air and Space Museum Archives, United States Air Force Pre-1954 Still Photo Collection.

<sup>110</sup> Author conversation with National Air and Space Museum Archivist Roger Connor, August 2019.

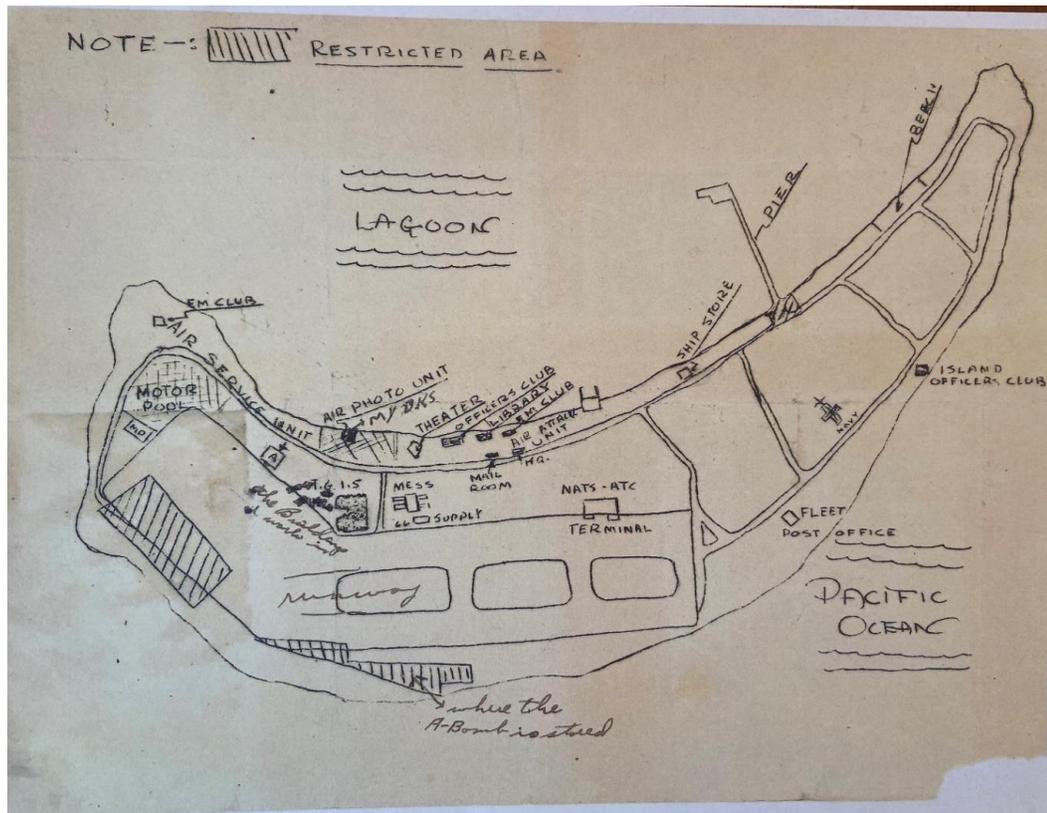


Figure 11. A soldier made map of the Army Air Force operating base at Eniwetok amidst preparations for atomic bomb testing at Bikini Atoll.

The same report rendered a cartoon history of the operation's atomic devastation from Washington through Dayton, Ohio's Wright Field to Bikini Atoll following stops at airfields in San Francisco, Honolulu, and other Pacific Islands along the way. The author demarcated each space on the map with drawings. A cloud of gears over Dayton, Ohio's Wright Field. A Hawaiian Hula 'olapa (dancer). The tail striped drone plane flying over the ocean and the planes' reduction to bees over Eniwetok.



Figure 12. The same report noted the travel route of drone technology from testing in Dayton, Ohio to operational use at Bikini Atoll.

The “baby” and “mother” referents to drones and control ships emergent during Operation Aphrodite remained in use and appeared painted on the airplanes flown at Bikini alongside an atomic bomb’s mushroom cloud. The air crews of Operation Crossroads also painted airframe art that dubbed themselves “the black sheep” of the Army Air Forces suggesting they were knowingly behaving badly at Bikini.



Figure 13. Airmen in the drone operation at Bikini Atoll dubbed themselves the “Black Sheep” of the Army Air Force. The “baby” and “mother” language for drone and control ship used during Aphrodite carried over to the drone operation at Bikini Atoll.

Control operators drawn from Wright Field to fly the drones through the atomic bomb's explosion included Lt. Col. Thomas C. Kelly who grimaced and squinted while struggling to direct a drone during a test flight at Eniwetok Island. One can only imagine what his face might have looked like while he was directing a drone into the atomic bomb's blast as control crews wore gas masks obscuring their heads during the mission. In-flight photos show, however, they did not wear protective clothing. Proximity to extreme danger and soldiers' resulting radiation exposure from the bomb was needed to maintain the drone's limited distanced radio wave connection for remote control.<sup>111</sup>



Figure 14. Left, a drone operator steers an aircraft from a distance in preparation for the atomic bomb test. Right, drone operators wore protective suits as they guided a drone through the atomic bomb's explosive cloud.

Airmen flying drones in the Second World War during Operation Aphrodite and Operation Crossroads were put near danger despite part of the drone's appeal being a

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<sup>111</sup> Lt. Col. Thoma C. Kelly's full title and position was as the Chief of the Controlled Airplanes Section at Wright Field, Dayton Ohio in charge of the Air Mobility Command Detachment with the Air Instrumentation and Test Requirement Unit sent to Bikini Atoll.

supposed distance from risk. Asked to fly bomb stuffed drone airplanes, pilots like Joseph P. Kennedy Jr. exploded and died flying a drone, while drone operators at Bikini encountered toxic levels of radiation as they maneuvered their remote-control airplane through the atom bomb's explosion. Shorn of claims to protect American lives, the drones of the Second World War proved to be instruments of mass destruction whether directly inflicting bombardment upon Germans or assisting in the study of nuclear war as the bomb's testing dislocated an entire people and destroyed their homeland.

The drone's use to fly through the atomic bomb's blast at Bikini Atoll foreshadowed how the two war weapons' relationship would intertwine during the "Cold War." Remote controlled airplanes had been imagined as weapons of mass destruction since their initial creation during the First World War. This violent fantasy was put into practice during the Second World War. While piloted planes remained the primary instruments of an American way of war centered on airpower the drone and its perceived utilities soon expanded beyond studying nuclear weapons to toting them.

## **Unmanly Powers: The 1960 U-2 Crisis, Gender Anxieties, and the Automation of United States Air Power**

“It can be said that a man of more heroic mold would have blown up his plane and committed suicide, but perhaps Powers couldn’t and certainly he didn’t do either.”<sup>1</sup>

This emasculating disparagement of captured Central Intelligence Agency pilot Francis Gary Powers published in the *Chicago Tribune* echoed a conversation that had roiled the United States and the World for months. On May 1, 1960, surface to air missiles fired by Soviet military forces shot-down pilot Powers while he flew a U-2 airplane over Russia amidst an attempt to photograph military installations. Pilot Powers miraculously survived his airplane’s destruction and a fall from the outer atmosphere. Yet, living appeared to many an effeminate and unpatriotic act that defied CIA dictates and the masculine entails of military service. The intelligence agency had provisioned Powers with a lethal injection. His U-2 airplane included a self-destruct mechanism. Eisenhower administration officials, international diplomats, and U.S. journalists pondered a morbid question: Why was Powers still alive? While Powers was under Soviet interrogation, popular audiences and intelligence officials grew anxious Powers might break under “brainwash” and unwittingly expose U.S. national security secrets. As American journalists and policy makers expressed anxieties over Powers’ performance and vulnerabilities, they constructed the pilot in the cockpit as an unmanly military liability.

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<sup>1</sup> “The Test of Soviet Fairness,” *The Chicago Tribune*, August 19, 1960, 12.

Imprisoned pilot Powers became an evidentiary pawn over the summer of 1960 as a major diplomatic summit in Paris collapsed and Soviet diplomats led an unsuccessful vote in the United Nations accusing the United States of committing aggression. By August, Powers faced trial in Moscow, pleading guilty to espionage and implicating the CIA and the United States. Far from a moment contained in time suggested by the labels “Crisis” or “Incident,” the scandal surrounding the Eisenhower administration’s covert aerial surveillance operations continued for months. Coming amidst the 1960 Presidential campaign, captured Powers functioned as both a real and imagined figure whose construction in public and private policy discourse impacted the institutions and technologies employed for U.S. foreign intelligence gathering.

The Soviet Union’s downing of a U-2 airplane has been most often reconstructed as diplomatic history told from the top echelons of national leadership. Many works tell a story of how the U-2 crisis disrupted Cold War international relations: the failed surveillance mission ruined the Four Power Summit held in mid-May 1960 that had brought leaders from the United States, the Soviet Union, Britain, and France together for the first time since the end of the Second World War to discuss the contentious joint occupation of Berlin and the threat of nuclear war. In Paris, arguments over U.S. aerial surveillance devolved into back-and-forth accusations between diplomats, leading the Russian delegation to flee the summit for French vineyards before returning home. A

potential moment for a “détente” in hostile international relations instead escalated tensions setting the stage for additional hot moments of the Cold War.

This essay draws upon and departs from that strand of historical literature. Powers’ downing and capture was not simply a cataclysm in the history of United States international relations. It was a moment when perceptions of gender and national technological capacity intimately intertwined. The anxieties surrounding captured Powers’ manhood had been primed by a prior decade in which nuclear war between the United States and Soviet Union was first imaginable and during which cultural anxieties shook American gender conceptions. Yet, most histories of the U-2 crisis or the U.S. surveillance state ignore this line of analysis instead focusing solely on the diplomatic and military realms.<sup>2</sup> Recent historical works posit Powers’ capture encouraged an embrace of surveillance satellites or drones.<sup>3</sup> Yet they fail to interrogate the meanings of

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<sup>2</sup> For analysis of the U-2 program in relation to domestic politics and military strategy see Michael S. Sherry, *In the Shadow of War: The United States since the 1930s*, Yale University Press, 1997, 217-226; and Russell Frank Weigley, *The American Way of War; a History of United States Military Strategy and Policy*, Macmillan, 1973, 435-442. For contextualization of the U-2 program within CIA operations see: Tim Weiner, *Legacy of Ashes: The History of the Central Intelligence Agency*, Doubleday, 2007, 158-160. For a first-hand account of the U-2 program’s operations from a former CIA photographic intelligence analyst see: Dino A. Brugioni, *Eyes in the Sky Eisenhower, the CIA, and Cold War Aerial Espionage*, Naval Institute Press, 2010; For a work that places the U-2 crisis in context with other moments in U.S. foreign policy history see Campbell Craig and Fredrik Logevall, *America’s Cold War: The Politics of Insecurity*, Belknap, 2012, 183-189; For narratives of the U-2 affair see David Wise and Thomas B. Ross, *The U-2 Affair*, Random House, 1962, and Michael R. Beschloss, *MAYDAY: Eisenhower, Khrushchev, and the U-2 Affair*, Perennial Library, 1987.

<sup>3</sup> Thomas P. Ehrhard, *Air Force UAVs: The Secret History*, Mitchell Institute Press, 2010; Brugioni, *Eyes in the Sky*.

the moment, instead taking at face value that diplomatic crisis and the U-2 airplane's newfound vulnerabilities to Soviet air defenses necessitated a technological change.

I analyze an archive made up of sources of both state and civilian provenance to engage with an expansive literature that considers discourses of gender and sexuality important factors in foreign policy reasoning.<sup>4</sup> Four years before the shooting down of the U-2 the Eisenhower administration considered the plane an invulnerable tool of knowledge production. Capable of flying above Cold War enemy's defenses, but not outside radar detection, the desire for "intelligence" through aerial surveillance provoked diplomatic antagonisms and eventually resulted in disaster. Yet, even when the Soviet military exposed the U-2's vulnerability by shooting it down many in the U.S. blamed Powers for an array of supposed failings as the primary threat to U.S. military operations. Recognizing the centrality of anxieties surrounding man and manhood alongside the technological fantasies accompanying the U-2 and other war machines helps make sense of the subsequent path paved in U.S. national security policy - the establishment of the National Reconnaissance Office - and the new agency's embrace of

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<sup>4</sup> There is a growing literature examining gender discourse and its intersections with foreign policy, military, and national security discourse. For some examples see: Frank Costigliola, "'Unceasing Pressure for Penetration': Gender, Pathology, and Emotion in George Kennan's Formation of the Cold War," *The Journal of American History* 83, no. 4, 1997; Robert D. Dean, "Masculinity as Ideology: John F. Kennedy and the Domestic Politics of Foreign Policy," *Diplomatic History*, 63rd ser., 22, no. 1, Winter 1998; Kyle A. Cuordileone, *Manhood and American Political Culture in the Cold War*, Routledge, 2004; Robert D. Dean, *Imperial Brotherhood: Gender and the Making of Cold War Foreign Policy*, University of Massachusetts Press, 2010; Miriam G. Cooke and Angela Woollacott, eds., *Gendering War Talk*, Princeton University Press, 2016.

“unmanned” means of aerial surveillance. The unmanning of Powers emerges not as the singular *cause* of the unmanning of aerial vehicle surveillance, but an important part of the *context* shaping the rationales for major policy changes employed by the Eisenhower administration.

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Critical theorist Joan Scott argues that state needs often produce gender constructs. War—the “expending of young lives to protect the state”—emerges as the most demanding of all state actions that draws upon socially constructed masculine expectations to protect women and children, serve a paternal national leader, and exhibit national strength.<sup>5</sup> For Powers, the demand imposed by the U.S. state to gather intelligence on its military rival’s missile developments had placed him in a U-2 cockpit over Russia, and equipped him with means of self-destruction in the case of operational failure. These state constructed material realities shaped the terms of gender critique Powers faced as a captured CIA pilot.

Powers’ masculinity faced criticism from an array of intersecting social and cultural constructions. Ideas about sexuality, religion, the human body’s vulnerabilities, and a war machine’s capabilities all infused the gendered discourse surrounding the

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<sup>5</sup> Joan W. Scott, “Gender: A Useful Category of Historical Analysis,” *The American Historical Review* 91, no. 5 (1986): 1071-1073.

captured pilot's manhood. Ideas about how Powers should have acted, how a "real man" would have performed, differed between who enunciated the gender critique. Popular writers at major news outlets carried distinct ideas about warfare, militarism, and man's place within these violent practices. While discourse in news media was predominately produced by men, some women readers offered dissenting opinions in letters to editors that challenged the suicidal expectations placed upon pilot Powers or challenged the CIA's actions calling for investigations into their practices around the world. Religious leaders also contributed to public discourse surrounding Powers by interrogating the morality of state sanctioned suicide. These alternate prescriptions for how Powers should have performed revealed that there were multiple conflicting conceptions to the ideal military man.

The varying masculine expectations reigned upon Powers are demonstrative of what Joan Scott has argued about gender, that "There is no essence of womanhood (or of manhood)" but rather "only successive iterations of a word that doesn't have a fixed referent and so doesn't always mean the same thing."<sup>6</sup> The plurality of idealized masculinities that emerged in domestic and international critiques of Powers' manhood also fits within gender theorist R.W. Connell's argument that competing conceptions of masculinity exist within a particular historical context.<sup>7</sup> As media commenters reacted to

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<sup>6</sup> Joan Wallach Scott, "Gender: Still a Useful Category of Analysis?" *Diogenes* 57, no. 1 (2010): 12.

<sup>7</sup> Raewyn Connell, *The Men and the Boys*, University of California Press, 2003, 10.

the revelation of Powers' capture and refusal to commit suicide, they presented differing expectations for how a CIA agent should have performed. Emerging amidst the "Lavender Scare" when state and societal efforts to secure ideal masculine servicemen culled gay men and men deemed "too effeminate" from military and government service, constructions of Powers' failures as a man by commenters in the U.S. public sphere refracted gender critique at the Eisenhower administration, the CIA, and the nation the pilot flew for.<sup>8</sup>

Six days passed between Powers' capture and the revelation he had survived his flight. When Nikita Khrushchev announced the CIA pilot was alive, the Soviet Premier also paraded before state media the spy's materiel.<sup>9</sup> Powers' equipment included a pistol, knife, food, water, compass, first aid kit, jewels, cash in an array of national currencies, and a silver dollar coin that hid a needle laced with a lethal neurotoxin. Photos of the U-2 airplane's crumpled airframe and its self-destruct mechanism were shown to Soviet state media alongside images of captured pilot Powers. Khrushchev had the U2 airframe's remnants placed on public display in Moscow's Gorki Park. He

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<sup>8</sup> Margot Canaday, *The Straight State: Sexuality and Citizenship in Twentieth-Century America*, Princeton University Press, 2009; David K. Johnson, *The Lavender Scare: The Cold War Persecution of Gays and Lesbians in the Federal Government*, University of Chicago Press, 2006; Christina S. Jarvis, *The Male Body at War: American Masculinity during World War II*, Northern Illinois University Press, 2010.

<sup>9</sup> Nikita Khrushchev, "Don't Play With Fire, Gentleman!" From concluding speech by N.S. Khrushchev at Fifth Session of Fifth Supreme Soviet of the U.S.S.R., May 7, 1960, printed in *No Return for U2: Truth About the Provocative Penetration of Soviet Air Space by an American Plane*, Foreign Languages Publishing House Moscow, 1960, pgs. 17-31.

also tested the lethality of Powers' unused poison pin by having it used on a dog, which died. Hoping to construct a political tool out of the first successful Soviet downing of a United States U2 airplane, Khrushchev disclosed the high salary Powers received from the CIA, insisting the operation revealed "how capital buys life, how it buys people."<sup>10</sup>

Powers' paraphernalia, survival, and juxtaposition to the U-2 airplane he flew formed the bases of arguments made by newspaper editorialists who interrogated the adequacy of the "spy-pilot's" performance as military man. Between May and August 1960, the harshest, and most common, rhetorical attack upon Powers centered on his refusal to commit suicide.

Writing for the nation's paper of record following the revelation Powers survived his CIA mission, Hanson W. Baldwin, *The New York Times'* military editor, asked "Why did the pilot survive?" and doubted Powers could answer "satisfactorily."<sup>11</sup> Baldwin was a prolific author having published more than 10 books on military affairs by 1960 including his then most recent work "The Great Arms Race" in 1958. The militant focus of Baldwin's work helps explain the ways he constructed Powers as a failed military man. Caught in the Cold War's nuclear standoff that posed an existential threat to the U.S., U.S.S.R., and the world, Baldwin escalated the expectation placed upon American servicemen to fight and die for their country into a fanatical demand for

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<sup>10</sup> Ibid, pg. 19.

<sup>11</sup> Hanson W. Baldwin, "Intelligence and Survival," *New York Times*, May 9, 1960.

self-sacrifice in service of the national interest. His rendering of Powers' failed performance shows how conceptions of human biology, religion, and the U2 war machine could all infuse into gender critique.

Baldwin's criticism of Powers blamed the human condition's "instinctive reaction" that "life was better than death" for leading the pilot down the disastrous path of self-preservation.<sup>12</sup> This consideration of human biology as obstacles to effective military performance hinted at the anxiety circling both the American public sphere and private policy conversations that the man in the cockpit was a military liability. The suicidal expectations Baldwin expressed reflected his perception that Powers had failed to "man up" to what he referred to as the "unwritten law of every secret intelligence agency" and avoid capture through suicide.<sup>13</sup> Baldwin argued it was the pilot's choice to survive, not the conduct of surveillance flights themselves, which caused "an international incident of unpredictable consequences" days before the Four Power Summit in Paris.<sup>14</sup> Baldwin's decision to blame Powers was questionable considering the downing of a U-2 plane enabled the Soviet Union to reveal and evidence American aerial espionage with or without a living pilot. Despite his suggestion that Powers should have killed himself, Baldwin recognized that asking him to do so raised a serious moral issue. He noted in his piece for *The New York Times* that "it is contrary to the

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<sup>12</sup> Ibid.

<sup>13</sup> Ibid.

<sup>14</sup> Ibid.

Judean-Christian and the American ethic to destroy one's own life."<sup>15</sup> Baldwin was among the first to point out a hypocrisy in the Eisenhower administration's claims to a "Judeo-Christian" religiosity while asking its spies to sacrifice themselves in contradiction those religions' tenets.

While Baldwin saw Powers as a cowardly failure the U2 airplane seemed to offer salvation for U.S. military preeminence. Seeking success in a moment of explosive failure, Baldwin constructed a dichotomy between man and machine that reclaimed the United States' exceptional technological abilities. Following his critique of Powers succumbing to self-preservative human instincts, he delineated how the U-2's accomplishments balanced out the pilot's shortcomings. The U-2's five years of aerial espionage proved it was "one of the most successful reconnaissance planes ever built." Contrasting Powers' flaws, the U-2 was exceptional. The plane had an "amazing high-altitude capability" of between 60,000 to 90,000 feet—far above any Soviet fighter jet. Its "high supersonic speed and maneuverability in very thin air" had enabled it to gain "a certain degree of invulnerability" to Soviet anti-air rockets. The downing of the plane only reinforced Baldwin's argument that American technical capacity outmatched the Soviets claiming their "feat of rocketry, despite the Soviet boasting about it, is not remarkable." Baldwin claimed the opposite was true. The Soviet downing of the U-2 at 65,000 feet proved their missiles had only just reached equivalency with American Nike-

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<sup>15</sup> Ibid.

Ajax missiles then in operation for seven years. To Baldwin, the exposure of American covert operations to the world may damage international negotiations, and the pilot operative seemed to have underperformed, but the U-2's demonstration of American air power's superiority provided a balancing silver lining, turning an apparent disaster into "the most successful reconnaissance espionage project in history."<sup>16</sup>

Some editorialists alluded to effeminacy and discipline failures as a determining factor in Powers' refusal to die. Willard Edwards, a columnist at the conservative newspaper the *Chicago Tribune*, did not explicitly accuse Powers of homosexuality, but dredged up the Lavender Scare's homophobic logics suggesting the possibility that the CIA's "glamor" drew many, including homosexuals constructed as "ripe for blackmail," into the agency.<sup>17</sup> In Edwards' opinion, improper sexual preference, along with the reigning psychiatric opinion that homosexuality was a mental illness, provided one possible explanation for why Powers failed to adhere to the "grim code imposed on all spies" and kill himself before capture.<sup>18</sup> Edwards' critiques veered beyond Powers to take aim at the Air Force and CIA. He attacked the military branch and intelligence

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<sup>16</sup> Ibid. Triumphant interpretations of U.S. actions with the U2 retained salience in the historiographical literature for decades, for one explicit example see: Herbert J. Friedman, *What America Did Right: The Weapon Systems, Events, and Leaders That Brought Us to Victory in the Cold War*, University Press of America, 1999, 17-18.

<sup>17</sup> Willard Edwards, "Spy Admission Spills a Secret," *Chicago Tribune*, May 12, 1960. On the construction of gays and lesbians as blackmailable national security threats, see Johnson, *The Lavender Scare*.

<sup>18</sup> Edwards, "Spy Admission Spills a Secret," *Chicago Tribune*.

agency for failing in its disciplinary efforts, lamenting Powers had not been “sufficiently indoctrinated to commit suicide rather than surrender.”<sup>19</sup> He insisted that the officials responsible for training Powers had failed and needed to be “punished.”<sup>20</sup> Powers’ survival not only suggested the human error of instinctive self-preservation, but the apparent limits of U.S. disciplinary regimes to control human agents. Despite Air Force and CIA training attempting to forge Powers into a functional and obedient man machine, his refusal to commit suicide was exacerbated in Edwards’ view by the U2’s self-destruct mechanism that offered Powers another means to achieve an ostensibly heroic death as martyr for the United States.<sup>21</sup>

While many journalists attacked Powers for refusing to kill himself, some defended his decision to survive, enunciating a competing conception of the military man’s ideal performance. Perhaps due to their proximity to federal power, the *Washington Post’s* reporting was more sympathetic to Powers, the Eisenhower administration, and the CIA. *Post* reporters Jack Anderson and Jack G. Norris pointed to a “survival kit” of medical supplies found in Powers’ possession as evidence the CIA had equipped him for more than suicide in the case of operational failure.<sup>22</sup> Norris wrote

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<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

<sup>21</sup> Ibid. Journalists like Edwards who critiqued Powers’ survival were unaware that the U-2’s self-destruct mechanism had a timed delay designed to destroy the plane and spare the pilot.

<sup>22</sup> Jack Anderson, “U.S. Heard Russians Chasing U-2,” *The Washington Post* (Washington D.C.), May 12, 1960, ProQuest Historical Newspapers.

that “Actual spies are supposed to kill themselves to avoid torture or disclosure of secrets...” but questioned whether Powers and other U-2 pilots drawn from the U.S. Air Force considered themselves “undercover agents.” Norris posited that Powers was a serviceman in transition whose previous identity as an Air Force pilot only called for him to risk his life, not willingly sacrifice it. Norris also forgave Powers for disclosing his mission details noting “some very effective ‘truth serum’ drugs now exist.”<sup>23</sup> Though *Washington Post* reporters refrained from critiquing Powers’ performance or denigrating his manhood, their explanations for his actions—survival gear and truth serums—nonetheless suggested that human agents were less than ideal instruments for covert operations, in need of life sustaining supplies, and susceptible to chemical manipulation.

Religious leaders wrote letters to editors critiquing the suicidal tenets of CIA policy. One man’s “manly man” was another man’s blasphemer. In mid-May, Dr. Oswald Hoffman—the public relations director of the Lutheran church Missouri synod – wrote to the *Chicago Tribune* from Frankfurt Germany to express his, and European Christendom’s, shock. Hoffman reported the revelation of U.S. espionage was no surprise to him or the German Christians he spoke to. But “the report that the pilot was apparently ordered to take his own life” struck them as immoral.<sup>24</sup> Hoffman’s letter held its own contradictions. Rather than blaming Powers as the source of international strife

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<sup>23</sup> John G. Norris, "New Details on U2 Indicate Nature of Future U.S. Spying," *The Washington Post* (Washington D.C.), May 13, 1960, ProQuest Historical Newspapers.

<sup>24</sup> "Shocked by Order," *Chicago Tribune* May 16, 1960.

Hoffman seemed to accept espionage was a normal state activity, yet wanted it conducted in a moral fashion. He intimated that the suicidal demands encouraged by the CIA threatened to undercut the image of the United States “as a standard for righteousness and justice” in the world without a hint of irony that spying itself might tarnish the United States’ self-righteous veneer.<sup>25</sup>

Religious leaders rose moral objections to spying and state sanctioned suicide while simultaneously giving their blessing to U.S. covert operations. The Associated Press’ religion writer George W. Cornell surveyed the opinions of Jewish, Protestant, and Catholic theologians concerning the CIA’s U-2 spy flights. These leaders expressed contradictory opinions that “condoned the practice while deploring it.” A printed quote from Rabbi Robert Gordis exemplified the tension within theologians’ opinions claiming, “it’s an immoral act for what we think is a moral purpose – the defense of our country and ideals.”<sup>26</sup> As religious leaders were forced to reckon with their nation’s pursuit of world hegemony, they lamented that the CIA’s methods violated doctrinal tenets, yet found they could live with the suicidal policy.

In late-May, conservative intellectual journal *National Review* pointed to alternate masculine ideals than the suicidal expectations expressed in other publications. *National Review* senior editor James Burnham moved past discussing the suicide needle in his

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<sup>25</sup> Ibid.

<sup>26</sup> “Morality of Spying,” *Durham Morning Herald*, Associated Press, Vol. LXV, No. 310, May 28, 1960.

editorial on Powers' capture instead interrogating the pilot's failure to violently resist Soviet capture.<sup>27</sup> Burnham's fascination focused on the weapons the CIA provided its agent. He asked, "If Powers possessed a gun and knife, why didn't he use them?" Burnham expected an American military man to exhibit aggressive violence against his nation's foes. Questioning Powers' masculine performance, Burnham asked: "Why didn't he fight to avoid capture by the jolly peasants, and get into the nearby mountains? The chances were a million to one against him? Men have fought on shorter odds than that. And if he died in that fight, he died a hero and his secrets died with him."<sup>28</sup> The conservative journal posited that real men did not kill themselves, or accept capture, but rather fought to the end despite impossible odds. Burnham asserted a hyper-masculine expectation of American servicemen's murderous capacity to defeat an inordinate number of civilian Communist foes, or at least die trying, and avoid traitorous surrender and revelation. Demanding the superhuman in service of a superpower, the ideal spy constructed in the *National Review's* pages was so far removed from reality it seemed to mirror the abilities of the murderous, globetrotting, lothario character James Bond. Ian Fleming's spy character was absent from Burnham's analysis of Powers, but Bond's emergence in annually released novels from 1953 to 1960 had helped lodge the

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<sup>27</sup> James Burnham, "The Case of the Missing U-2," *The National Review*, New York, May 21, 1960, OpinionArchive. Burnham, once a Marxist theorist who had co-written pamphlets with the exiled Russian Revolutionary Leon Trotsky, fit within William F. Buckley's repeated recruitment of former leftist intellectuals turned critics of Communism to the *National Review's* editorial board.

<sup>28</sup> James Burnham, "The Case of the Missing U-2."

ultraviolent image of covert agents within the zeitgeist of the 1950s into 1960. These violent fantasies were later elaborated by *National Review's* founder William F. Buckley who re-imagined the Russian capture of a U-2 pilot in his spy novel *Marco Polo, if You Can*, in which he replaces Powers with the protagonist Blackford Oaks, a fictional CIA agent who shares James Bond's capacities for violence and womanizing.<sup>29</sup>

*National Review* editor Burnham ignored the implications of the acts his violent imagination conjured Powers performing. Already caught in what Khrushchev considered an aggressive territorial violation, had Powers fought off and potentially killed his civilian captors he would have escalated the calamitous event's impact on international relations. Had Powers used the pistol or knife in his possession, his violent actions would have escalated the existing crisis. By emasculating Powers for his passive surrender, Burnham and the *National Review* asserted the legitimacy of violence against America's Cold War enemy, no matter the situation or outcome.<sup>30</sup>

Burnham echoed other media commenters who extended Powers' perceived effeminacy to the CIA and Eisenhower administration. The *National Review* editor argued the CIA's bumbling response to Powers' capture seemed to reveal America's

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<sup>29</sup> William F. Buckley Jr., *Marco Polo, If You Can*, Doubleday, 1982.

<sup>30</sup> This line of analysis is indebted to historian Carol Cohn, who in her study of gender dialectics within the national security intelligentsia emphasizes the quieting role of emasculating discourse. She argues reducing the decision to use force to a purely masculine construct shuts down considerations of "prudence, thoughtfulness, efficacy, (or) 'rational' cost-benefit calculation." See: Carol Cohn, "Wars, Wimps, and Women: Talking Gender and Thinking War," in *Gendering War Talk*, 226-246.

intelligence agency as “an organization without either strong faith or clear policy, directed by stuffed shirts and bureaucrats, staffed too often by routine clerks plus activist hired hands.” Burnham’s characterizations suggested that CIA staff were effete pencil pushers removed from the ultraviolent masculinity the *National Review* favored. With such men helming America’s Cold War struggle Burnham questioned whether “such an organization is not capable of sustaining a continuous war of the kind fought by the Communist World Empire?” Burnham’s claim of CIA staffers leading “soft” lives infused the blame he placed on Powers for failing to fight and die like a man.<sup>31</sup> Despite the CIA’s aggressive pursuit of military intelligence through U-2 flights over other countries, militant critics like Burnham questioned the agency’s ability to wage the Cold War.<sup>32</sup>

Juxtaposed to the ostensibly cowardly and incapable pilot Powers was the U-2 airplane. Amidst his ridicule of Powers and the CIA the sole compliments Burnham could muster went to the U-2. Burnham constructed the U-2’s capabilities as all its own shorn of its operative pilot or intelligence agency. He argued “the U-2” has “carried out unscathed for four years one of history’s most remarkable intelligence campaigns” insisting “they have opened the skies that all the might and cunning of the Soviet Union

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<sup>31</sup> K.A. Cuordileone has closely analyzed how the terms “soft” and “hard” signaled a preoccupation with masculinity and a “cult of toughness” within U.S. Cold War political culture, see K.A. Cuordileone, *Manhood and American Political Culture in the Cold War*, Routledge, 2005.

<sup>32</sup> Burnham, “The Case of the Missing U-2,” *The National Review*.

strove to keep shut” while ridiculing “the boasted Soviet defenses” that had taken “four years to bring down a single plane.”<sup>33</sup> Burnham concluded his feigned pleasure with the U-2, declaring “Let us have more of such defeats, please!”<sup>34</sup> His self-congratulations of American technological capacity made sense within a Cold War structured around competing superpower’s continuous push to invent new militant technologies – nuclear weapons, intercontinental ballistic missiles, orbital satellites – all made to facilitate a more effective destruction of the enemy. Recent Soviet technological accomplishments had given rise to perceptions that the U.S. was falling behind. Sputnik launched in 1957 demonstrating Soviet rocket and satellite capabilities. Presidential hopeful John F. Kennedy attacked the Eisenhower administration for allowing a disadvantageous “missile gap” to emerge between the U.S.S.R. and U.S. The popular debates about pilot Powers’ vulnerabilities in public discourse echoed anxieties surrounding the “human factor” in air operations that had become a central concern for aeronautical scientists manifesting the machines of Cold War during the 1950s.

Popular discourse in the U.S. public sphere critiqued CIA pilot Powers for his performative failings, or human limitations including a survival instinct, while lauding the U-2 airplane’s capabilities for aerial intelligence gathering. A distinct yet intertwined

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<sup>33</sup> Ibid.

<sup>34</sup> Ibid.

discourse concerning all sorts of problems rooted in the “human factor” of air operations had emerged in the 1950s amidst a transnational exchange of technology. Scientists in North Atlantic Treaty Organization (NATO) nations began formally sharing their aeronautical research and development work in 1952 when NATO’s Military Committee created an Advisory Group for Aeronautical Research and Development (AGARD). Headquartered in Neuilly sur Seine, France, this new NATO institution’s self-described “mission” was “to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace” to work together towards an array of research questions. Among the leading scientists brought together through AGARD membership were figures like Hungarian American aerospace engineer Theodore von Karman who had founded the Jet Propulsion Lab at the California Institute of Technology. AGARD’s institutional goals included: “Exchanging of scientific and technical information; Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture;” and “Improving the co-operation among member nations in aerospace research and development.” Scientific institutions in NATO nations conducted and published studies on aerospace technologies to advise NATO’s Military Committee on military aircraft.<sup>35</sup> Pilots’

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<sup>35</sup> “AGARD Index of Publications, 1952-1970. Vols I. & II.,” Advisory Group for Aerospace Research and development, North Atlantic Treaty Organization, published 1972-1974, Linda Hall Library.

performance and the “human factor” of flying emerged as a central research concern in the years before Powers’ downing and capture.

Early research initiatives for the NATO Advisory Group for Aeronautical Research and Development emphasized integrating research universities and their scientific personnel into solving key research tasks concerning “the development of weapons and weapon systems.”<sup>36</sup> An index of government departments, industrial research organizations, universities, professional institutions, and private organizations producing sources of aeronautical interest in NATO countries was compiled and translated into an array of languages. Organized as a means of exchanging cutting edge research in aeronautics between NATO member nations, scientists within AGARD spent much of the 1950s researching an array of issues that addressed questions of cybernetics concerning the relationship between pilot and aircraft in flight alongside research studies of pilots’ discipline and bodily capabilities.

In 1953, a series of papers presented by scientists from the U.S., U.K., France, Canada, and the Netherlands addressed the “Methods and Criteria for the Selection of Flying Personnel” at a symposium in Paris.<sup>37</sup> Focus lay on the physical and psychological tests for finding airmen and assessing their potentials as pilots. One paper

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<sup>36</sup> Ibid.

<sup>37</sup> “Methods and Criteria for the Selection of Flying Personnel,” symposium held 23-25 February 1953, Paris, France. North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development, Linda Hall Library Archives.

from a French engineer reflected on the French Air Force's adoption and implementation of the U.S. Air Force's selection tests for pilots developed during the Second World War offering one example of how ideas about airmen transferred between national militaries.<sup>38</sup>

In 1955, a symposium in the Netherlands drew an assortment of papers addressing the factors of "human engineering" for aviation. Topics emphasized the interconnection of "Anthropometry and Human Engineering" emphasizing the importance of pilots' body measurements for modelling aircraft cockpits. Similar papers emphasized the "Human Factors in Aircraft Design," "Body Measurements in Relation to Work Spaces in Aircraft," or alternatively "Adapting the Aeroplane to the pilot." Some papers focused more on the medicinal needs of airmen and the potential bodily dangers of flying. One research paper on "Consequences of Loss of Cabin Pressure" analyzed the effects of air blasts upon the human body, noting the resultant prevalence of gas expansion within hollow organs, lung damage amidst explosive decompression, and anoxia - a lack of oxygen supply to the brain. Pilots' minds mattered alongside their bodies. The topic of the "Psychological Aspects" of aviator service was studied by U.S. Navy aviation researchers who shared their findings at the research conference in the

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<sup>38</sup> Ibid.

Netherlands.<sup>39</sup> Anthropometric studies measuring pilots' bodies and minds first emerged in U.S., British, and French research labs, but would increasingly transfer to the air forces of NATO nations like Turkey and Greece that were expanding their capacities to wage air war.<sup>40</sup>

Similar attention to the labor of piloting and the relationship between airman and flying machine carried across the AGARD conference programs of the late 1950s. A study entitled "Measurement of Pilot Mental Effort" written by engineers at the Wright-Patterson Air Force Base in Dayton, Ohio tried to measure the "factors affecting a pilot's ability to cope with situations demanding effort." Expressing the stakes of their research the report's co-authors argued "One major problem facing aeronautical engineers today is whether the human factor should be maintained as a variable in aircraft systems of the future; if it is to be maintained so, then there is surely a need of techniques for measuring the state of pilots and crews during operations." Posing the question of whether automating the "human factor" from air operations was desirable, the study's authors were not yet ready to push for total mechanization, instead suggesting their

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<sup>39</sup> "Anthropometry and human engineering a symposium on anthropometry, human engineering and related subjects conducted by the AGARD Aeromedical Panel on 3 and 4 May 1954 in Scheveningen, The Netherlands," North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development, Medical Panel, published 1955, Linda Hall Library Archives.

<sup>40</sup> Hans Theodore Edward Hertzberg, et. al., "Anthropometric survey of Turkey, Greece and Italy," Advisory Group for Aeronautical Research and Development, North Atlantic Treaty Organization, Linda Hall Library Archives, 1963.

paper helped decide “what to do about the human element in future aircraft systems.” Their aim was to better construct the man-machine. They argued “The increasing complexities of flight necessitate that man should function as nearly as possible like a computer.” Yet, they recognized that “the exactness of man’s function” was complicated by “ever-growing stresses in new and unexplored areas which will be imposed on crews of future aircraft systems.” Airmen would need to learn to operate airplanes that were becoming more complex over time. These aeronautical engineers argued that pilots could not yet be automated out of air operations, instead pushing for humans to be made as machine-like as possible.<sup>41</sup>

Far from a decided opinion, many research papers presented at conferences for NATO’s Advisory Group for Aeronautical Research and Development critically interrogated the limitations of the human factor upon air operations yet fell short of calling for the automation of pilots. One study on U.S. Navy pilot actions during operational flights of high-performance jet aircraft introduced its findings with a blunt disparagement of airmen: “Engineers have begrudgingly admitted that at the present time and for some time in the future, man must usually be included in the control link of experimental and operational aircraft. Man has been looked upon as the weak link due

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<sup>41</sup> Sanford I. Cohen and Albert J. Silverman, “Measurement of Pilot Mental Effort,” Report 148, Advisory Group for Aeronautical Research and Development, North Atlantic Treaty Organization, presented at the tenth meeting of the Flight Test Techniques Panel, 20-24 May, 1957, London, England.

to his physical and psychological sensitivity to the abnormal situations and even the usual sensations of flight." The authors argued, however, that the sentiment that "man is the weakest link in our current series of high-performance jet airplanes can certainly be a point of conjecture, especially when one reviews the numerous accidents caused by material failure or mal-maintenance and mal-servicing of the high complex systems encountered in modern aircraft." In these scientists' view, human limitations were readily apparent, yet far from the singular defining problem of military air operations. The authors' concluding suggestions again pushed the boundaries of the man-machine claiming, "Our ultimate goal" was to have the "pilot as fully instrumented for in-flight monitoring and post-flight analysis, as we now have our airplanes." Resultant "gains of knowledge" from the instrumentation and monitoring of pilots aimed to "assure peak performance" on missions "and help prevent costly aircraft accidents with attendant loss of life and fantastically expensive hardware." Rendering the pilot's body legible was supposed to make handling stressful operational moments more physically feasible for airmen.<sup>42</sup>

Recognition of other operational limitations imposed by the human factor guided AGARD research. Studies of airmen's mental and bodily fatigue included work

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<sup>42</sup> Frank H. Austin, "Physiological Instrumentation of Pilots for Test and Operational Flights in Navy High Performance Jet Aircraft," Report 240, Advisory Group for Aeronautical Research and Development, North Atlantic Treaty Organization, presented at the Fourteenth Meeting of the Flight Test Techniques and Instrumentation Panel, 11-15 May 1959, in Athens, Greece, Linda Hall Library Archives.

examining the “Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Military Flight Operations” which drew on an assortment of sources to emphasize that sleep loss was a common problem for airmen that hindered their flying effectiveness.<sup>43</sup> Several studies in 1959 concerned the “Medical Aspects of Flight Safety” including papers like “Blinking of Eyes, A Possible Cause of Air Accidents” that investigated the requisite bodily function of blinking as a hinderance to pilots’ ability to fly.<sup>44</sup> A French study entitled “Contribution to the Study of Accidents of Undetermined Origin, Stressing the Importance of the ‘pilot-Aircraft’ Complex” presented at a 1959 conference perhaps best expressed the reigning question guiding much AGARD research and development efforts: “The adaptation of man to machine is considered to remain as a perennial problem in aviation.”<sup>45</sup>

Pilot Powers’ downing in May 1960 came after a near decade of NATO aeronautical research and development premised on the need to rely less and less on the human factor in air operations. Powers’ capture and the resultant political scandal in the

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<sup>43</sup> “Rest and Activity Cycles for the Maintenance of Efficiency of Personnel Concerned with Military Flight Operations” CP 74, listed in *AGARD Index of Publications 1952-1970*, Part I: Abstract Section, Advisory Group for Aerospace Research and Development, North Atlantic Treaty Organization, Linda Hall Library Archives.

<sup>44</sup> “Medical Aspects of Flight Safety,” AG 30, 1959, and “Blinking of Eyes, A Possible Cause of Air Accidents,” AG 30/7, 1959, listed in *AGARD Index of Publications 1952-1970*, Part I: Abstract Section, Advisory Group for Aerospace Research and Development, North Atlantic Treaty Organization, Linda Hall Library Archives.

<sup>45</sup> “Contribution to the Study of Accidents of Undetermined Origin, Stressing the Importance of the ‘pilot-Aircraft’ Complex,” 1959, AG 30/13, listed in *AGARD Index of Publications 1952-1970*, Part I: Abstract Section, Advisory Group for Aerospace Research and Development, North Atlantic Treaty Organization, Linda Hall Library Archives.

public sphere amplified longstanding anxieties about human vulnerabilities that had encouraged research and development fantasies reaching for “pilotless,” “drone,” or “unmanned,” aerial vehicle technologies. The Eisenhower administration’s considerations for the future of aerial surveillance in the wake of the U-2 airplane’s downing thus operated in the context of the disparaging discourse surrounding Powers’ masculine failures abounding in the U.S. public sphere, alongside the preceding years of NATO’s aeronautical research and development which saw scientists construct airmen as an inherent limitation for air operations.

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Figures in the Eisenhower administration paid close attention to the debates surrounding pilot Powers and tried to shape public discourse themselves. Staff in the Department of State, CIA, and Eisenhower himself reviewed newspapers’ publications about U-2 operations. The popular critiques of Powers shaped the attitude of the President towards the captured pilot. At a National Security Council meeting on May 24, CIA director Dulles delivered a long presentation on “Significant World Developments Affecting U.S. Security.”<sup>46</sup> Dulles’ topics ranged from projections of “Khrushchev’s next steps,” speculation about internal divisions between Soviet political and military leaders over how to handle Powers and U-2 surveillance flights, alongside discussion of a

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<sup>46</sup> “Discussion at the 445<sup>th</sup> Meeting of the National Security Council, Tuesday, May 24, 1960,” Dwight D. Eisenhower Library, Eisenhower, Dwight D.: Papers as President, 1953-61 (Ann Whitman File), NSC Series, Box No. 12, Folder: 445<sup>th</sup> Meeting of NSC May 24, 1960, 2-4.

statement from the Chinese government that the news of U-2 overflights was not surprising because China had its own experiences with the U.S. aerial surveillance planes.<sup>47</sup>

Eisenhower interrupted Dulles during his national security briefing to speak about the administration's handling of the U-2's downing. Eisenhower expressed concerns about an impending Congressional investigation into the U-2 program then delineated what administration figures should and should not say publicly about covert operations. He then turned to interrogating CIA director Dulles about his agency's captured pilot. The administration had operated under the presumption that no pilot could survive a U-2 downing caused by mechanical failure or enemy anti-aircraft fire. Presented with the new reality of Powers' survival, Eisenhower probed Dulles about the pilot's prior flight record then moved into echoes of the performance critiques that had been circulating the U.S. public sphere. The President insisted he thought Powers was trained to self-destruct his plane rather than allow it to fall into Soviet hands. He complained that "apparently Powers had started talking as soon as he touched the ground" rather than withhold sensitive information about his covert mission. He also blamed Powers for failing to destroy other incriminating evidence including maps of his flight plan.<sup>48</sup>

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<sup>47</sup> Ibid, 2-5.

<sup>48</sup> Ibid, 6.

Eisenhower's questioning placed Dulles in the position of having to defend Powers' performance because the pilot's perceived failures reflected poorly upon the intelligence agency's director. Eisenhower's interrogations and accusations against Powers led Dulles to contextualize Powers' extensive mission experience, clarify the plane's self-destruct mechanism was not meant to kill its pilot, and deny that Powers hand-delivered his flight-plan to his captors. The accusatory tone of the President's questions nonetheless suggested his disappointment with Powers' performance. As the meeting progressed and re-criminations subsided Eisenhower summarized his feelings about U-2 operations at that late-May moment, saying: "we had been the leader for peace in the world. In order to remain the leader, we must remain strong and in order to be strong we must obtain intelligence information."<sup>49</sup> Even when foreign intelligence gathering missions were threatened by the vulnerabilities of man and machine a panoptic imperative seemed to necessitate the U.S. pursuit of information about global adversaries.

While Dulles defended Powers in private conversations with the president, the CIA director spoke with more derision about the pilot's performance to U.S. politicians. On May 31, after a month that saw the media flail Powers and by extension the CIA as incompetent and unmanly, Dulles testified to the Senate Foreign Relations Committee about U-2 operations. As the CIA director tried to justify his actions, he turned to the

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<sup>49</sup> Ibid, 10.

technical realm, relying upon claims to the U-2's capabilities to counteract the criticism directed at pilot Powers' failed performance. Dulles' arguments thus fashioned what might be termed "techno-masculinity" as a way for the U.S. to reclaim and secure American manhood.

Powers' crash exposed the CIA's legally objectionable aerial espionage regime leading Dulles to insist in Senate testimony his true desire all along was for aerial surveillance "sanctioned on a mutual basis."<sup>50</sup> Dulles framed the United States as a scorned suitor in the realm of diplomatic relations. He reminded the senators that the Eisenhower administration had previously proposed a mutual arms inspection regime with the Soviet Union called "Open Skies" and blamed the Soviets for rejecting the offer.<sup>51</sup> Dulles defended the CIA's surveillance flights with the U-2 insisting foreign intelligence gathering could not be "shackled by traditions" instead arguing "I submit that we live in an age when old concepts of the limits of 'permitted' techniques for acquiring information are totally outdated. They come from the horse and buggy days."<sup>52</sup> Dulles contested the concept of territorial sovereignty arguing it was an old-world idea outdated in the day of the U-2 plane's "high-performance" capacity for

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<sup>50</sup> *Statement by Mr. Allen Dulles Director of Central Intelligence to the Senate Foreign Relations Committee on 31, May 1960* (testimony of Allen Dulles), CIA digital reading room, 4.

<sup>51</sup> Historian Ira Chernus has interrogated the Eisenhower administration's "Open Skies" proposal noting the inspection regime would have imposed terms far more favorable to the U.S. than to the U.S.S.R, see Ira Chernus, *Apocalypse Management: Eisenhower and the Discourse of National Insecurity*, Chapter 8 "Open Skies," Stanford University Press, 2008, 127-145.

<sup>52</sup> *Statement by Mr. Allen Dulles*, 4

surveillance.<sup>53</sup> While Dulles ostensibly pleaded for an expansion of international regulations through the policy of Open Skies, he contradicted himself by insisting international law was irrelevant.

As Dulles discussed the U-2 airplane's merits he constructed an American masculinity through claims to the nation's technological power. Aiming to combat the unmanly images recently ascribed to Powers and the CIA, his gendered valuation of the U-2 spy-plane program reached for what I term a techno-masculinity. In Dulles' macho rhetoric, the U-2 performed a castrating role against the Soviet military by penetrating their airspace with "impunity," rendering "their vaunted fighters...useless," gathering vital military intelligence, and demonstrating Soviet "ground-to-air missile capability was inadequate."<sup>54</sup> Dulles claimed the U-2 airplane held great psychological value insisting years of U.S. overflights conducted with impunity had "frustrated" the Soviet's military might.<sup>55</sup> To him, U-2 flights had "made the Soviets less cocky about their ability to deal with what we might bring against them."<sup>56</sup> After a month that saw the media denigrate Powers' manhood—and by association the manhood of all CIA figures—Dulles emphasized the U-2's "high flying, high performance" capabilities to reassure

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<sup>53</sup> Ibid.

<sup>54</sup> Ibid, 10.

<sup>55</sup> Ibid, 9-10.

<sup>56</sup> Ibid, 10.

senators that the intelligence agency was cocksure about its contribution to the Cold War.

Four years of radar-detected U-2 flights passed yet Khrushchev had never told his people about U.S. surveillance flights. Dulles claimed this showed the Premier was afraid to reveal Soviet weakness and American “capability.” Claiming another psychological value for the U-2 program, Dulles declared: “His [Khrushchev’s] frustrated military... are far less confident today than they otherwise would have been.”<sup>57</sup> Dulles argued in a cold war founded on competing technological power regular demonstrations of America’s “relative strength” reinforced Soviet weakness to the world. Dulles thus constructed Powers’ downing not as failure, but rather a moment that had helped maintain American alliances by exemplifying the power disparity between the two superpowers through the U-2’s years of overflights. Despite the U-2’s first downing, Dulles’ senate testimony spun the machine’s failure into a success that reclaimed the United States’ masculinity.<sup>58</sup>

Dulles declared the U-2 program “one of the most valuable intelligence collection operations that any country has ever mounted at any time.”<sup>59</sup> The U-2 airplanes and their pilots took numerous photographs of the Soviet Union’s bomber force production, airfield locations, nuclear weapons storage facilities, intercontinental ballistic missile test

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<sup>57</sup> Ibid, 10.

<sup>58</sup> Ibid, 9-11.

<sup>59</sup> Ibid, 5.

program, atomic energy development, and nuclear testing grounds. Yet while Dulles and Eisenhower rationalized the U-2 program as a defensive check on a Soviet surprise nuclear attack “the most important intelligence obtained” proved the program’s offensive and retaliatory value “affecting the tactics of the United States deterrent air strike force.”<sup>60</sup> Thanks to the U-2’s photographic evidence the United States Strategic Air Command could now “make a more efficient and confident allocation of aircraft, crews and weapons” in the case of nuclear war.<sup>61</sup>

Dulles defended Powers from the attacks he received in the media while still suggesting the pilot had underperformed and was a liability as Soviet captive. He characterized Powers as a capable pilot who previously flew “technically similar flights” demonstrating a “high degree of reliability.”<sup>62</sup> Dulles emphasized Powers was trained as a pilot, not as an “agent,” and that agent training was “incompatible” with the “technical demands” of flying an airplane. Dulles insisted the lethal injection Powers carried was only a means of death made available but not mandated for use. Dulles’ efforts to absolve Powers of wrongdoing served equally to rehabilitate the CIA’s image for choosing to employ him and make its policies seem less macabre.<sup>63</sup> Despite these

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<sup>60</sup> Ibid, 9

<sup>61</sup> Ibid, 9

<sup>62</sup> Ibid, 13; Former CIA intelligence analyst Dino Brugioni notes Powers was among the CIA’s most experienced U-2 pilots having previously flown over Russia and other states in the Soviet Union. See Brugioni, *Eyes in the Sky*, 346.

<sup>63</sup> *Statement by Mr. Allen Dulles Director of Central Intelligence*, 12-15.

defenses of Powers, Dulles insisted the pilot's most important "duty" was the "destruction of the aircraft and its equipment," something he said it was unclear Powers had attempted.<sup>64</sup> Dulles disclosed to Senators that Powers received multiple trainings in "escape and evasion," and was expected to "attempt escape and evasion so as to avoid capture," but had instead been captured immediately after his parachute descent near Sverdlovsk, Russia. Dulles claimed CIA policy instructed Powers to honestly discuss his mission if captured to avoid a torturous extraction of information, yet also expected him "to delay as long as possible the revelation of damaging information," contradictory actions which might encourage captors to use force.<sup>65</sup>

Dulles concluded his remarks to the Senate Foreign Relations Committee professing his greatest worry about Powers was that by the time the pilot faced trial for espionage, the Soviets "will have had a more thorough opportunity for a complete brainwashing operation." Dulles framed the brainwashing allegation as a defense against what Powers' testimony would reveal about CIA operations insisting whatever he uttered would be "a mixture of truth and fiction."<sup>66</sup> By insisting Powers would be "brainwashed," Dulles enunciated a meaningful phrase still new to U.S. discourse that insinuated Powers' incapacity to resist mental domination and exploitation.<sup>67</sup> Compared

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<sup>64</sup> Ibid, 12-15.

<sup>65</sup> Ibid.

<sup>66</sup> Ibid, 14-15.

<sup>67</sup> Ibid, 12-15

to Dulles' rave review of the U-2's abilities and accomplishments, the man piloting the plane seemed a security liability.

Anxieties surrounding American masculinity and patriotism reached new heights during the Korean War when the term "brainwashing" first entered U.S. discourse. After combat in Korea ceased in 1953, twenty-three American prisoners of war refused repatriation shocking contemporary U.S. audiences who considered it traitorous that soldiers would choose to live in Communist China over the United States. U.S. POWs pointed to the Jim Crow South's regular violence against African-Americans, unequal distributions of wealth across America, and the recent controversial execution of Julius and Ethel Rosenberg insisting they did not want to return to the land of "KKKism, capitalism, and McCarthyism." A growing consensus emerged in the press and military that many of the 4,400 imprisoned U.S. servicemen returning from the Korean War had faced political indoctrination while in captivity.<sup>68</sup>

The Korean War POW experience was grueling. Soldiers faced forced marches across immense distances that left many dead. Those who reached prison camps suffered through inadequate food supplies, poor sanitation, and physical abuses. Ideological reeducation accompanied these horrendous conditions. Some prisoners

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<sup>68</sup> Susan L. Carruthers, *Cold War Captives: Imprisonment, Escape, and Brainwashing* (Berkeley: University of California Press, 2009), 174-179.

willingly read communist texts and participated in pro-communist discussion groups. Others required forceful coercion. It is difficult to determine whether soldiers' interest in communism was genuine or if ideological cooperation stemmed from desires to avoid punishment and receive extra food, cigarettes, liquor, and money.<sup>69</sup> Psychiatrists, journalists, and military officers expressed concern over why some soldiers "weakened when others stood fast."<sup>70</sup> The journalist Edward Hunter made up the term and popular explanation of "brainwashing" by translating the Chinese *hsi nao* as "wash brain" in his book *Brain-Washing in Red China*. Also referred to as "coercive persuasion" or "menticide" by 1950s psychiatrists, brainwashing was believed to be a form of irresistible mental domination implemented through practices including extended isolation, assignment of repetitious tasks, sleep deprivation, violent threats, and physical assaults to break its victims.<sup>71</sup> U.S. journalists and politicians' embrace of "brainwashing" as explanation for American soldiers' critical opinions of their nation's society also shifted blame to communist captors' abusive actions, rather than recognizing any legitimacy to prisoners' stated reasons for refusing repatriation.

The term "brainwashing" also intimated masculine failings. Defense officials expected disciplined soldiers and criticized or court-martialed returning prisoners of

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<sup>69</sup> Elizabeth Lutes Hillman, *Defending America: Military Culture and the Cold War Court-martial* (Princeton, NJ: Princeton University Press, 2005), 47-54.

<sup>70</sup> *Ibid*, 51.

<sup>71</sup> *Ibid*, 47-52.

war for caving to their captors' demands.<sup>72</sup> The military refused to acknowledge that many soldiers cooperated with their captors to survive horrendous prison camp conditions leading civilian observers to alternative rationalizations for soldiers' pro-communist stances. Some newspapers and magazines blamed prisoners' rejection of America on post-World War II U.S. culture's supposed moral weakness.<sup>73</sup> Coinciding with a moment of societal and state persecution of gays, lesbians, and queerness at home, media commenters speculated servicemen's behavior stemmed from a "lavender menace" imposed in prison camps where soldiers "dressed in women's clothes" and were "bound together more by homosexuality than Communism."<sup>74</sup> Fears over sexual "deviancy" infused the meaning of "brainwashing" in 1950s America linking mental domination to homosexuality and leading government officials to invest millions in studies on therapies that attempted sexual and ideological conversion.<sup>75</sup> The experience with Korean War POWs also led Eisenhower to initiate training programs to improve U.S. soldiers' discipline under duress.<sup>76</sup>

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<sup>72</sup> Carruthers, *Cold War Captives*, 184.

<sup>73</sup> Hillman, *Defending America*, 51.

<sup>74</sup> Carruthers, 176

<sup>75</sup> For more on psychiatrists reaction to brainwashing see chapters seven and eight in Ron Robin, *The Making of the Cold War Enemy: Culture and Politics in the Military-intellectual Complex*, Princeton University Press, 2003.

<sup>76</sup> Robert Genter, "Understanding the Pow Experience: Stress Research and the Implementation of the 1955 U.S. Armed Forces Code of Conduct," *Journal of the History of the Behavioral Sciences*, October 20, 2014.

News of Dulles' Senate testimony about U-2 flights, and his claims that Powers faced Soviet brainwash, sparked a public obsession. Some commenters like James Burnham at *National Review* had written about brainwashing before Dulles made it an issue. But Burnham had insisted "Brainwashing is a matter of weeks, more often of months" and suggested Powers' immediate revelations to Soviet captives demonstrated his weakness.<sup>77</sup> The CIA director's legitimization of Powers' impending brainwashing, however, spurred popular conspiracies.<sup>78</sup> Hollywood screenwriter James Clavell, made famous by his recent release of *The Fly* and himself a World War II prisoner of war, approached Barbara Powers for the movie rights to her husbands' story. Clavell suggested a film might help Powers gain his freedom while answering burning questions like: "Did he land in Russia purposely? Was he a Russian agent? Was he double-crossed by a counter-spy? Why didn't he use the suicide kit?"<sup>79</sup>

As Powers' espionage trial began in mid-August 1960 conspiracies about his brainwashing or being a double-agent evoked contemporary literary works like Richard Condon's best-selling novel *The Manchurian Candidate* published the year before Powers' capture. The ways U.S. audiences worried about Powers' duplicity or complicity appeared something akin to a real life stand in for the novel's fictional protagonist Raymond Shaw - a soldier in the Korean War who is captured and brainwashed by a

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<sup>77</sup> Burnham, "The Case of the Missing U-2."

<sup>78</sup> Pearson, Drew, "Dulles Fears Powers Brainwashed," *Miami Herald*, July 31, 1960, page 2-F.

<sup>79</sup> Vernon Scott, "Film on Powers Planned," *Miami Herald*, June 4, 1960.

team of Soviet and Chinese psychiatrists to serve as an assassin targeting the U.S. President. More than pulp fiction, Condon's novel's infused 1950s Cold War anxieties of a Communist "fifth column" with ideas about domineering mothers, gender troubles, and homosexuality into a morality play that satirized the McCarthy era's political hysteria.<sup>80</sup>

U.S. journalists, policy makers, and popular audiences paid close attention to CIA pilot Powers as he took the stand for his espionage trial in Moscow facing a possible death sentence. Seeking a lesser punishment, Powers plead guilty to spying for the U.S. government, claiming he was "profoundly sorry I ever had any part in" CIA operations. Powers insisted he "was not asked whether I wanted to take the flight." He presented himself as duty bound by state employment claiming he "could not refuse" his mission because "it was an order" and that if he did refuse he would be considered a "coward by all of my associates" while also committing "an unsuccessful completion of my contract."<sup>81</sup> Powers' counsel Mikhail I. Griniov constructed a legal defense that emphasized Powers came from working class origins, was a pilot not a trained spy, that he had no role in orchestrating U.S. policy, and that he simply followed orders from his

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<sup>80</sup> Condon, Richard, *The Manchurian Candidate*, Orion Books, 1959. For a history of the pervasive anti-maternalism at mid-20<sup>th</sup> century, see Rebecca Jo Plant, *Mom: The Transformation of Motherhood in Modern America*, University of Chicago Press, 2010.

<sup>81</sup> Caruthers, Osgood, "1<sup>st</sup> Day of Trial," *Chicago Daily Tribune*, August 18, 1960, N2.

CIA superiors.<sup>82</sup> Yet, this defense concerning the duty of “just following orders” faced critique from Chief Soviet Prosecutor Roman Rudenko, who gained legal fame by rejecting a similar defense made by Nazi leaders during the post-World War II Nuremberg trials.<sup>83</sup>

Once Powers began testifying and appeared coherent the U.S. and international press agreed he had not been brainwashed in Soviet capture.<sup>84</sup> Yet, CIA director Allen Dulles was less sure. In a private memo to Eisenhower, Dulles commented that while Powers may not have been “brainwashed,” he still seemed “brain conditioned.”<sup>85</sup>

As Powers testified in Moscow U.S. journalists continued to attack his performance as a military man. The hawkish *Chicago Tribune* proved the most critical newspaper of Powers during the trial. A *Chicago Tribune* editorial responding to Powers’ first day of testimony painted the trial as Soviet propaganda and Powers as weak. The newspaper writer complained Powers “didn’t have to be beaten to make him plead guilty” further suggesting the whole embarrassing moment could have been avoided as “a man of more heroic mold would have blown up his plane and committed suicide, but

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<sup>82</sup> Ibid.

<sup>83</sup> Ibid.

<sup>84</sup> “Doubts Powers Brainwashed: Press of World in Agreement,” *Chicago Tribune*, August 19, 1960, 7. This conclusion failed to recognize that the extensive solitary confinement Powers endured was among the psychologically damaging methods originally associated with brainwashing.

<sup>85</sup> Allen Dulles, memo to President Eisenhower, August 22, 1960, Dwight D. Eisenhower Papers as President, Eisenhower Presidential Library Archives.

perhaps Powers couldn't and certainly he didn't do either."<sup>86</sup> The *Chicago Tribune's* aviation correspondent Thomas Wayne quoted an anonymous "high ranking air force pilot" who dubbed Powers a coward for failing to commit suicide and pointed to his high-paying CIA contract as evidence the spy-pilot placed dollars before country. In the opinion of the Air Force pilot cited in Wayne's story, Powers' failure to commit suicide was a breach of contract. The anonymous Air Force pilot deemed Powers a "soldier of fortune" whose \$30,000 salary (\$300,000 in 2022 dollars) was awarded to "very high caliber individuals with a special kind of courage to make these very high altitude, long range, and extremely hazardous flights alone." The Air Force officer said it was clear "Powers was not the right man to have drawn the assignment" because "in all such matters the life of any individual is at stake. Recruits are told this at the outset and this fact of life... is fully understood by everyone."<sup>87</sup> In turning to the monetary rewards and mortal obligations of military contracts Powers' peers simultaneously considered his self-preservative performance an exhibition of his failed manhood, excessive greed, and lacking patriotism.

There is a macabre irony in the recognition that a soldier for capitalism in a war against communism exposed the limits of economic incentives to overcome the human condition's will for self-preservation. As contemporaries lambasted Powers for not

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<sup>86</sup> "The Test of Soviet Fairness," *Chicago Daily Tribune*, August 19, 1960, 12.

<sup>87</sup> Thomis, Wayne, "Experts Hurl Criticism at Flyer of U-2," *Chicago Daily Tribune*, August 20, 1960, N3.

living up to his self-sacrificial side of a lucrative CIA contract their criticism put teeth in Khrushchev's claim that the captured pilot, his high pay, and his suicide needle showed exactly "how capital buys life, how it buys people."<sup>88</sup>

The perception that Powers should have killed himself for his nation remained controversial and faced challenge in letters written to newspaper editors. A Chicago Tribune reader named Jeanne Barry confronted newspapers' objectionable opinions simultaneously rejecting the mortal mandate of suicide while raising larger questions about U.S. covert operations. In her letter to the editor of the *Chicago Tribune*, Barry expressed shock at reading aviation writer Wayne Thomas' suggestion that Powers failed as a heroic man by not committing suicide. Barry asked:

Since when is suicide considered heroic? What kind of philosophy are you advocating? This course is contrary to the historic teachings of the great Christian and Jewish religions. The hint that the United States government is not opposed to the suicide of its airmen is a matter for open hearing, thorough investigation, and a close examination of the principles by which these secret governmental agencies are operating.<sup>89</sup>

Herein lay the greatest threat to a covert military agency: civilian oversight. Covert operations, by their very nature, were meant to remain in the shadows, out of sight and

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<sup>88</sup> Khrushchev, Nikita, quoted in *No Return for U-2*, 19.

<sup>89</sup> Barry, Jeanne, "The Powers Case," *Chicago Daily Tribune*, August 24, 1960, 16.

out of mind from the public. The U-2 crisis revealed the Eisenhower administration's aggressive pursuits of military intelligence and suggested the limits to America's technological might. The real danger to this regime of power was not the Soviet Union, but rather transparency, and an interrogation of whether America was on the right path as it pursued world hegemony.

It was amidst a scandal over U.S. surveillance operations and an emasculated CIA pilot that President Eisenhower considered the future roles "unmanned" surveillance technologies should play. On August 25, 1960, six days after Powers was found guilty of espionage in Moscow, a top-secret report from science advisors on the Special Panel on Satellite Reconnaissance reached President Eisenhower. The panel's science advisors pitched satellite reconnaissance as a key component of future U.S. intelligence gathering, yet the scientists admitted the logistics of creating digital networks of communication between orbit and earth was an expensive and long-term research project. Their proposed plan of action called for the development and launching of unmanned surveillance satellites while continuing to rely on piloted and "droned" surveillance flights.<sup>90</sup> Immediately following the presentation by the president's satellite reconnaissance panel, Eisenhower transitioned to a National

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<sup>90</sup> Report of A Special Panel on Satellite Reconnaissance, Office of the Special Assistant to the President for Science and Technology, Box 15, Folder: Intelligence Matters (17), White House Office, Office of the Staff Secretary: Records, Subject Series, Alphabetical Series, Dwight D. Eisenhower Library.

Security Council meeting, where he gave official approval for the creation of a new intelligence agency - the National Reconnaissance Office. This new covert intelligence agency became the central hub for coordinating and funding aviation research and development work for the U.S. armed services and intelligence agencies through the late-20<sup>th</sup> century up to today. As one of President Eisenhower's final major actions in office his creation of the National Reconnaissance Office came to exemplify the "military industrial complex" he would warn against in his farewell address as the operational budget for the new agency he created soon ballooned in cost beyond the CIA and all other intelligence agencies.<sup>91</sup>

Military historians and former CIA intelligence analysts have written about the National Reconnaissance Office ushering in a shift in priorities that placed greater emphasis upon producing "unmanned" satellite and drone technologies in the 1960s.<sup>92</sup> The National Reconnaissance Office and other covert research focused government agencies like the Advanced Research Projects Agency became the primary institutions funding and developing drone technology in the 1960s as the U.S. war in Vietnam

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<sup>91</sup> Gerald K. Haines, "The National Reconnaissance Office: Its Origins, Creation, and Early Years," National Reconnaissance Office Information Access and Release Team, Chantilly, VA; Berkowitz, Bruce, *The National Reconnaissance Office at 50 Years: A Brief History*, Center for the Study of National Reconnaissance, National Reconnaissance Office, 2011. As of writing in 2022 the budget for the National Reconnaissance Office makes it the single most expensive organization within the U.S. government.

<sup>92</sup> Thomas P. Ehrhard, *Air Force UAVs: The Secret History*, Mitchell Institute Press, 2010, 4-12; Brugioni, Dino, *Eyes in the Sky: Eisenhower, the CIA, and Cold War Aerial Espionage*, Naval Institute Press, 2010, 223-225.

witnessed the first mass deployment of drones in war.<sup>93</sup> Yet, despite growing scholarly recognition of a policy shift in favor of drone use following Powers' capture, no work has adequately interrogated the meanings of the CIA pilot's capture to explain why the unmanning of U.S. surveillance made sense to the Eisenhower administration at this moment.

Lifeless machines do not need controversial suicide injections. Machine substitutions for piloted aircrafts like drones provided a malleable and controllable war machine that avoided human vulnerabilities like death, capture, and interrogation. Satellites and drones feel no pain and have no mind. The threat of torture or "brainwash" poses no threat to a mechanical agent. Within a few years of Powers' capture Presidents Kennedy then Johnson could ignore and disown a lost drone far easier than a killed or captured U.S. pilot. Substituting a war machine for a man became the ideal means of sustaining the United States' panoptic imperative of intelligence gathering while hiding the U.S. surveillance regime away from the gaze of a critical civilian populace. The debate surrounding CIA pilot Francis Gary Powers demonstrated that characteristics of the human condition—self-preservation and an open mind—were

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<sup>93</sup> On intelligence agency funding of drone projects, see: Thomas P. Ehrhard, "Unmanned Aerial Vehicles in the United States Armed Services: A Comparative Study of Weapon System Innovation," John Hopkins University Dissertation, 2000, 103, 105; The U.S. conducted thousands of drone surveillance operations over Vietnam, see Ehrhard, *Air Force UAVs*, 8-12.

unacceptable vulnerabilities for air war signaling only an automaton could serve as the ideal spy.

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In the early 1960s, U.S. military deployment of drones quickly demonstrated the war machines could overfly adversarial nations and be shot-down without creating an international scandal like pilot Powers' capture. Drones manufactured by the Ryan Aeronautical Company overflew and photographed China's Lop Nor nuclear testing site in 1964 to gather intelligence and gauge the Chinese Air Force's reaction to a U.S. aircraft invading the nation's air space. The downing of these drones sparked official objections from Chinese diplomats and led to some news articles in U.S. newspapers including the *New York Times*. Yet, there was no sustained political controversy or even a Soviet objection to the U.S. surveillance actions.<sup>94</sup> Drone downings over China did not make front page news for months like Powers' capture and trial had done. While drones suffered technical limitations in operation, their ability to avoid scandal in moments of failure made them appealing as "spies in the sky," especially when compared to piloted airplane surveillance that could lead to airmen's capture or death. The successor airplane to the U-2, Lockheed's SR-71 Blackbird jet plane, was itself outfitted with a drone version of the jet and deployed in surveillance operations overflying the Soviet

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<sup>94</sup> Ehrhard, *Secret History*, 8-10.

Union in the 1960s.<sup>95</sup> Drones increasingly demonstrated their capability to surveil U.S. adversaries through their mass deployment by the many thousands during the U.S. War in Vietnam. Not only a surveillance machine, as the 1960s witnessed the heightened threat of nuclear war, drones also became a nuclear weapons platform.

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<sup>95</sup> Ibid, 6.

## **Seeking a Do It All Drone: Nuclear War, Counterinsurgency, Depoliticized War, and the QH-50 Drone's Legacy of Violence**

"QH-50 is a remotely piloted coaxial helicopter with multi-mission capabilities.

..... It can carry various types of weapons and 'real time' surveillance and detection systems. .... It can be controlled from ship-board, airborne, or shore-based command/control stations. .... It can provide absolute personnel safety in performing hazardous missions."<sup>1</sup> These declarations of mechanical agency by Gyrodyne Corporation of America about its QH-50 drone appear printed in a classified pamphlet published by the war machine's manufacturer. They provide a sense of the violent fantasies surrounding the most technologically advanced drone of the "Cold War" era. Built initially for the U.S. Navy in the 1960s by Gyrodyne as a means of waging nuclear war against Soviet submarines, war planners found many additional uses for the QH-50 drone as the U.S. war effort in Vietnam grew. Equipped with weapons ranging from nuclear bombs, guided missiles, and miniguns, while also envisioned as a tool to perform an array of support tasks including retrieving shot-down pilots behind enemy lines or defending military bases, the QH-50 drone emerged as a seeming "do-it-all" war machine in the minds of U.S. war makers.

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<sup>1</sup> "Model QH-50 Coaxial Helicopter Multi-Mission Capabilities," pamphlet produced by Gyrodyne Company of America, Inc., National Air and Space Museum Archives, Gyrodyne Manual Collection, underlines appear in original document, undated circa 1970.

Air power was a central component to the U.S. war in Vietnam. Immense bombing campaigns brought destruction to North Vietnamese cities and towns and into neighboring countries Cambodia and Laos. The environment was increasingly targeted through attacks on jungle forests and farms.<sup>2</sup> Piloted helicopters formed an air cavalry providing transport, fire support, and medical evacuation for ground soldiers. The role of drones within the U.S. air war in Vietnam is often overlooked in scholarly literature despite the proliferation of studies concerning piloted air war and missile bombardment.<sup>3</sup>

Among the existing historiographical attention paid to drones' place in the Vietnam war most scholars analyze the roles of surveillance drones.<sup>4</sup> The Ryan

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<sup>2</sup> Jacob Darwin Hamblin, *Arming Mother Nature: The Birth of Catastrophic Environmentalism*, Chapter 8 "Vietnam and the Seeds of Destruction," Oxford University Press, 2013.

<sup>3</sup> For several excellent studies of the development of ideas and technologies for air war during the Cold War and U.S. War in Vietnam that have not examined the drone, see: Russell F. Weigley, *The American Way of War*

*A History of United States Military Strategy and Policy*, Part 5 "American Strategy in Perplexity, 1945-," Indiana University Press, 1977; Matthew Evangelista, *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies*, Cornell University Press, 1989; Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*, MIT Press, 1993; Michael Sherry, *In the Shadow of War: The United States Since 1930*, Yale University Press, 1995; Campbell Craig, *Destroying the Village: Eisenhower and Thermonuclear War*, Columbia University Press, 1998; Mark Philip Bradley and Marilyn Young eds., *Making sense of the Vietnam Wars: Local, National, and Transnational Perspectives*, Oxford University Press, 2008; Thomas Hippler, *Governing From the Skies: A Global History of Aerial Bombing*, Verso Books, 2017;

<sup>4</sup> William P. Sloan and William Wagner, *Fireflies and other UAVs (Unmanned Aerial Vehicles)*, Aerofax Press, 1992; Thomas Ehrhard, *Air Force UAVs: The Secret History*, Mitchell Institute for Airpower Studies, 2010; Ian G. R. Shaw, "Scorched Atmospheres: The Violent Geographies of the Vietnam War and the Rise of Drone Warfare," *Annals of the American Association of Geographers*, 106:3, 688-704; Katherine Chandler, *Unmanning: How Humans, Machines and Media Perform Drone Warfare*, Rutgers University Press, 2020.

Aeronautical Corporation manufactured thousands of drones capable of photographing enemy spaces during the 1960s and 1970s to overfly Vietnam and perform the key function of target detection that aided the U.S. military dispense mass death from the air. Built initially to serve as aerial targets to be shot down by anti-aircraft gunners or amidst mid-flight pilot training, Ryan Aeronautical engineers converted “Firebee” target drones into camera equipped surveillance machines the company dubbed the “Lightning Bug.” The Lightning Bug drone not only flew over Vietnam, but also China, Korea, Cambodia, and other spaces in Southeast Asia deemed requisite surveillance targets by the U.S. military.<sup>5</sup>

Minimal attention, however, has been placed on analyzing the drone as a mechanism of bombing itself within the Vietnam war. This chapter focuses on the QH-50 drone produced by the Gyrodyne Corporation of America and this drone’s place within both the massively destructive logics of nuclear war and the emergent notions of ostensibly “precise,” “safe,” or “humane,” bombing that supposedly defines a post-Vietnam generation of drones in the late-20<sup>th</sup> century and early 21<sup>st</sup> century.

The strategic imaginary surrounding the QH-50’s “multi-mission capabilities” demonstrates how U.S. war makers placed their faith in drone technology to perform an array of military functions. The QH-50 drone’s perceived military utilities exhibit war planners’ aim of rectifying the shortcomings of the piloted air power they so heavily

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<sup>5</sup> Ehrhard, *Air Force UAVs*; Chandler, *Unmanning*; Shaw, “Scorched Atmospheres.”

depended upon in Vietnam. Amidst this mass ascent of U.S. airpower over Vietnam, the regular downing of aircraft alongside the death or capture of pilots, spurred a critical social movement in the U.S. made up mostly of mourning families pressuring the U.S. government to bring imprisoned airmen or their lost corpses home.<sup>6</sup> As domestic and worldwide criticism of U.S. violence in Vietnam proliferated, the drone emerged as a way to automate pilots' roles in air war and thus mitigate popular political criticism of the war's cost in American lives. Through an attention to recently declassified military records alongside cultural sources produced by the anti-war movement, the Vietnam war moment emerges as a high-water mark in the history of drone technology. It was the moment when remote-controlled war machines not only evidenced their destructive capabilities but also their political allure through their use as a means of depoliticizing air war by mitigating the sacrifice of American lives and render violence less visible. Yet, despite the faith placed in the drone to wage war, the technology failed to secure victory for the U.S. in Vietnam foreshadowing later conflicts like the U.S. War on Terror when drones were again imagined as an ideal tool for waging a counterinsurgency, yet could not turn the tide of war. Developed and put into operation through the 1960s and well into the 1970s, the Advanced Research Projects Agency's (ARPA) interest in the QH-50

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<sup>6</sup> Michael J. Allen, *Until the Last Man Comes Home: POWs, MIAs, and the Unending Vietnam War*, The University of North Carolina Press, 2009.

drone emerges as inseparable from the Defense Advanced Research Projects Agency's (DARPA) 1979 adoption of the Predator drone's prototype.

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Nuclear war increasingly shaped international militant relationships in the 1960s. As the United States and United Socialist Soviet Republic mass produced nuclear weapons, they shared their burdens of annihilation, building missile silos in their allies' lands that fueled anxieties of world ending planetary destruction. While "inter-continental ballistic missiles" took flight from land, it was the sea that shaped the drone's place in the preparations of nuclear war.

U.S. intelligence agencies like the National Reconnaissance Office (NRO) and the Advanced Research Projects Agency (ARPA) emerged as the primary state institutions through which the funding, research, and development of drones flowed.<sup>7</sup> These secret government agencies became the hubs for developing the United States' most complex aviation technologies because their classified operations were more shielded from public view than service branches like the U.S. Air Force and other more publicly known intelligence agencies like the CIA.

In the 1960s, spending millions upon millions of dollars on new war technologies, especially less established technologies like drones and other unmanned vehicles like orbital satellites, was still a controversial allocation of military funding

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<sup>7</sup> Ehrard, *Unmanned Aerial Vehicles*, 103.

within the ranks of the institutions tasked with these technologies' development. Even in the years when the U.S. war in Vietnam was at its apex and state funds to the military had reached an all-time high debates over where all this funding should flow – between differing piloted aircraft like jets or helicopters, missile systems, satellites, or drones – was hotly debated by war planners. A recently declassified report entitled “Some Borborygmus Rumbblings from the Innards of NRO” submitted to National Security Advisor McGeorge Bundy demonstrates the sources of strife within the U.S. intelligence community.

The report of “borborygmus rumbblings” from inside the NRO complained that “morale is quite low” among the CIA representatives within the new agency. Though the NRO was created to coordinate the splintered development priorities for military aviation technologies between the military branches and intelligence services the resulting institution created a power struggle. The report’s author, a CIA figure, claimed that Air Force officials controlled the NRO and were using the new organization “to divest the agency of all its rights and holdings in the overhead reconnaissance field....” The report painted certain Air Force figures as “villains” purposely trying to disrupt CIA budgets and development priorities. It lamented a total breakdown in communication between the Air Force officers and CIA figures leading the NRO. The CIA agent authored report pointed to specific technology projects the Air Force favored like the SAMOS (Satellite and Missile Observation System) as being “a total bust” and

waste of resources. Many CIA figures in the NRO felt they were “being euchred out of what they feel they know more about than anyone else by a power grab tactic of the Air Force which has support in certain Pentagon circles....” Insisting “overhead reconnaissance is the most operational activity in peacetime” and the work of surveillance was “glamorous and attractive stuff” the report complained “there are many sharks anxious to bite off a chunk.” Concluding his tirade against a perceived Air Force coup against the CIA’s surveillance priorities the author insisted to National Security Advisor Bundy that there was a need to return to the bygone days of CIA heads Allen Dulles and Richard Bissell where a singular “Mr. Big” could be “put in charge and ‘crack skulls’ to make NRO work right.”<sup>8</sup> The contentious relationship between CIA and Air Force officials within the National Reconnaissance Office reminds us that decisions about surveillance technologies including drones were not foregone conclusions but hotly debated issues. It also demonstrates the frequent disfunction within U.S. military bureaucracies and operations.

The QH-50 Drone Anti-Submarine Helicopter (DASH) was fantasized as an ideal weapons platform for waging nuclear war against Soviet submarines. DASH was imagined as providing the capability of deploying a nuclear warhead through remote

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<sup>8</sup> “Some Borborygmous Rumbblings from the Innards of NRO,” Memo for McGeorge Bundy, The Lyndon Baines Johnson Library, Papers of Lyndon Baines Johnson as President, 1963-1969, National Security File, Intelligence File, Box 9, NRO Folder, document 8.

control while distancing U.S. servicemen from its blast radius. Yet, the drone operation's primary legacy proved to be one of disfunction and failure.

The QH-50 DASH was the first and only fielded weapons delivery drone in the 20<sup>th</sup> century.<sup>9</sup> It was not the first weaponized drone. But it was the first drone platform built to carry and deploy bombs then return to an operating base or Navy ship rather than the sort of self-sacrificial drones and pilotless airplanes made during the World Wars. During operation DASH, as U.S. Navy fleets sailed with the drone, hundreds of QH-50s toed both torpedoes and nuclear depth charges in preparation for war with the Soviet Union.

There proved to be two major problems with operation DASH. The first was technological. In a cost saving move, a dated "off the shelf" control system from the World War II era was chosen for the DASH's guidance system instead of developing a new means of remote control. This old hardware was cited by operators as frequently faulty and too complex to operate, technical faults further exacerbated by operators' limited training time with the drone equipment. The second flaw stemmed from the inexperience of operators and technicians assigned to the DASH project. Despite the

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<sup>9</sup> Thomas P. Ehrhard, "Unmanned Aerial Vehicles in the United States Armed Services: A Comparative Study of Weapon System Innovation," Chapter 7: "The Naval Services and UAVs," John Hopkins University dissertation, 2000; Thomas P. Ehrhard's dissertation is the closest publication resembling an official history of U.S. drone and Unmanned Aerial Vehicle (UAV) warfare from the 1950s through the 1990s. Ehrhard's military rank enabled him to access and declassify key documents for his study of U.S. military branches and intelligence agencies' development and deployment of drones.

operation's initial proposal calling for experienced servicemen aged into their 20's or 30's to oversee the drone's maintenance and flight, an audit of the program showed the average age of technician and operator crews was only 18 ½ years old.<sup>10</sup>

Antiquated control equipment combined with the mistakes of inexperienced crewmen bedeviled the DASH program with frequent flight failures. Gyrodyne Company engineers had managed to sustain their drones during initial testing through rigorous technical checks and maintenance regimes which saw only 3 out of 543 QH-50 drones produced fail to make it through initial flight testing. Yet, once the drones were in Navy possession, these disciplined maintenance and testing practices disappeared resulting in hundreds of drone crashes.

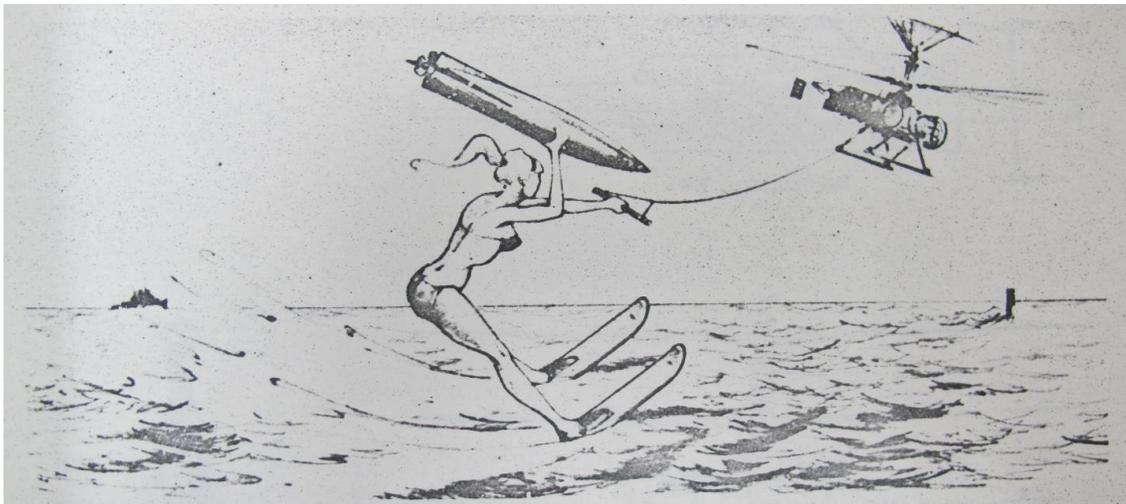


Figure 15. Operator manuals for the QH-50 drone included fantasies of drones pulling bikini-clad women carrying bombs.

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<sup>10</sup> Ibid.

Despite constructions of drone operations being a fun time that included images in QH-50 flight manuals of the drone pulling a bikini-clad woman as she jet-ski in the sea holding a bombshell, the drone was primarily a source of animus for Navy operators.<sup>11</sup> During flight tests operators of the QH-50 drone during operation DASH found it so unreliable many dubbed it the “fire and forget” weapon. Many QH-50 drones were lost. The DASH operation cultivated a negative perception from drone operators whose records received career stymieing black marks whenever a drone was lost at sea. Naval aviators increasingly feared the drone as dangerous and refused to share the air with the unreliable flying robot.<sup>12</sup>

During the U.S. Navy’s DASH program frequent crashes and drone losses had rendered the program seemingly inoperable. But there was also a growing recognition that if the drone’s nuclear depth charge were ever used against an enemy submarine the resultant blast radius and fallout would endanger its ferrying fleet and crewmen.<sup>13</sup> Defense secretary Robert McNamara pulled the program’s funding in 1966 following repeated years of poor performance and a sense of the project’s infeasibility. A piloted

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<sup>11</sup> “Flight Manual Navy Model QH-50C Drone and Target Control System,” Published by the Direction of the Commander of the Naval Air Systems Command, October 15, 1964, Smithsonian Institution, National Air and Space Museum Archives, DSN-3/QH-50C (Gyrodyne) Manual Collection, Box 4, Folder 150 DHB-1 Flight Manual.

<sup>12</sup> Ehrhard, “Unmanned Aerial Vehicles,” 321.

<sup>13</sup> Author conversation with National Air and Space Museum archivist Roger Conner, 2019.

helicopter was chosen as a more reliable instrument of anti-submarine warfare. Yet, even after defunding, QH-50 drones continued to sail on Navy destroyers for years.<sup>14</sup>

Despite its limitations, the DASH program had intrigued many U.S. allies who purchased QH-50 drones for their own uses. The Japanese, German, and Israeli militaries all purchased QH-50 drones making it a transnational weapon that was integrated into US allies' militaries and studied for its relevance for developing new drone technology.<sup>15</sup> While the U.S. Navy lost interest in the QH-50 drone, the U.S. Advanced Research Projects Agency remained interested and increasingly fantasized about what the QH-50 might be able to accomplish as the U.S. war in Vietnam escalated.

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Classification of state records still clouds a full accounting of the QH-50 drone's deployment during the U.S. war in Vietnam. Oral interviews conducted by historian Thomas Ehrhard with servicemen involved in the QH-50's operation accredited the drone with at least one battlefield accomplishment amidst efforts to interdict enemy barge traffic in Vietnamese waterways. During a North Vietnamese attack on a strategically significant bridge near the demilitarized zone partitioning North from South Vietnam, the QH-50 drone helped direct fire from Army and Marine Corps

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<sup>14</sup> Ehrhard, "Unmanned Aerial Vehicles, 326-329."

<sup>15</sup> Ibid.

artillery.<sup>16</sup> Impossible as it is to decipher the extent of the QH-50's deployment in Vietnam from limited and still classified archival records, some official sources discussing the drone as a weapons platform have become available shedding light on how war planners imagined the drone's violent use.<sup>17</sup>

Despite the QH-50's poor performance amidst operation DASH the drone lived many operational afterlives. Revitalized by the Advanced Research Projects Agency, the QH-50 drone became a testbed for an array of possible military utilities. What little scholarly attention has been paid to the QH-50 drone's offshoot operations dismiss these actions as failed sideshows to other drones like Ryan Aeronautical's "Lightning Bug" surveillance drone that performed more direct roles in the U.S. surveillance regime constructed during the Vietnam war. Yet, this failure to take seriously the fantasies constructed around the QH-50 drone downplays the U.S. military's pursuit of the war machine while ignoring the ways ideas about the QH-50's militant use influenced subsequent generations of drones.

The U.S. Navy remained invested in the QH-50 drone beyond project DASH. A new project codenamed "Snoopy" equipped the QH-50 airframe with advanced target

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<sup>16</sup> Ehrhard, *Unmanned Aerial*, 163; "QH-50 the Vehicle for Anti-STAG (Submarine/Ship, Tactical Target, Ambush, Guerilla) Warfare," Gyrodyne Corporation of America Inc. pamphlet, undated, National Air and Space Museum Archives.

<sup>17</sup> I have personally filed several Freedom of Information Act Requests for the declassification of state records concerning the QH-50 drone's use in Vietnam. It is hoped that in the near future a fuller access to still classified archival records will better illuminate the deployment of the QH-50 drone as a weapons platform during the U.S. war in Vietnam.

detection mechanisms and data-linked televisions providing real-time video streams to operators who aimed to use the drone to provide gunfire mission support in the direction of naval bombardment.<sup>18</sup> The operational shift for the QH-50 from anti-submarine-warfare to reconnaissance fit within military roles established for drones by the mass deployment of Ryan Aeronautical's Lightning Bug surveillance drones.

By 1968, the Military Aircraft Panel within President Johnson's Science Advisory Committee considered the QH-50 drone helicopter the ideal method for improving the U.S. military's interdiction capabilities. Interdiction operations focused U.S. military efforts at stymying North Vietnamese soldiers from entering South Vietnam. The U.S. Defense Intelligence Agency and National Security Agency's Signals Intelligence produced meticulous analyses of North Vietnamese soldiers entering South Vietnam.<sup>19</sup> These reports on North Vietnamese "infiltration groups" examined transportation infrastructure including the roads used by soldiers from the north travelling south, active railways, river ferries, and the spaces where transportation vehicles concentrated.

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<sup>18</sup> "QH-50 the Vehicle for Anti-STAG (Submarine/Ship, Tactical Target, Ambush, Guerilla) Warfare," Gyrodyne Corporation of America Inc. pamphlet, undated circa 1968, National Air and Space Museum Archives. The codename "Snoopy" seemingly referenced Charles M. Schultz's cartoon character from the *Peanuts* comics. The name choice carried a slight relevance to the air war being waged given the character Snoopy, an anthropomorphic dog, often imagined himself piloting a World War I era biplane and engaging in an aerial dogfight against the Red Baron.

<sup>19</sup> Many of these reports are available at the LBJ Presidential Library. For an example from the time under discussion, see "DIA Intelligence Supplement: Status of Infiltration Groups 1 Nov 67-31 Jul 68," published 2 August 1968, National Archives and Records Administration, Lyndon Baines Johnson Library, Papers of Lyndon Baines Johnson as President, 1963-1969, National Security File, Country File, Vietnam, Box: 79, Folder: NVA Infiltration (Rostow/McC./CIA/DIA), 3 of 3.

These reports also estimated the numbers of North Vietnamese soldiers travelling south and identified potential bombing targets for U.S. interdiction efforts.<sup>20</sup> Interdiction had taken on greater importance for U.S. warmakers in 1968 which witnessed the hardest fighting of the U.S. war in Vietnam initiated in late-January with the surprise North Vietnamese attack on most major U.S. military positions on the Tet holiday celebrating the Lunar New Year. The so-called Tet Offensive carried on for most of the year as thousands of North Vietnamese Army and National Liberation Front for South Vietnam soldiers travelled to fight in the south.

A lengthy 25-page report produced by President Johnson's science advisors compared the capabilities of various war machines to improve U.S. interdiction capabilities. The report analyzed manned jets and helicopters, guided missiles, land mines, drone helicopters, and other war technologies' possible utility for preventing North Vietnamese soldiers from entering South Vietnam. Despite the reality that most of the possible options under discussion for improving U.S. interdiction operations had a more proven battlefield record than the QH-50 drone, the reports' authors wrote most enthusiastically and at longest length about the progress being made with the QH-50 compared to the other options under consideration.<sup>21</sup> The report noted that the joint

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<sup>20</sup> Ibid.

<sup>21</sup> In an analysis of the "Possible Near-Term Improvements" for U.S. interdiction capabilities, President Johnson's science advisors analyzed the QH-50 drone in comparison to other options including gunships, manned helicopters including the Huey Cobra AH-1G and HH-53B, manned airplanes including the B-52, and B-57, Walleye and Laser-Guided Bombs, Time-Delay Bombs,

“ARPA-Navy-Marine developments based on the Snoopy drone helicopter” had led to new advancements through two new projects codenamed “Nite Panther” and “Nite Gazelle.”

Project Nite Panther included more advanced optical equipment installed on the QH-50 airframe than what was used during project Snoopy. New instruments affixed on the QH-50 airframe included “a high resolution (1000 line) low-light-level TV, a covert illuminator and other equipment” all added to improve the gunfire support capabilities achieved by project by Snoopy. Despite a codename that suggested the predatory nature of project “Nite Panther,” it was project “Nite Gazelle” which witnessed the QH-50’s outfitting with lethal weaponry in the form of a “high-velocity flechette-firing gun” being added to the helicopter drone’s airframe.<sup>22</sup>

Drawing upon the testing and operational deployment of project Snoopy, the Presidential Science Advisory Committee emphasized the utility of the successor projects Nite Panther and Nite Gazelle. Stating confidently that “There is no doubt about

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land mines, MTI Radars, Long-Range Surface-to-Surface Cruise Missiles, and special operations SOG (Studies and Observations Group) Teams. The fact that the QH-50 emerged as the most-discussed and favored option by science advisors suggests their hope for drone technology’s lethality and improvement upon all the other options that had more direct combat experience.  
<sup>22</sup> “Possible Technical Contributions to Improvements in Interdiction Capability,” A Report by the Military Aircraft Panel of the President’s Science Advisory Committee, 2 July, 1968, National Archives and Records Administration, Lyndon Baines Johnson Presidential Library, Papers of Lyndon Baines Johnson President, 1963-1969, National Security File, Agency File, Box: 42, Folder: Office of Science and Technology Vol. 1 [1968], page 12.

the utility of the Panther” the report emphasized the airframe’s aerial stability and its stealth qualities of “undetectability to ground troops” were already “well demonstrated.” Dismissing the “chief problem” of “unreliability’ plaguing the drone helicopter that had led to “high operational loss rates,” the President’s science advisors insisted that the typical field life of only 22 hours might be brought closer to the 350 hours of flight life achieved during testing through an “urgent reliability improvement program” the authors noted had already begun.<sup>23</sup>

Assuming the QH-50’s reliability would be improved, the Presidential science advisors insisted “the Panther should be a highly valuable real-time intelligence gatherer for day-night and bad weather.” This abundance of confidence despite a clear recognition of the drone’s limitations in a battlefield setting led to a series of exclamations boosting the QH-50 as a solution to the problems facing U.S. air war through aircraft downing and airmen’s death or capture. In one of the report’s few underlined recommendations signaling the importance of the finding, the Presidential science advisors emphasized the QH-50’s “most important feature is its infinite courage which will enable us for the first time to undertake intelligence-gathering missions unconstrained by problems of safety.” Here, the authors suggested the historical significance of the drone project that “for the first time” held real advantages over manned airpower through their implicit recognition that human emotions like fear in

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<sup>23</sup> Ibid, pages 12-13.

the face of danger could be overcome by the supposed unlimited “courage” of the mindless war machine. Acknowledging that pilot losses were a constraint upon air interdiction operations, the QH-50 drone helicopter seemed a war machine that escaped the “problems of safety,” implying that the loss of a drone was less of a complication for the war effort than the loss of an airman.<sup>24</sup> North Vietnamese “truck parks,” or spaces where vehicles transporting North Vietnamese soldiers south congregated, were the primary target imagined for the Nite Panther project. Though the equipment configuration for the QH-50 drone for project Nite Panther did not include weaponry, the President’s science advisors suggested the drone could “implant a precisely located sensor and a command-controlled radar beacon for blind radar bombing” which they expected to “greatly enhance our ability to do effective attack on truck parks.”<sup>25</sup>

The equipment configuration for the QH-50 drones used for project Nite Gazelle included a modified 50-caliber Browning machine-gun which inspired the President’s science advisors to imagine a more directly violent role for the drone. Referencing weapon tests for the modified 50-caliber machine gun being conducted by war contractor Thompson Ramo Woolrdige Inc. (TRW), the President’s science advisors suggested the ammunition being developed – a “190-grain depleted uranium flechette” – could “destroy a truck engine.” Imagining the utility of the modified machine gun still

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<sup>24</sup> Ibid, page 13.

<sup>25</sup> Ibid, page 13.

being developed, the reports' authors noted that the current production program aimed to produce 15 guns and 20,000 rounds within the following 33 weeks. The uncertainty of these weapons developments and production schedules, however, forced reservations into the science advisors' analysis who bemoaned the Nite Gazelle program "cannot be considered a good candidate for a Fall campaign" but still hoped for the eventual "possibility of its success." Hedging their bets on the experimental modified machine gun, President Johnson's science advisors emphasized that "equipping the Nite Gazelle with the SS-11 antitank missile seems both possible and desirable."<sup>26</sup> These bombing munitions were soon installed on the QH-50 making it the first drone in U.S. military history outfitted to fire guided missiles.<sup>27</sup>

The violence imagined possible by equipping the QH-50 with guided missiles and machine guns was further enhanced by the panel's emphasis upon developing the drone's stealth capabilities. The panel emphasized its belief that "a more intensive development of silent droned helicopters with provision for remote night viewing and armed with any of several highly effective weapons would satisfy the requirement for truck interdiction at minimum risk and cost compared to present techniques." Johnson's science advisors hoped that the silencing of the QH-50 drone helicopter for stealthy battlefield operations "could be achieved in less than six months using proven

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<sup>26</sup> Ibid, pages 13-14.

<sup>27</sup> An image depicting the QH-50 equipped with these anti-tank missiles made it into pamphlets produced by the drone's manufacturer Gyrodyne and appears in this chapter's photo essay.

technology” relying primarily on “off-the-shelf subsystems.” Emphasizing stealth and possible quick acquisition for a supposedly silent, safe, and infinitely courageous war machine, the science advisors assured President Johnson that “With sufficient priority, the first test units could be made available in three months for deployment to SEA [South East Asia].”<sup>28</sup> Insisting that the QH-50’s “basic concept” had been “effectively demonstrated in Snoopy” the Presidential science advisors wrote assuredly that “the follow-on programs, Nite Panther and Nite Gazelle will elaborate or further develop the concept.”<sup>29</sup>

These visions for the possibilities of the QH-50 drone inspired the president’s science advisors’ hopes for transforming excess and obsolete manned helicopters into “droned” versions of themselves. The notion of silent droned helicopters so invigorated President Johnson’s science advisors that they insisted:

We believe that these programs should be pursued at highest priority but that the whole concept is of such great promise that the program should be expanded to include other airframes which are available in large quantities, for example, almost obsolete ones such as the H-13 and H-23, the more recent one such as the TH-55 and turbine powered vehicles such as the OH-6....<sup>30</sup>

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<sup>28</sup> Ibid, page 14.

<sup>29</sup> Ibid.

<sup>30</sup> Ibid.

In suggesting that existing manned helicopter airframes might be converted into silent droned helicopters Johnson's science advisors echoed prior efforts like World War II's Operation Aphrodite which had recycled war-weary and obsolete airframes into drones. Further elaborating the possibilities of droning obsolete helicopter airframes, the science advisors suggested an array of advantages to be gained from the war machines' transformation. They argued droned helicopters would produce "low sound levels" around the level of only 60-65 decibels which they deemed "practically inaudible" especially at a distance from the drone.<sup>31</sup> Other hopes for helicopters converted into drones included a "remote night vision capability" that could relay intelligence to a ground base or "mother aircraft;" "offensive capability" that would allow "immediate engagement at the target;" and improvements to operational safety as "unmanned operation" could supposedly occur "under any weather conditions and in a hostile environment."<sup>32</sup>

Following their pitch for droning obsolete manned helicopters the science advisors explained that converting helicopters into drones seemed preferable to droning fixed wing aircraft for tactical reasons. Helicopters could fly at slower speeds "thereby providing a higher probability of detection of the target." The "high maneuverability"

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<sup>31</sup> Spoken conversation occurs at approximately 60 decibels so while the projected sound of the droned helicopters would not be completely silent it would amount to a significant noise reduction compared to the typical sound levels of helicopter engines and rotors.

<sup>32</sup> Ibid, pages 14-15.

offered by a helicopter meant it could “orbit over the inspection point or return rapidly to reexamine a suspicious area.” A helicopter drone could “slow down to hover for accurate aiming of the weapon.” The droned helicopters were also expected to be capable of flying “at very low altitudes to reduce probability of detection by using terrain masking and to greatly reduce anti-aircraft fire.”<sup>33</sup> Converting obsolete helicopters into droned versions of the airframes, the science advisors argued, would recycle waste materiel into war machines even more capable than their original iterations. Though the science advisors did not use the term “loiter,” a term referencing an aircraft flying above a target for an extended period of time, their expressed desire for a helicopter drone to slowly “orbit over” a target for either surveillance or attack purposes signaled their desire for a key militant capability that war planners would look for in subsequent generations of drones.<sup>34</sup>

Just as the President’s science advisors considered an array of weaponry to equip the QH-50 drone, they also imagined several armament configurations that could work for their proposed droning of obsolete helicopter airframes. They noted the “M61 Vulcan 20 mm Gatling gun” had been modified for helicopter use with 6 of the weapons available and more expected available within a year, or possibly sooner “with a higher

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<sup>33</sup> Ibid, 15.

<sup>34</sup> The capability to “loiter” over a target was the requisite quality specified by DARPA in the late 1970s when Israeli Engineer Abe Karem’s “Albatross” drone won initial funding and developed into the “Predator” drone. Richard Whittle, *Predator: The Secret Origins of the Drone Revolution*, Picador Press, 2014; see also P.W. Singer, *Wired for War: The Robotics Revolution and Conflict in the 21<sup>st</sup> Century*, Penguin Press, 2009, 36, 39, 152.

funding level” applied to the program. Several methods of bombardment were also recommended including a “40 mm grenade launcher,” either the TOW (Tube-Launched, Optically Tracked, Wireless-Guided) missile system, the SS-11 anti-tank missiles, or rockets capable of a single or salvo launch.<sup>35</sup> The modified Browning 50-caliber machine gun made to fire flechette munitions was also considered but discounted as an ideal option due to a suspected limit to their destructive capabilities “the exclusive use of these against trucks is questioned since they are more likely to disable only, rather than destroying the truck and contents.” Despite this reservation the flechette firing machine gun was expected to be “very effective against AA gun barrels” if adequately accurate firing could be achieved.<sup>36</sup>

Having pitched the QH-50 drone and the droning of obsolete helicopter airframes as their preferred method for improving U.S. interdiction methods in Vietnam the President’s science advisors pushed for a rapid procurement program for the drones. They recommended that the “Nite Panther and Nite Gazelle versions be procured as expeditiously as possible” while also advocating “the program be augmented to include the droning of the other aircraft available from inventory....” Insisting the conversion of manned helicopters into drones would both “broaden the base of procurement” and “take advantage of the many fully mature highly reliable airframes” the advisory panel

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<sup>35</sup> “Possible Technical Contributions to Improvements in Interdiction Capability,” 15.

<sup>36</sup> Ibid, pages 15-16.

noted the additional advantage that recycled drone helicopters could rely upon already established “supply and maintenance bases in the services that will actually use the vehicles.” The panel also suggested the possibility that a “single sensor and control package” could be designed and made useable to operate all the various obsolete airframes considered for droning.<sup>37</sup>

The President’s science advisors concluded their remarks about the utility of drone helicopters with their most boisterous exhortations about the war machines. The reports’ authors assured President Johnson that:

The availability of a large number of such quiet, armed and droned vehicles capable of viewing at night and operating close to the ground under the weather would permit continued surveillance of all routes and destruction of hostile infiltrators under the conditions of low ceilings and heavy enemy anti-aircraft activity which now limit our present capabilities for much of the time.

Constructed as solutions to the limits of manned air operations, the reports’ authors boosted the droned helicopters violent capabilities, utility during bad weather, and operational safety in the face of North Vietnamese anti-aircraft defenses then limiting interdiction operations. Yet, in the sentence following this exclamation of droned helicopters’ utilities, the science advisors reiterated their pattern of making large claims for the drone’s potential then noting a limitation immediately after. The reports’ authors

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<sup>37</sup> Ibid, page 16.

admitted that these drone operations required “a relay by aircraft or by balloon” for control and video signal transmission, though they assured the president this equipment “could be located at a considerable distance from the target area, requiring only line of sight to the drone.” Despite their efforts to downplay this limitation the maintenance of a line-of-sight upon the drone amounted to a significant limitation upon functionality.<sup>38</sup> Moving past the admitted complications added by maintaining signal transmissions between drone and operators, the science advisors heaped more prophecies of violent success with drones into their recommendations. Though drone helicopters were being considered for interdiction purposes, the science advisors of the military aircraft panel believed “that this proposed system has far greater implications than just the truck interdiction mission and may well prove to be a significant pacification device to suppress terrorist activity and maintain continuous watch over large areas of the country.” Envisioning a dramatic expansion for the violent roles of drones the science advisors concluded their pitch urging for the program to “proceed on a highly accelerated schedule, by-passing normal procurement channels and assuring the immediate implantation of the program with joint service participation.” The advisors insisted the “feasibility of the concept has already been demonstrated” and that “the

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<sup>38</sup> Katherine Chandler places particular emphasis on the maintenance of line of sight as a significant limit to drone operations, see Katherine Chandler, “Drone Flight and Failure: The United States’ Secret Trials, Experiments and Operations in Unmanning, 1936-1973,” Chapter 3 “No-Body,” PhD Dissertation, University of California, Berkeley, 2014; and Katherine Chandler, *Unmanning: How Humans, Machines and Media Perform Drone War*, Chapter 3 “Unmanning,” Rutgers University Press, 2020.

technology is well proven” only requiring sufficient procurement of vehicles and “the minor modifications required to quiet and drone them.” Emphasizing droned helicopters would improve operational effectiveness and result in cost reductions, the panel of advisors again underlined their recommendation assuring the President they were “convinced that an effective interdiction capability would result in several orders of magnitude more effective than the present techniques, and at a fraction of the cost.”<sup>39</sup>

Though the science advisors’ recommendations for droning obsolete manned helicopters did not come to fruition, their suggestions that the QH-50 drone could be outfitted with an array of weaponry, and utilized in ways beyond U.S. interdiction operations, shaped the do-it-all imaginary that surrounded the drone. Between 1968 and 1972, manufacturer Gyrodyne repeatedly modified the QH-50’s instrumentation with an eye to performing combat, surveillance, and support roles. Though most official records from U.S. intelligence and military services remain classified, pamphlets about the QH-50 drone produced by Gyrodyne have recently become available for analysis making it possible to see what the war contractor and ARPA envisioned for the war machine.<sup>40</sup>

Multiple Gyrodyne pamphlets concerning the QH-50 emphasized the apparatus’s “multi-mission capabilities” or its effectiveness performing a variety of

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<sup>39</sup> “Possible Technical Contributions to Improvements in Interdiction Capability,” 17.

<sup>40</sup> Gyrodyne’s records concerning the QH-50 had only just arrived and were still being processed in 2019 by National Air and Space Museum archivists. I am grateful to archivist Roger Connor who graciously allowed me to examine these records amidst his ongoing organization of Gyrodyne’s documents.

military functions.<sup>41</sup> A pamphlet entitled “Model QH-50 Coaxial Helicopter Multi-Mission Capabilities” opens with the quote that appeared at the start of this chapter assigning an array of combat agencies to the drone: “...It can carry various types of weapons and ‘real time’ surveillance and detection systems. ....It can be controlled from shipboard, airborne, or shore-based command/control stations. ....It can provide absolute personnel safety in performing hazardous missions.” Echoing the proclamations enunciated in the Presidential science advisors’ report, Gyrodyne constructed its war machine as holding agency itself to not only survey or attack an enemy but also offer “safety” from combat hazards by substituting for manned air power in hazardous situations. The following page made clearer that the QH-50 had been tested with an array of weapons as well as executing many applications outside combat, including: “radar and television surveillance, missile delivery, hyper-velocity gun, bomb delivery, minigun, grenade launcher, bomblet dispersing, torpedo delivery, smoke laying, downed pilot rescue, cargo retrieval/transportation, equipment retrieval/transportation.” These tested applications show that Gyrodyne and ARPA had taken the QH-50 past the imaginings of the President’s science advisors by reaching beyond surveillance and weapon configurations to battlefield support tasks like

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<sup>41</sup> “Model QH-50 Coaxial Helicopter Multi-Mission Capabilities,” pamphlet, Gyrodyne Company of America Inc., undated circa 1970, Smithsonian Institution, National Air and Space Museum Archives.

dispersing smoke cover, rescuing shot-down pilots, and transporting 1000 pound shipping containers filled with war materiel.

The remainder of the pamphlet included close-up photographs of the QH-50 equipped with these various instrumentations or performing one of the claimed capabilities. Images of the QH-50 featuring differing equipment configurations were accompanied by text descriptions identifying the instrumentation and supposed abilities proffered by that set-up. For instance, one image depicted the QH-50 incorporating a TV surveillance and missile system ostensibly enabling “precision bombing.” But precision bombing was not the sole aim of the QH-50’s violent capabilities. Images also depicted the QH-50 airframe featuring a large minigun machinegun, or alternatively, grenade launching turrets capable of dispensing more than 100 bomblets. These alternate weapon configurations signaled to readers of the pamphlet that the QH-50 was not only a means for conducting limited “precision bombing” but could also be outfitted with an abundance of fire power.

Contrasting the close-up images of the QH-50 airframe equipped with a variety of weaponry, pamphlet images depicting the drone’s support role capabilities showed the QH-50 from a distance while in-flight mid-performance. One image shows the drone helicopter flying above a forest as a plume of smoke flows from a smoke generator or “laying down a protective smoke screen” in the pamphlet’s description. Another image again displays the QH-50 mid-flight toting a 500-pound container of military supplies,

though the image description boasted the drone could tote a cargo load up to 1000 pounds. The photo depicting the QH-50 “rescuing a downed pilot from the sea” shows the drone dangling a body over water. Though this functionality was imaged as a method of returning shot-down airmen to safety, the photo raises questions about how safe this experience of cable-suspension from a high-speed aircraft would really be for the person being “rescued.” One can easily imagine that any obstacle – trees or a protrusion from the ground in the form of a boulder or hill – would create a dangerous obstacle for the drone to navigate. Whether it was this possibility for an in-air collision, or a distrust of the new unproven technology, airmen refused to accept the QH-50 as a means of rescue.<sup>42</sup> A final image of the QH-50 seemingly gestured towards the war machine’s lackluster field performance showing one in-flight QH-50 retrieving another.

The bulk of the pamphlet focused solely on depicting the drone itself without reference to requisite operators or control equipment. These images reinforced a false perception that the drone alone was capable of military tasks without attention to requisite control personnel. Only the final few pages of the pamphlet show the control stations needed for the QH-50’s direction and the people required to handle the operational side-stick while pressing an array of buttons. Despite the lack of attention paid to control crews in Gyrodyne’s pamphlet, the image that does show the role of people in the drone’s operation reveals that those responsible for directing the drone

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<sup>42</sup> Ehrhard, *Unmanned Aerial Vehicles*, 321.

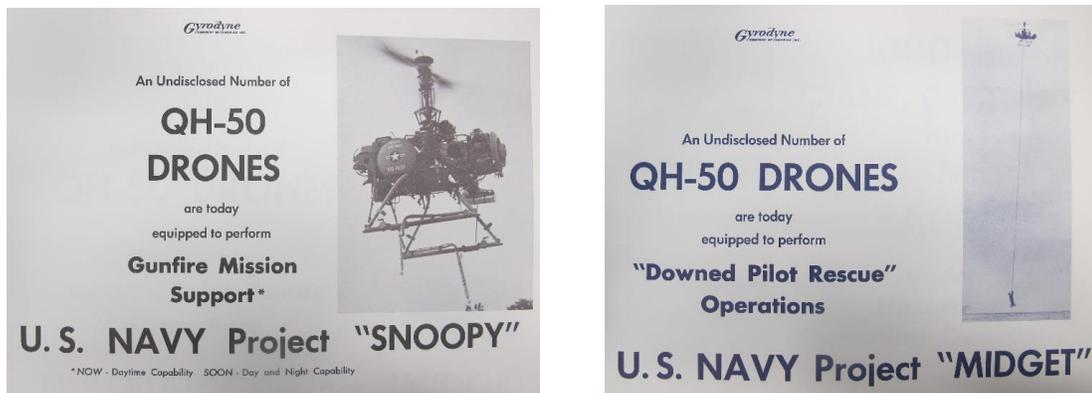
during ARPA testing wore civilian clothing rather than military uniforms. This reliance upon Gyrodyne employees for the drone's maintenance and direction speak to both the difficulty presented by the requisite training of military personnel to operate the drone and the increasing reliance upon private contractors to perform military functions.

The fantasies surrounding the supposed capabilities of US military technologies like the QH-50 to win wars or mitigate war's sacrifices are part of why war planners held onto the notion of a possible victory in Vietnam. The QH-50 drone, while connected to the war effort, was also far removed from the primary spaces of violence – the ground war and the piloted air war. Fantasies surrounding the QH-50 drone were just that, a fantasy of the United States' capability to win through advanced technology without weighing the importance of personal political resolve or a reason to fight. These sorts of motivations were often absent from the minds of U.S. servicemen drafted into service, but present for North Vietnamese soldiers who could see themselves as participants in a multi-generational war against foreign imperialism and military occupation.

## Photo Essay:



Figure 16. Above left, U.S. Navy project "DASH" (Drone Anti-Submarine Helicopter) sought to extend the range of destroyer ships' anti-submarine capabilities with helicopter drones armed with either torpedoes or a nuclear bomb depth charge. As the U.S. war in Vietnam expanded, the Advanced Research Projects Agency (ARPA) pursued additional codename projects with the QH-50 including "Snoopy," "Nite Gazelle," "Nite Panther," and "Midget." An array of additional weapon configurations for the QH-50 drone were also tested outside of official codenamed projects.<sup>43</sup> Above right, a QH-50 drone equipped with a deactivated nuclear depth charge on display at the National Air and Space Museum's Steven F. Udvar-Hazy Center.<sup>44</sup>



<sup>43</sup> Images from "QH-50 the vehicle for Anti-STAG (Submarine/Ship, Tactical Target, Ambush, Guerilla) Warfare," pamphlet, Gyrodyne Company of America Inc., undated circa 1970, Smithsonian Institution, National Air and Space Museum Archives, Gyrodyne Manual Collection, Box: Gyrodyne QH-50C DASH, undated circa 1970.

<sup>44</sup> Photo by author, 2019.

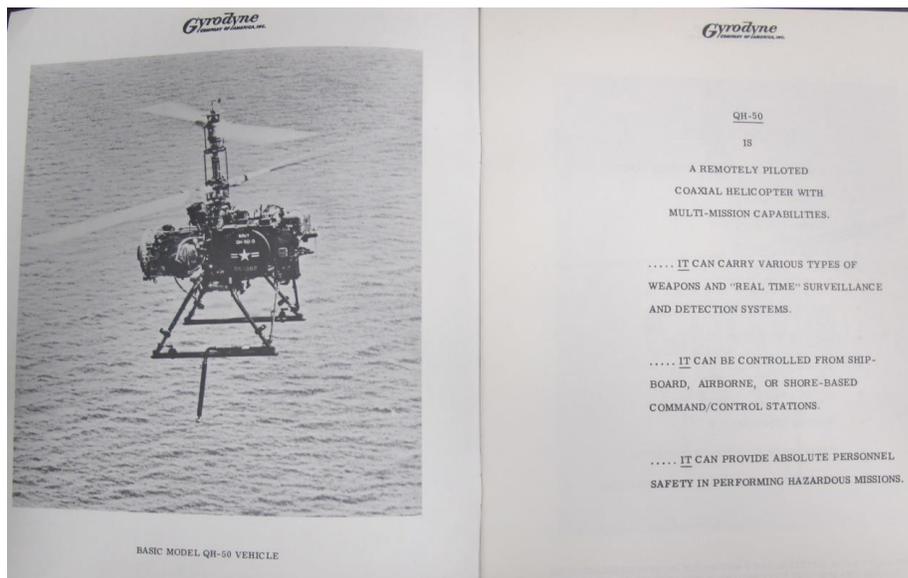
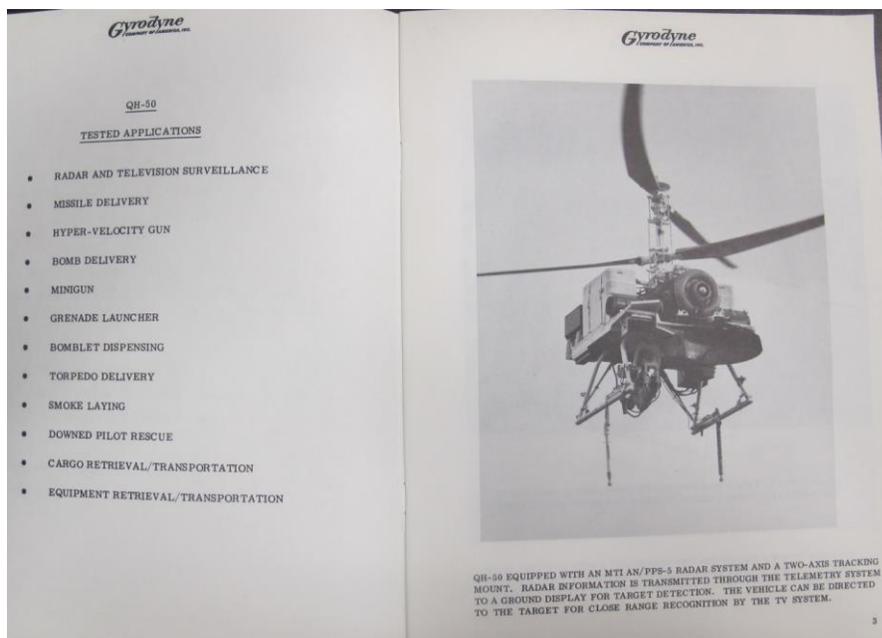


Figure 17. Above, the opening of a Gyrodyne Corporation pamphlet depicting the “multi-mission capabilities” of the QH-50 drone including a photo of the basic QH-50 airframe without additional munitions or surveillance equipment. Below, a list of the QH-50’s numerous tested applications and an image of the QH-50 in an equipment configuration to aid target detection.<sup>45</sup>



<sup>45</sup> Images from “Model QH-50 Coaxial Helicopter Multi-Mission Capabilities,” pamphlet, Gyrodyne Company of America Inc., undated circa 1970, Smithsonian Institution, National Air and Space Museum Archives.

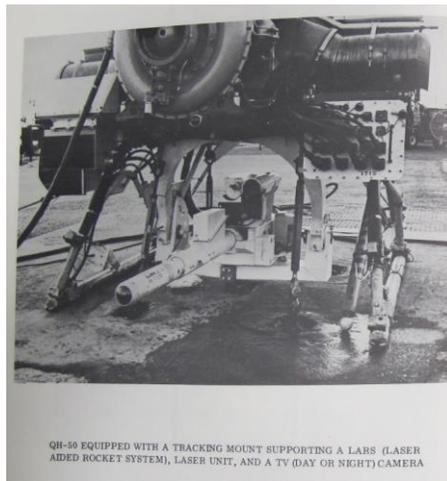


Figure 18. Above, laser guided rockets and “precision” bombing were among the many combat applications envisioned for the QH-50 by figures in the Advanced Research Project Agency (ARPA). Below left, notions of precision bombing coincided with attack configurations that prioritized an abundance of force including the outfitting of the drone with two grenade launching turrets capable of firing 38 explosive rounds.<sup>46</sup> Below right, while the QH-50 was often equipped for “search and destroy” operations, war planners also imagined a team of six drones performing air base defense.<sup>47</sup>

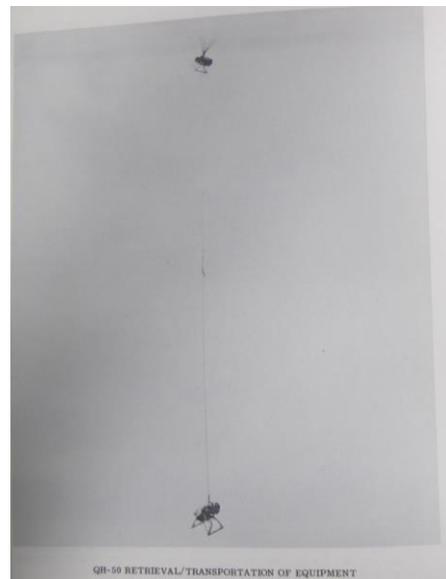


<sup>46</sup> Ibid.

<sup>47</sup> “The QH-50 for Air Base Defense,” pamphlet, Gyrodyne Company of America Inc., Smithsonian Institution, National Air and Space Museum Archives, Gyrodyne Manual Collection, undated circa 1970.



Figure 19. Combat utility was far from the only envisaged use for the QH-50. Protective smoke screens, downed pilot rescue, cargo transport, and even the QH-50 recovering a lost QH-50 were among the many utilities envisioned for the drone by Gyrodyne and ARPA.<sup>48</sup>




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<sup>48</sup> Images from "Model QH-50 Coaxial Helicopter Multi-Mission Capabilities," National Air and Space Museum Archives, undated circa 1970.

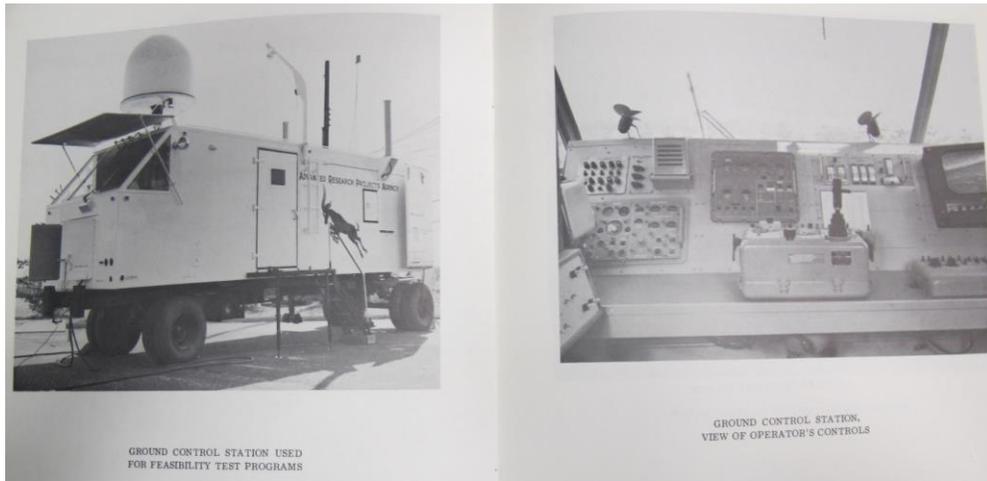


Figure 20. Above, the ground control equipment used to operate the QH-50 drone, note the project “Nite Gazelle” logo emblazoned on the control truck under the Advanced Research Projects Agency branding. Below, the mobile ground control station and the shipboard control station, note the civilian dress worn by contractor technicians hired from Gyrodyne for equipment installation and maintenance.<sup>49</sup>




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<sup>49</sup> Ibid.

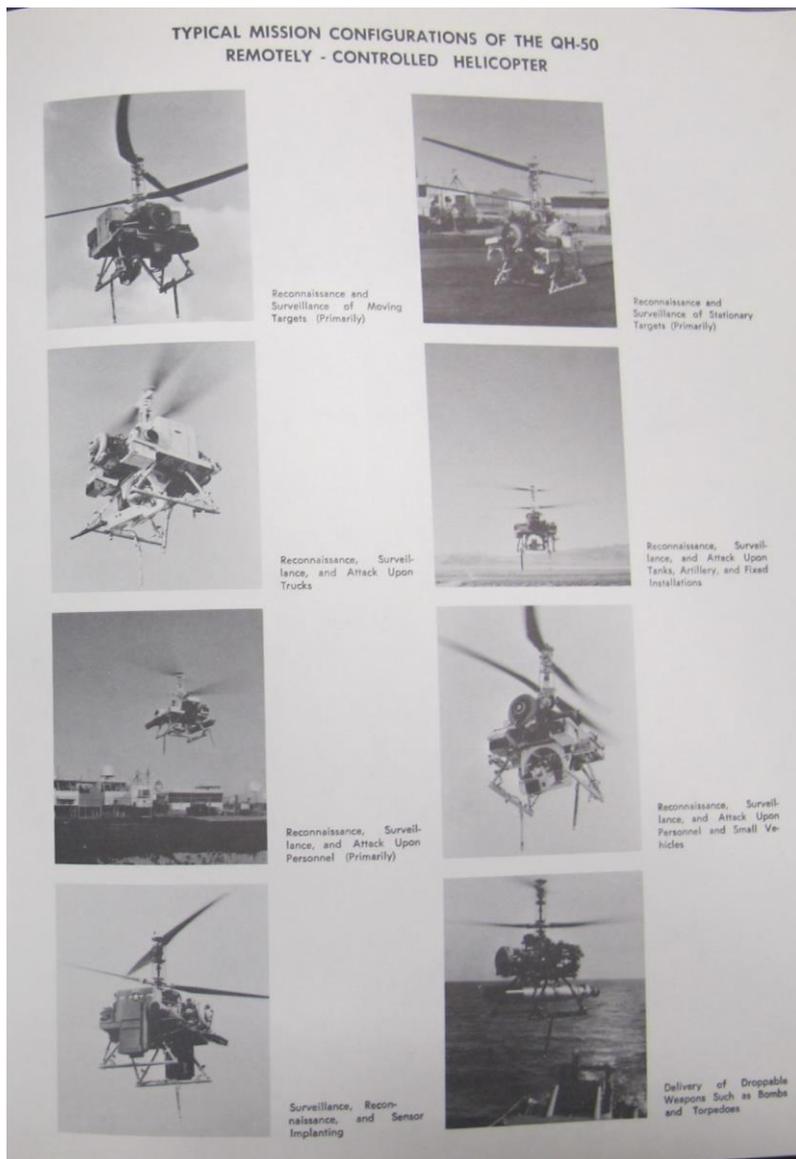


Figure 21. Above, many of the QH-50's numerous envisioned operational configurations and uses are juxtaposed with each other in a pamphlet produced for war planners.<sup>50</sup>

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<sup>50</sup> Ibid.

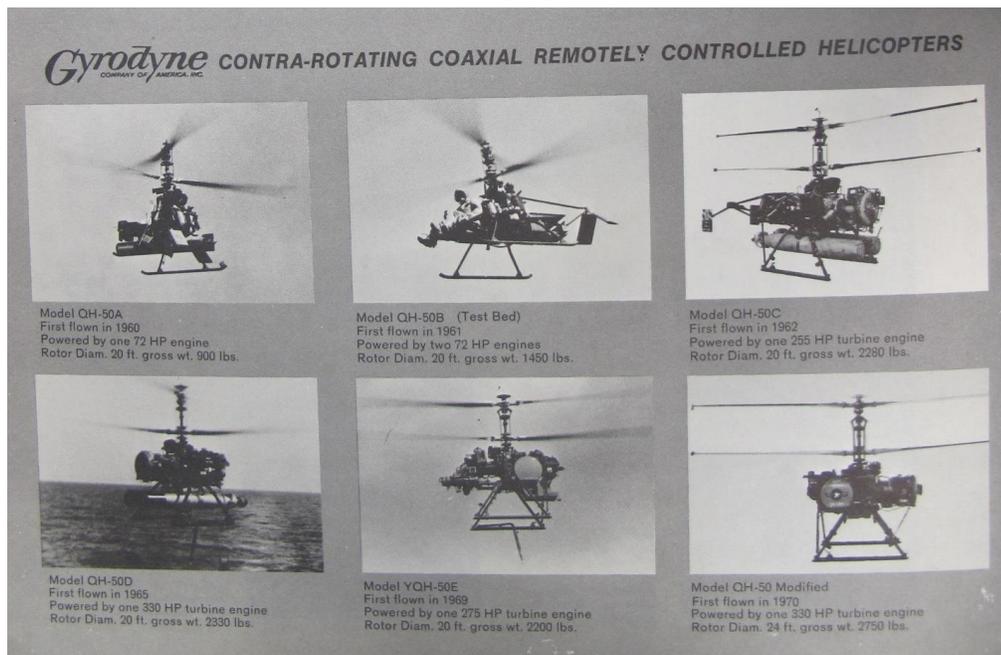


Figure 22. The QH-50's airframe configurations over the 1960s into the 1970s.<sup>51</sup>

War planners pitched the QH-50 drone helicopter as a war machine that was difficult to see or hear in battle while ostensibly capable of conducting “safe” combat operations. Militant aims for invisible, inaudible, and “safe” drone combat invoked the interconnected aim of depoliticizing the Vietnam war through the mitigation of U.S. soldiers’ losses. Relying on drones to bomb instead of piloted aircraft promised to lead to less U.S. pilots being shot down, killed, or captured. The drone’s vaunted military functions carried with them a set of political intentions.

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<sup>51</sup> Ibid.

Invisibility and inaudibility were operational goals of the QH-50 drone program. But the absence of the drone within the popular anti-war critiques that emerged in the 1960s-1970s evidences the invisibility and inaudibility of the drone within the public sphere as another significant political allure the technology heralded for war makers. Anti-war music helped construct the mass unpopularity of U.S. war making in Vietnam during the 1960s and 1970s. While wide ranging in its critical focus, the anti-war movement's music often expressed a material critique that specifically derided the weapons of war like guided missiles, napalm, or machine guns. Yet, the "drone" escaped the attention of the Vietnam war's most vocal critics. Even though drones like Ryan Aeronautical's Lightning Bee drones flew thousands of surveillance missions over Vietnam, China, and North Korea, the war machine's existence flew past the anti-war movement's critical gaze, signaling drones had a political utility for war beyond combat considerations.

U.S. war planners and war machine makers did not live only in government buildings. A broader society's ideas seeped into their minds from exposures to their time's public sphere. Writing, art, music, and politics became more accessible in the 1960s through radios and televisions that beamed sounds and shows to listening and viewing audiences. Even those who could not afford or abstained from such entertainments might encounter them from their children or neighbors. Ventures to a restaurant or store often promised ambient music from contemporary radio or jukebox.

It strains common-sense to think military leaders and politicians were unaware of the popular music and musicians of their time. Even if they were not fans, war makers assuredly knew of figures like Bob Dylan, Jimi Hendrix, or Dolly Parton to name only a few of the moment's most popular singer-songwriters whose lyrics enunciated a critique of war.

The U.S. surveillance state was itself increasingly occupied with studying the growing social movements of the new left. The black freedom struggle, the student movement, and an emergent feminist women's movement all incorporated critiques of U.S. war efforts into their broader claims for social equality. Indeed, historian Van Gosse has argued it was a shared aversion to the state's violence in Vietnam – and its disproportionate demands for sacrifice from black and youth populations – which helped link the new left's disparate political demands into a “movement of movements.”<sup>52</sup> The growing political threat posed by the new left to the U.S. war effort in Vietnam inspired state surveillance programs. The FBI's counterintelligence program (COINTELPRO) covertly and illegally surveyed, infiltrated, disrupted, and attempted to discredit popular efforts in struggle for black equality or an end to the war in Vietnam.<sup>53</sup>

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<sup>52</sup> Van Gosse, “A Movement of Movements: A Definition and Periodization of the New Left,” in *A Companion to Post-1945 America*, eds. Jean-Christophe Agnew and Roy Rosenzweig, Blackwell Publishing, 2002.

<sup>53</sup> Nelson Blackstock, *Cointelpro: The FBI's Secret War on Political Freedom*, Pathfinder Press, 1975; Charles DeBenedetti, *An American Ordeal: The Antiwar Movement of the Vietnam Era*, Syracuse University Press, 1990; Andrew E. Hunt, *The Turning: A History of Vietnam Veterans Against the War*, New York University Press, 1999.

The CIA also carried out lesser-studied domestic surveillance efforts on the “restless-youth” of the day despite the agency’s official role as a foreign, not domestic, intelligence gathering service.<sup>54</sup>

Historian Gaye Theresa Johnson has offered a compelling theorization of the significance of music for constructing spaces of conflict and sounds of solidarity.<sup>55</sup> Print texts like newspapers or pamphlets have long been recognized as a transportable media capable to transferring a writer’s ideas across space and time to a reader. But music amplifies the qualities of text. Sounds do not require literacy, only listening. The mass production and wide availability of popular records placed them in the hands of consumers around the U.S. and the world. Radio offered even more accessibility for the sonic interpretation of a musician’s political text. It is no coincidence that the 1960s and ‘70s became the moment when protests and music festivals proliferated.

Radio-broadcasted sounds of popular American music not only informed the critical consciousness of a generation, the sound of music also helped amplify North Vietnamese anti-war propaganda. Radio personality Trịnh Thị Ngọc began her English-language “Special Broadcast to American G.I.’s” through *Radio Vietnam* in 1965 following the dramatic increase in soldiers committed to the U.S. war effort. A long-time

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<sup>54</sup> Upon submission of the report “Restless Youth” to President Johnson, the study’s underwriters themselves noted the controversial nature of the CIA spying on American college students. *Restless Youth*, CIA Report No. 0613/68, September 1968, Lyndon Baines Johnson, National Security File, Intelligence File, Box 3, Folder “CIA Report ‘Restless Youth,’ 9/68.

<sup>55</sup> Gaye Theresa Johnson, *Spaces of Conflict, Sounds of Solidarity: Music, Race, and Spatial Entitlement in Los Angeles*, University of California Press, 2013.

broadcaster on the North Vietnamese state station whose experience in radio dated back to the French occupation, Ngô's half-hour shows merged war news and anti-American rhetoric alongside popular U.S. music for additional listener appeal. A student of the English language since her youth when she longed to understand the dialogue in American movies, Ngô continued to improve her English skills amidst the decade-long run of her broadcasts, which only ceased following the "fall" or "liberation" of Saigon. Characterizing her work as falling within a Vietnamese "tradition of resisting aggression" she saw the mission of the messages she helped write and translate as doing the important work of convincing U.S. soldiers to stop fighting against the Vietnamese people. Working under the pseudonym Thu Hương, and dubbed "Hanoi Hannah" by U.S. soldiers, Ngô's radio shows merged carrot – popular American music – and stick – moral judgements of U.S. violence or derogatory proclamations of the war's danger to G.I.'s. Some of her most damning statements came in the form of declarative one-liners: "They will give you a medal, G.I. But only after you are dead!" "Your rich leaders grow richer, while you die in the swamps, G.I." "They lie to you, G.I. You know you cannot win this war." The vulnerabilities of U.S. air war and its friendly-fire fallibility was a recurrent source of material in her messaging: "G.I. your helicopters fall from the sky like broken birds." "G.I. your airplanes bomb your own men, you are not safe here." "The skies are dangerous, G.I. They will napalm you tonight." "Your pilots do not care that you are down here, G.I." "They cannot see you from the sky, G.I. They come to

bomb you.”<sup>56</sup> Seeking to discourage and dissuade soldiers from fighting, Ngô’s recurrent focus on the air war likely reflected her own experiences with U.S. bombardments whose proximity she insisted never endangered her, but nonetheless could cause disruptions whenever “the hooter” or air raid sirens sounded the approach of airplanes.<sup>57</sup> While it is difficult to ascertain how many U.S. soldiers listened to her messages, instances where soldiers experienced limited radio signals from American-run South Vietnamese stations might encourage reticent listeners to tune-in and tolerate an anti-American diatribe in exchange for some rock music. And repeat references to her in Hollywood films from “Good Morning Vietnam” (1987) to Spike Lee’s “Da 5 Bloods” (2020) signal a prevalent American awareness of her radio transmissions.

Consciousness of the war’s unpopularity in the U.S. infused North Vietnamese diplomatic strategy and soldiers’ will to fight American occupation. A CIA agent attending negotiations in Paris in 1968 reported his perception that the diplomatic exercise was undercut by the anti-war movement at home. He concluded North Vietnamese negotiating strategy revolved around a belief that the “doves” would outmaneuver the “hawks” and convince the American people the war was unwinnable. He linked this awareness of the war’s unpopularity to North Vietnamese diplomats’

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<sup>56</sup> Many recordings of Trịnh Thị Ngô’s broadcasts are available on YouTube. The lines quoted here can be found here:

[https://www.youtube.com/watch?v=w3VeKnW9cNo&ab\\_channel=ВахтангНебридзе](https://www.youtube.com/watch?v=w3VeKnW9cNo&ab_channel=ВахтангНебридзе)

<sup>57</sup> All information besides the specific quotes from Trịnh Thị Ngô’s broadcasts comes from a 2003 CSPAN interview she conducted with Brian Lamb, see: <https://www.c-span.org/video/?26204-1/hanoi-hannah-vietnam>

goal of a total removal of U.S. troops from Vietnam. Interrogations of prisoners of war from the North Vietnamese Army frequently feature an insistence from the captured Vietnamese soldier that most Americans did not support the war and cited this as an important motivator for their own commitment to overthrowing U.S. occupation.

While some scholars remain skeptical about the accomplishments of the anti-war movement in turning a popular tide against the U.S. war in Vietnam, the movement's messaging, including its popular music, found many uses within North Vietnamese propaganda, diplomacy, and war making that shaped Vietnamese victory and American defeat.<sup>58</sup>

But what were musicians saying to listening audiences in their anti-war songs? In what ways did the lyrics and sounds of war resistance shape popular consciousness? And what does it say that the drone was absent from the critiques sounded by song writers and singers?

Too often, existing scholarly literature on protest music focuses primarily or exclusively upon white male voices with figures like Country Joe McDonald or Bob Dylan operating as the emblematic figure of musical political critique. While these figures certainly exercised immense influence, and feature in the analysis here, this historiographical tendency elides the propensity of voices that animated the moment's

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<sup>58</sup> Jeremi Suri, *Power and Protest: Global Revolution and the Rise of Détente*, Harvard University Press, 2003.

concert venues and featured on Billboard charts. It was often women and people of color who enunciated the most excoriating critiques of American militarism insisting on peace now.<sup>59</sup>

Musicians produced a wide array of war critiques as the center of US militancy shifted from Soviet antagonisms to full-fledged war in Vietnam. Nina Simone opened her diatribe against “Mr. Backlash” asking “Just who do you think I am?” then lamenting “You raise my taxes, freeze my wages, and send my son to Vietnam” within a song that went on to critique second class housing, second class schools, and promised to leave Mr. Backlash with the backlash blues.<sup>60</sup> Grace Slick, head of the band Jefferson Airplane, alluded to Lewis Carrols’ *Alice’s Adventures in Wonderland* in her song “White Rabbit” that suggested the ingestion of pills or mushrooms could send one down the rabbit hole, but invoked the draft in warnings of the moment “When the men on the chessboard get up and tell you where to go.”<sup>61</sup> Even Dolly Parton, whose country-western music was more typically associated with a conservative politics, could not help but write and sing-out against the Vietnam war. Her song “Daddy Won’t Be Home Anymore” offered a melancholic mourning of “all the happy times we’ll never see again” recounting the struggle to tell her children about the death of their soldier-father

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<sup>59</sup> A Spotify playlist including the songs analyzed in this chapter is available here: <https://open.spotify.com/playlist/55jgE1XTOqcfC2a2ciUN53?si=457a790e13114e7c>

<sup>60</sup> Nina Simone, *Backlash Blues*, *Nina Simone Sings the Blues*, RCA Victor Records, 1967.

<sup>61</sup> Grace Slick, Jefferson Airplane, “White Rabbit,” *Surrealistic Pillow*, RCA Victor Records, 1967.

who fought for what he “thought was right,” but has left her with the burdens of single-motherhood including children who “just don’t understand why daddy won’t be home anymore.”<sup>62</sup>

Within the many critical themes of the anti-war movement’s music, critiques focusing on war’s materiality was a recurrent, yet understudied, theme. Many popular songs constructed abstract critiques of mass violence through attention to the metaphorical “war machine,” or the “masters of war,” or even “war pigs,” who profited from war production. Other songwriters focused specifically on the violent instruments whose cacophonies sounded war: the “machine gun,” “bombers,” “guided missiles,” or the “hydrogen bomb.” Yet, the absence of the “drone” as a target of critique in musicians’ lyrics focused on war weapons evidences the invisibility of the drone within the moment’s critical public sphere suggesting a political utility for the war technology beyond its battlefield capabilities.

Songs critical of war, its makers, and its weapons proliferated in the early 1960s before the mass commitment of U.S. troops to war in Vietnam. Musicians with growing influence like Bob Dylan, for example, penned songs so hostile to the “masters of war” his lyrics wished death upon them. Released in 1963 on his second album, Dylan’s song “Masters of War” opened by beckoning war makers to listen and hear his diatribe against them: “Come you masters of war, you that build the big guns, you that build the

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<sup>62</sup> Dolly Parton, “Daddy Wont Be Home Anymore,” *As Long As I Love*, Monument Records, 1970.

death planes, you that build all the bombs..." yet he juxtaposed these warrish traits of his song's subjects alongside descriptions of them as those who "hide behind walls" and "hide behind desks" away from the violence they create. Dylan attacked the masters of war describing them as "You that never done nothin' but build to destroy" who "play with my world, like its your little toy" while reasserting these militant figures' cowardice, insisting that though they "put a gun in my hand" they themselves "hide from my eyes" and "turn and run farther, when the fast bullets fly." He shifts from accusations of cowardice to claims of dishonesty and deception, suggesting the masters of war are like "Judas of old" because they "lie and deceive" falsely claiming "a world war can be won." Dylan juxtaposes those who "fasten all the triggers, for others to fire," who "sit back and watch, when the death count gets higher," and who "hide in your mansion" with the young people whose "blood is spilled and buried in the mud." Merging materialist critique and Christian moralism, he asks "Is your money that good? Will it buy you forgiveness, do you think that it could?" arguing instead that "I think you will find, when your death takes its toll, all the money you made, will never buy back your soul." Concluding with a wish of death upon masters of war, Dylan sings "I hope that you die, and your death will come soon," then promised to "follow your casket" and "watch while you're lowered, down to your deathbed" where he vowed to "stand over your grave, 'til I'm sure that you're dead."<sup>63</sup>

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<sup>63</sup> Bob Dylan, "Masters of War," *The Freewheelin' Bob Dylan*, Columbia Records, 1963.

An explicitly hateful anti-war song, with lyrics that did not enunciate a pacifism but instead wished death upon the masters of war, Dylan's lamentation about war and its makers helped codify terms and tones of popular political criticism expressed through music. Often hailed as the "voice of a generation" that shaped the 1960s counterculture, "Masters of War" appeared on the album *The Freewheelin' Bob Dylan* alongside songs like "Talkin' World War III Blues" which took a more sardonic approach to criticizing war, as well as compositions like "Blowin' in the Wind," and "A Hard Rain's a-Gonna Fall," which received immense critical acclaim helping elevate Dylan to a new plane of fame. Yet, Dylan had a complicated relationship with his anti-war songs, especially "Masters of War," which was written primarily about the Cold War crisis but took on additional meanings as the U.S. war in Vietnam grew more destructive. Despite Dylan's reputation as a critical protest song writer, he expressed personal reticence over audiences carrying the anti-war themes in his 1963 song over to critiques of the U.S. war in Vietnam.

Popular musical critique of the weapons of war filled songwriters' lamentations about the U.S. war in Vietnam yet the drone was absent from popular criticism. Songs like Richie Havens' "Handsome Johnny" excoriated American history for its recurrent militarism. The song strings together lyrically similar stanzas that each open with a question about the figure of "handsome Johnny" marching to war. Opening with the American Revolutionary war, Havens asks listeners: "Hey, look a yonder, tell me what's

that you see, marching to the fields of Concord?" then answers himself singing "It looks like handsome Johnny with a musket in his hand, marching to the Concord war, hey marching to the Concord war." Each stanza repeats this call and response referring to a different U.S. conflict – "the Gettysburg War," "the Dunkirk war," "the Korean War," "the Vietnam War," and finally "the Birmingham War" – where in each war the figure of handsome Johnny is holding a new weapon – a flintlock, a carbine, an M1, an M15, and finally his hand rolled into a fist for fighting in Birmingham, Alabama. Linking together a succession of U.S. armed conflicts up to the Vietnam war, Havens' inclusion of the "Birmingham War," alongside armed conflicts, indicates both his sense of historical connection between successive U.S. wars as well as the inseparability of domestic racial conflicts from American militarism. Only the song's final stanza departs from Havens' recurrent evocation of handsome Johnny at a war front with weapon in hand, instead lobbing an accusatory inquiry at the listener: "Hey, what's the use of singing this song?, some of you are not even listening, tell me what we've got to do?, wait for our fields to start glistening?, wait for the bullets to start whistling?" Suggesting that only violence at home might shake an apathetic population into an anti-war consciousness, Havens' final lines link the song's focus on weapons and wars into a macabre cynicism for the future, decrying: "Hey, here comes a hydrogen bomb, and here comes a guided missile, here comes a hydrogen bomb, I can almost hear its whistle, I can almost hear its whistle..."

Suggesting the possibility of total destruction through hydrogen bomb and guided missile, Havens final words see war as a threat to all, and begs listeners to care.<sup>64</sup>

First released in 1966 on Havens' most popular and critically acclaimed album *Mixed Bag* which charted on both Billboard's jazz and pop charts, Havens regularly performed his protest song "Handsome Johnny" for live audiences including the mass of people who witnessed his opening set of the 1969 Woodstock festival. The Woodstock music festival has rightly been criticized as a predominately white affair in terms of its organizers, the bands invited to perform, the bulk of attendees, and the attention paid to the festival by the press compared to other predominately black music events like the Harlem Cultural Festival. Yet, Havens' opening performance of Woodstock – a shift in performance scheduling forced upon festival organizers due to the mass of attendees making it impossible for the planned opening act to make it to stage on time – was a significant instance where a black musician and his attendant politics were heard. Asked to fill time while other bands struggled to make it past crowds to the concert venue, Havens claimed to play every song he knew during his set including "Handsome Johnny."<sup>65</sup>

Live performances provided musical artists the opportunity to converse with listening crowds and extrapolate on the meanings of their songs. Introducing his song

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<sup>64</sup> Richie Havens, "Handsome Johnny," song on album *Mixed Bag*, Verve records, 1966.

<sup>65</sup> Michael Lang, *The Road to Woodstock*, HarperCollins, 2010, 164-165, 172-173.

“Machine Gun” during a 1970 live performance in New York City, Jimi Hendrix linked the song’s sonic replication of weapon-fire and lyrical critique of war to the domestic conflicts over race, rights, and war then roiling the United States:

Happy new year, first of all. I hope we’ll have a million or two million more of them... if we can get over this summer, hehehe. Right, I’d like to dedicate this one to the draggy scene that’s goin’ on, all the soldiers that are fighting in Chicago, in Milwaukee, and in New York.... Oh yes, and all the soldiers fighting in Vietnam. I’d like to do a thing called ‘Machine Gun.’<sup>66</sup>

Hendrix shifted the original focus of his anti-war song – the Vietnam War – to speak out against the violence surrounding domestic protests for racial justice and an end to the war. Insisting his performance was dedicated to the soldiers fighting in major U.S. cities, before sarcastically remembering to mention the soldiers fighting in Vietnam, Hendrix insinuated the violence in American streets was something akin to a war as demonstrators regularly faced the militant backlash of U.S. police forces and the national guard. Hendrix’s sense that the war had reached home seemed more demonstrable than ever given this performance came shortly after the early-May 1970 Kent State Massacre that witnessed the U.S. national guard open fire against students protesting the expansion of the Vietnam war.

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<sup>66</sup> Jimi Hendrix, Live Performance of “Machine Gun,” Band of Gypsies, Live at Fillmore East, 1970.

Hendrix's critique of war enunciated in "Machine Gun" carried with it the weight of his own negative experience in the United States Army Airborne. Biographers note that Hendrix reluctantly entered military service as a means of escaping imprisonment. During his service, Hendrix wrote home detailing his distaste with the harassment and abuse he faced as an African American soldier, alongside the exhaustive monotony of continuous physical training and parachute jumps, all while longing to be able to play guitar. Once his father shipped his guitar to Hendrix, he reportedly focused more on practicing and performing with fellow musician servicemen like Billy Cox, than his military duties, resulting in an honorable discharge approximately a year after his enlistment.<sup>67</sup>

Despite the brevity and displeasure of Hendrix's military service, his personal experience in the Army Airborne likely shaped the lyrics of his song "Machine Gun," which not only critiqued that weapon of war, but also the air war Hendrix came close to participating in. The song speaks in fragments. It lacks definitive reference to who is fighting who in lyrics that only refer to "me" versus "you" or "farmer" versus "bomber," yet still invoke the violence of war in Vietnam. Stanzas are introduced and punctuated by quick guitar riffs alongside with snare drum beats sonically mimicking bursts of machine gun fire. Hendrix opens with a wailing voice that a "Machine gun" is

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<sup>67</sup> Leon Hendrix and Adam Mitchell, *Jimi Hendrix: A Brother's Story*, St. Martin's Press, 2012; Steven Roby and Brad Schreiber, *Becoming Jimi Hendrix: From Southern Crossroads to Psychedelic London, the Untold Story of a Musical Genius*, Da Capo, 2010.

“tearing my body all apart.” He bemoans “evil man make me kill you, evil man make you kill me, evil man make me kill you, even though we’re only families apart” placing blame for war upon evil, controlling, men. He proclaims, “I pick up my axe and fight like a farmer...” lamenting “your bullets keep knocking me down,” possible references to a popular Vietnamese resistance that included peasant farmers taking up arms. Hendrix juxtaposes this farmer way of war with fighting “like a bomber” then immediately notes “yeah but you still blast me down to the ground” invoking air power’s vulnerabilities to air defenses that resulted in airmen’s death or capture. Shifting to a defiant tone, Hendrix promises his enemy’s own destruction claiming invincibility to their bullets, insisting “the same way you shoot me down baby, you’ll be going just the same, with three times the pain, and your own self to blame” then claiming “I ain’t afraid of your mess no more, babe... after a while your cheap talk don’t even cause me pain, so let your bullets fly like rain.” Abstract in its lyrical construction, the song’s final stanza returns to war references like “Don’t you shoot him down, he’s about to leave here” seeming reference to a soldier’s death near the end of their tour, and “He’s been shot down to the ground, oh where he can’t survive no no” again speaking to the vulnerabilities of piloted airplanes being shot down resulting in airmen’s deaths.<sup>68</sup> Particularly interpretable due to its lyrical opaqueness, Hendrix’s 1970 live performance concluded with a spoken clarification between him and drummer Buddy

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<sup>68</sup> Jimi Hendrix, “Machine Gun,” *Band of Gypsies*, Capitol Records, 1970.

Miles, Hendrix: "Yeah that's what we don't wanna hear any more, alright;" Miles: "No bullets, no guns, no bombs, no nothin', just let's all live, and live you know instead of killing."<sup>69</sup>

The cost of the space race, inextricably linked with the science of rocketry and missiles, also formed critiques of war's costly materiality. Gil Scott-Heron's poem "Whitey on the Moon," (1970) was "inspired by some whiteys on the moon" and regaled a personal experience of poverty juxtaposed to whitey's costly ability to reach the moon. A farcical yet realistic capture of lived experience set to drumbeats, Scott-Heron made live audiences laugh in disgust while describing his sister's health concerns, resultant doctor bills, and raised rent from "the man" suggesting these dispossessing costs might be connected to whitey's adventures on the moon. In its sardonic evocation of a society where a white man could fly beyond the heavens and a black woman might die from a rat bite the disparity in positionality evoked the sorts of race, capital, and gender differences then animating the moment's social movements.<sup>70</sup>

The West Coast Pop Art Experimental Band's third album *A Child's Guide to Good and Evil* released in 1968 featuring several songs that critiqued the U.S. war in Vietnam with a macabre sardonicism. The opening song on the album entitled "Eighteen is over

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<sup>69</sup> Buddy Miles, during Live Performance of "Machine Gun," Band of Gypsies, Live at Fillmore East, 1970.

<sup>70</sup> Gil Scott-Heron, "Whitey on the Moon," Small Talk at 125<sup>th</sup> and Lenox, Flying Dutchman/RCA Records, 1970.

the Hill” echoed the common expression of mockery from the moment that anyone “30 is over the hill,” a phrase conveying the perception that anyone beyond youth had succumbed to a conservative society’s demands for homogeneity and obedience in contrast to those participating in the counterculture, or who “dropped out.” Though much of the song’s lyrics are poetic without a clear meaning, a few passages like “You can’t change me into something that I’m not” and “I’ll hear your line, some other time, when miming performance rhyme, The way you feel, it is so phony and unreal” conveyed the reluctance to abandon a youthful defiance or perform as expected by society.<sup>71</sup>

The album’s titular song claimed to offer guidance to children on morality. In the song’s first verse, the singer encourages listeners to take their hand and flee into a forest. There, several animal encounters are to occur – “A vampire bat will suck blood from our hands, A dog with rabies will bite us, Rats will run up your legs” – yet these horrors are dismissed immediately with the verse’s concluding line “But nothing will matter.” The second verse’s lyrics, while still abstractions, speak to the youth experience of the moment where the “doors of many strange rooms have been bolted and locked” leaving a defeated figure to “come back dragging your day dreams behind you,” but the singer reassures the listener, promising “I’ll give you a new shiny face, And a yellow brick road,” while insisting “The rest of the world is wrong, Don’t let anyone change you.”

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<sup>71</sup> West Coast Pop Art Experimental Band, “Eighteen is Over the Hill,” *Volume 3: A Child’s Guide to Good and Evil*, Reprise Records, 1968.

These defiant cries for a personal identity different from the social norm conclude with the final verse that repeats the lines “Evil doesn’t exist anymore, except for the war.”<sup>72</sup>

While these songs conveyed a generational defiance pervading the thoughts of many young people coming into adulthood, the album’s song “A Child of a Few Hours is Burning to Death” spoke explicitly about the horrors of the war while affixing critique upon the rampant use of Napalm within the U.S. air war. Here, the band specifies a prominent weapon of war – Napalm – and describes the effects of the war materiel’s use in macabre satire while also enunciating a critique of an immobile populace lulled into doing nothing about war’s violence. The opening verse exclaims “A child of a few hours, is burning to death. Her eyes are full of smoke. Her mouth is full of fire. Napalm is perfect, for women and children. Forgive us, forgive us.” before a punctuating exclamation of sarcasm that completes each of three verses: “We should have called Suzy and Bobby, they like to watch fires.” Enunciating the immolating effects of napalm while noting the indiscriminate use of the chemical weapon upon women and children, the song’s lyrics not only target violence for derision, but also societal complacency as these evils unfold. The song’s second verse blames the news media’s censorship of the war’s violence - “Pretend it’s not happening, it will be clipped, out of tomorrow’s news show” - for constructing a lazy and indifferent people: “We all are nothing, but soft

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<sup>72</sup> West Coast Pop Art Experimental Band, “A Child’s Guide to Good and Evil,” *Volume 3: A Child’s Guide to Good and Evil*, Reprise Records, 1968.

moist people, with soft moist hands, folded over our buttons, silently sleeping, cold and unmoving and doing nothing.” The song concludes repeating its opening descriptions of “a child of a few hours” – an infant – burning to death with eyes filled of smoke and mouth full of fire.<sup>73</sup>

Contrasting these songs whose lyrics ring with critical acerbity came the track “Anniversary of World War III,” which had no words or sounds, only silence. This somber soundlessness interrupted the album’s songs creating a confusing effect as if the album had finished, though two more songs followed on the record.<sup>74</sup>

Eugene McDaniels’ 1971 album “Headless Heroes of the Apocalypse” included multiple songs excoriating past and ongoing violence. The opening song “The Lord is Back” claims the lord is black, mad, and back “to make corrections” by “traveling the road to mass destruction” a fate that “Revelations tells us...is near” so one “better pay attention, to the warning voice you hear.”<sup>75</sup> In the album’s titular track “Headless Heroes” McDaniels excoriates three then raging conflicts between “Jews and the Arabs,” “left wing and right wing,” and “Niggers and Crackers.” All these participants, in McDaniels’ read, are merely pawns in a “master game” run by “industry and war machine” who are the true “kings of the master game.” While the war machine

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<sup>73</sup> West Coast Pop Art Experimental Band, “A Child of a Few Hours is Burning to Death,” *Volume 3: A Child’s Guide to Good and Evil*, Reprise Records, 1968.

<sup>74</sup> West Coast Pop Art Experimental Band, “Anniversary of World War III,” *Volume 3: A Child’s Guide to Good and Evil*, Reprise Records, 1968.

<sup>75</sup> Eugene McDaniels and Dwight Singleton, “The Lord is Back,” *Headless Heroes of the Apocalypse*, Atlantic Records, 1971.

metaphorically “controls the board” those deployed in these conflicts are simply “the cannon fodder” ignorantly sustaining the master game. A refrain follows each of the song’s verses insisting “Nobody knows who the enemy is” while suggesting the master of the game is “slitting our throats, right in front of our eyes” insisting the listener “Better get it together, Better get it together, and see what’s happening, to you and you and you.” While less explicitly focused upon the U.S. war in Vietnam, McDaniel’s ultimate finger pointing to “Industry and War Machine” as the source of both domestic and international strife fit within the moment’s growing discontent with the “war machine” as source of society’s militarism and bellicism. While “Headless Heroes” subtly referenced U.S. political conflicts, the album’s final song, “The Parasite (For Buffy)” enunciated an explicit critique of America from its colonial founding. The song repeatedly tells the story of those “who landed at Plymouth” and deceived the “trusting Indians” with each version of the story adding detail to who the pilgrims were – “ex-hoodlums and jail birds” – who deceived the native peoples with forked tongue, causing chaos spreading disease, and who “as agents of God did damn well what they please.” Though the opening stanzas are sung in a slow groovy jam each stanza incorporates a new American horror sung with more anger and exasperation until finally devolving in to screams of bloodcurdling terror accompanied by discordant instrumentals shocking listeners out of the song’s calm recollection of criminality.<sup>76</sup>

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<sup>76</sup> Eugene McDaniels, “Headless Heroes,” *Headless Heroes of the Apocalypse*, Atlantic Records, 1971.

Joan Baez's 1973 track "Where are you now, my son?" also opts for a sonic surprise, not silence, but the sounds of bombing and mothers mourning dead sons as she toured North Vietnam's bombed spaces and hid in its bomb shelters, rolling tape.<sup>77</sup> She devoted the entire second side of her fourteenth album to the song that included recordings of war sounds intermixed with poetic expressions of her personal experiences in-country alongside songs sung by her and by local Vietnamese women. Intermixed into the track's sounds are nearby bombing explosions, anti-aircraft ground fire, air raid sirens, and conversations in multiple languages enunciated by Vietnamese, French, German, and U.S. recorders. At times in the track the sounds of overflying jets, their accompanying explosions, and retaliatory anti-aircraft fire are so close the fear of death forces Baez and others' re-entry into bomb shelters cutting short their active recordings.<sup>78</sup>

Weapons of war like machine guns, napalm, or hydrogen bombs became targets of critique alongside the metaphorical "war machine" in the discourse of popular anti-war music. Yet, despite the conduct of thousands of drone surveillance flights during the U.S. war in Vietnam the war technology escaped mention within the critiques of war in popular discourse. While it is difficult to know how attuned war makers were to the

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<sup>77</sup> By the album's release in 1973, Baez was well known by popular audiences following a string of solo and duo recordings with Bob Dylan. Her place as social reformer through song was also under scholarly discussion at the time, see for instance: Cheryl Irwin Thomas, "Look What They've Done to my Song, Ma': The Persuasiveness of song," *Southern Speech Communication Journal*, 1974, Vol. 39 Issue 3, 260-268.

<sup>78</sup> Joan Baez, "Where are you now, my son," *Where are you now, my son*, 1973.

popular music of their time the absence of the drone within anti-war music speaks to way drones could render war's violence less visible for a depoliticizing effect.

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The QH-50 drone was first designed to conduct nuclear war. This tool of mass destruction was redesigned and imagined as capable of "precision" and "safe" bombing operations with guided missiles. An array of other weapons attached to the QH-50 drone, however, instead pointed to war planners' hopes the machine could still inflict mass destruction with miniguns and grenade launchers. War planners' fantasies that the QH-50 might save downed pilots or defend air bases pointed to the vulnerabilities of air war and the ways the drone was fantasized as a solution to these problems. Perhaps most significant of all the many visions for the QH-50's operational use was the hope the helicopter drone could hover over and surveil targets – a "loitering" capability explicitly sought by DARPA agents in the late 1970s when the agency first funded the Predator drone's prototype.<sup>79</sup> Despite the QH-50 drone's limitations in operation as a destructive instrument of war the way drones evaded the critical public eye of the moment nonetheless pointed to drones' political utility to hide war's violence.

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<sup>79</sup> Richard Whittle, *Predator*; Singer, *Wired for War*, 36, 39, 152.

## **Conclusion: Has the drone made U.S. war conduct humane?**

The scholarship on drones has primarily focused on the late twentieth and early twenty-first centuries. Much of this literature has emphasized or interrogated drone warfare's "surgical" nature. In contrast, a longer history of drone warfare shows the war machine was an important part of making the U.S. into a world military power. During the World Wars, Cold War, and U.S. war in Vietnam, drones were intertwined into an American way of war dependent upon air power to wage distanced and immensely destructive warfare. This history of drones' immense violence refutes contemporary notions of drones supposedly enabling a "humane" or "surgically precise" form of warfare.

As I have demonstrated in Chapter 1 of this thesis, the pilotless airplane first emerged alongside the first full-fledged war in the air waged during the First World War. Global weapons manufacturers including key figures at the Sperry Gyroscope Company transferred mechanisms like the original "auto-pilot" into the control apparatus for a new weapon of war: the "aerial torpedo." Known alternatively as a "pilotless" or "automatic" airplane, development work begun in 1915 by U.S. engineers through the Naval Consulting Board transferred into an Army weapons project led by engineers Charles Kettering and Orville Wright. These Army war planners sought a device capable of automatic flight and bombing. Though the weapon entered mass production in late-1918 the German surrender ended plans for the weapon's

deployment. Yet, the imagination that surrounded the pilotless airplane is significant. Designers of the pilotless airplane envisioned it acting as a solution to total's war's stalemated sacrifice in lives. To U.S. war planners, the pilotless airplane seemed capable of substituting for piloted airplanes to bombard German trench lines and cities. The new weapon seemed a means of sparing American and Allied soldiers lives by regaining offensive action through the air amidst attritional trench warfare. Pilotless airplanes promised to lessen the dangerous labor placed upon pilots in air war. The personal records of key boosters of the pilotless airplane like plastics manufacturer and Naval Consulting Board member Leo Baekeland show the weapon's manufacture for war was intertwined into broader anxieties concerning his German occupied Belgian homeland and his pilot son flying in the air war against Germany. Working in the U.S. away from the war, major boosters and engineers of the pilotless airplane infused aerial torpedo and pilotless airplane with a sense of vicarious violence that made them feel as if the weapon's potential destructiveness was their own. As a weapon, the pilotless airplane of the First World War era was never considered a means of precision bombing, but rather fit within war planners' fantasies for "terror" bombing German cities, or as post-war discourse in popular publications revealed, waging chemical war against entire national populations.

Many of the same actors and ideas that animated pilotless airplanes during the First World War sought to make the weapon a reality of war during the Second World

War. Charles Kettering leveraged his position as famous inventor and General Motors head of research to chair the U.S. National Inventors Council. Council members' solicitations in popular print publications and radio programs asked the public to design war technologies. The U.S. National Inventors Council functioned as a significant propaganda tool that geared people's minds to supporting the Allied war effort that led to important materiel developments used on war fronts. The National Inventors Council drew in hundreds of thousands of submissions including designs and blueprints sent to Washington D.C. by lay-inventors living around the world, many of which were sent to the Commerce Department in Washington D.C. from lay-inventors living in spaces around the world. The Council's "remotely controlled devices" subcommittee led by Kettering funneled ideas about remote control and "robot airplanes" to U.S. military engineers then designing pilotless airplanes. As Kettering examined blueprints and designs for remotely controlled devices through his work on the Council he led GM engineers in a failed attempt to redesign his 1918 "Bug" pilotless airplane into a "robot" airplane capable of air war in the 1940s.

Commanding General of the U.S. Army Air Force Henry Harley "Hap" Arnold supported the pilotless airplane's development since the First World War and directed the first U.S. combat deployment of "drones" against German military and civilian targets in 1944-1945. Drones became intertwined into the mass destruction of World War II Allied air bombing. The joint U.S. Army and Navy led Operation Aphrodite saw U.S.

servicemen remotely guide drones into V-weapon launching sites and submarine pens, as well as sending wayward drones to land and explode randomly within German cities like Cologne. No simple munition, the drones of Operation Aphrodite carried over 18,000 pounds of torpex explosives that caused explosions recognized as setting a new destructive height for a singular bomb in the months immediately preceding the U.S. use of atomic bombs to destroy Hiroshima and Nagasaki. The drone technology developed and deployed during Operation Aphrodite lived a destructive afterlife when repurposed in 1946 to fly through and detect radiation levels within the explosive cloud of the atomic bomb tested at Bikini Atoll. During World War II, the drone was intertwined into the massively destructive U.S. air war as both a bombing mechanism and a producer of knowledge about the nation's super weapon, the latter an exercise of power that dispossessed the Bikini people of their homeland and rendered their island an irradiated toxic space.

The 1960 Soviet downing and capture of CIA U-2 pilot Francis Gary Powers proved a climactic moment of the Cold War that reshaped the institutions and the technologies within the U.S. pursuit of world hegemony. Policy and public discourse reveal many blamed pilot Powers whose failure to use a lethal injection proffered to him by the CIA in case of capture inspired gendered critiques of his performance as a military man. Pilot Powers exemplified how the "human factor" of air war carried with it a wide array of vulnerabilities: a self-preservative instinct that defied suicidal

mandates, mental manipulation and potential “brainwash” during Soviet interrogation, and a public exposure of U.S. covert operations that placed CIA actions at the center of worldwide scandal. Despite the U-2 airplane’s downing to Soviet missiles, the public and Eisenhower administration officials constructed a dichotomy between flawed man (Powers) and perfect machine (U-2 airplane), that defined the context for the administration’s creation of the National Reconnaissance Office and the intelligence agency’s turn towards unmanned war machines like drones and satellites.

Covert intelligence agencies like the National Reconnaissance Office and the Advanced Research Projects Agency became the primary institutions within the U.S. government guiding drones’ development during the latter-half of the 20<sup>th</sup> century. While many historians have studied the mass deployment of U.S. surveillance drones during the Vietnam War, the U.S. military’s use of drones as bombing mechanisms for the Cold War and Vietnam War have been largely overlooked. The QH-50 drone manufactured by Gyrodyne Corporation of America originally flew under U.S. Navy direction in the early 1960s as a weapons platform that carried torpedoes and nuclear depth charges to target Soviet nuclear submarines. Despite regular technical malfunctions and operator errors that left the QH-50 drone with a poor performance record during operation Drone Anti-Submarine Helicopter (DASH), the Johnson administration and the Advanced Research Projects Agency imagined the drone as uniquely capable for “interdiction” campaigns aiming to stop North Vietnamese soldiers

from reaching South Vietnam. Classification still clouds the QH-50 drone's operational record. Newly declassified records, however, reveal the Advanced Research Projects Agency envisioned the QH-50 as a "do-it-all drone." The Advanced Research Projects Agency equipped QH-50 drones with laser-guided missiles, grenade launching turrets, and minigun machineguns, with the aim of the drone waging a counterinsurgency campaign in Vietnam. Advanced Research Project Agency officials also imagined the drone performing an array of support roles during the U.S. war in Vietnam including downed pilot rescue, long-term surveillance, air base defense, and the illumination or smoke screening of battlefields. Despite the U.S. military deploying drones en masse for the first time during the Vietnam war, the drone was invisible to a critical U.S. public compared to other hyper-visible instruments of machine war like napalm bombing or nuclear weapons. The drone's absence from the lyrics of the era's musicians that produced the most popular and widely consumed anti-war messages signals drones held an insidious political utility of rendering war's violence less visible. Officials in the U.S. Advanced Research Projects Agency tested their fantasies for the QH-50 drone waging war in the 1960s and early-1970s. Their ideas about drone war established during the war in Vietnam carried into late-1970s initiatives led by the renamed Defense Advanced Research Projects Agency including development funding for a drone design made by Israel engineer Abraham Karem that the General Atomics defense corporation developed into its "Predator," "Reaper," and "Avenger" drones.

Drone warfare of the recent past and present reveals the fits and starts that characterize the war machine's non-linear history. Where many authors are prone to teleological narratives that paint drones' embrace for war as inevitable, the post-Vietnam war era of drone development again shows the technology faced challenges to adoption. The U.S. military's embrace of drones during the Vietnam war was fueled by fantasies of hyper capable war machines, anxieties concerning the frequent downing of U.S. pilots to North Vietnamese anti-air defenses, and hopes for a drone that could conduct violence while mitigating war's requisite sacrifice in life thus curbing the political unpopularity of the war. Yet, war planners did not solely place their hopes upon machine substitutions for pilots. Alternative responses to the vulnerabilities of piloted U.S. air war birthed new military institutions during the Vietnam war like the U.S. Navy Strike Fighter Tactics Instructor Program, or "Top Gun" program. The Top Gun school sought to train U.S. pilots to be more capable at waging air combat against enemy jet fighters or better evade surface-to-air missiles thereby reducing U.S. military losses. The popularization of the Top Gun school and construction of fighter pilots as hyper-masculine figures through state-backed films in 1986 and a sequel in 2022 signal the U.S. military remained and remains committed to piloted air war even as drones became so central to U.S. war making that some military commanders allowed themselves to imagine the last fighter pilot has already been born.

Many drone models flew surveillance missions to direct U.S. bombardments during 1990s armed conflicts like the First Gulf War and the Bosnian war. The Clinton administration's United Nations' backed air strikes during the Bosnian conflict relied upon video evidence gathered by Predator drone surveillance for target selection. This practice of internationally sanctioned bombardments aiming to prevent war crimes like ethnic cleansing helped the Clinton administration claim a spirit of humanity and justice pervaded the U.S. exercise of force around the world.

It was not until the U.S. war on terror that a drone was made into a weapons platform capable of firing guided missiles like the QH-50 drone during the Vietnam war. Drone war has taken center stage in U.S. war making during the first two decades of the 21<sup>st</sup> century. New technologies including long-range communications networks and the internet have enabled the U.S. to conduct air bombings around the world while operators direct drones from U.S. based control centers. Key as instruments for both military intelligence production through surveillance and war's violence through bombardment, contemporary drones have emerged as the favored means in the U.S. arsenal to further extend war's ever-expanding boundaries.

The historian Samuel Moyn has critiqued the recent past's emergent regime of "humane" war arguing reforms to war's conduct have obfuscated the more important goal of preventing or ending war in pursuit of peace. There is much to applaud in Moyn's analysis that demonstrates U.S. war making since the Vietnam war has operated

under a legalist regime that prides itself on claims to mitigating civilian casualties but has lost sight of the bigger picture of interrogating war's legitimacy as state policy.<sup>1</sup> Rather than seeing a change toward "humane" war, other historians like Alfred W. McCoy have argued for the continuities between past and recent U.S. war making defined by torture practices and targeted assassinations.<sup>2</sup>

Moyn's argument gives far too much credence to the notion that reforms in U.S. war conduct have affected a "humane" form of war. The sense of change over time Moyn imparts to U.S. war conduct between the Vietnam War and war on terror is not incorrect, per se, but constructed in an inaccurate and misleading manner. While the U.S. military has made efforts to curb civilian casualties in war through legal regimes and new war technologies like drones, the actual results of these efforts are more limited than Moyn admits. His chief demonstration of a tangible shift towards "humane" war making are statistics of civilian casualties from the Vietnam war compared to the Iraq war. Here, Moyn not only counts an estimated 2 million Vietnamese civilian deaths caused by U.S. military actions, but also lumps in the estimated 5 million deaths caused by Khmer Rouge regime in Cambodia. In an argument about U.S. war conduct he misleadingly expands the counting for the earlier "pre-humane" Vietnam moment to include millions of civilian deaths that were not directly caused by U.S. military forces.

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<sup>1</sup> Samuel Moyn, *Humane: How the United States Abandoned Peace and Reinvented War*, Farrar, Straus and Giroux, 2021.

<sup>2</sup> Alfred W. McCoy, *Torture and Impunity: The U.S. Doctrine of Coercive Interrogation*, University of Wisconsin Press, 2012.

While Moyn expands the scope of death counts in this earlier moment to try and solidify his argument, he does not take the same expansive counting method for the later Iraq war period. For one, Moyn only ascribes 500,000 civilian deaths to the U.S. war in Iraq counting deaths solely from the war waged by the George W. Bush and Barack Obama administrations. This ignores the continuity of the Iraq war in the 2000s to a preceding 1990s decade of U.S. bombing under the Clinton administration's enforcement of a no-fly zone and imposition of stringent sanctions estimated to have caused an additional 500,000 Iraqi civilian deaths. Counted more accurately, the civilian casualties of U.S. war making in Iraq alone are much closer to the U.S. caused civilian deaths in Vietnam than Moyn admits.<sup>3</sup>

There is a second major issue with Moyn's comparative tabulations of civilian casualties caused in U.S. wars. Where Moyn questionably includes the genocidal campaigns of the Khmer Rouge in the civilian death count ascribed to the U.S. war in Vietnam, he does not include any of the many other conflicts that accompanied the U.S. war in Iraq amidst a "Global War on Terror." The war in Iraq was only one part of the recent past's supposedly "humane" moment. Civilian casualties from U.S. war making including drone war in Afghanistan, Pakistan, Syria, Yemen, and Somalia, alongside many other secret deployments of U.S. military force around the world, go unrecognized by Moyn. Civilian death counts in these conflicts are difficult to accurately

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<sup>3</sup> Moyn, *Humane*.

assess but would again escalate the tabulation for the recent pasts' supposedly "humane" war. These other conflicts, especially the Syrian example, also undercut Moyn's central evidence for a "humane" shift being based solely upon civilian casualty numbers as this ignores other horrors of war, for instance the U.N. estimated 13.5 million displaced Syrian refugees needing humanitarian assistance and the 6 million internally displaced Syrians. Put shortly, if the expansive tabulating Moyn engages in to amplify the devastation of the "pre-humane" Vietnam war moment is applied to the 21<sup>st</sup> century "humane" war moment then the supposed shift towards restraint in recent U.S. war conduct is far less tangible.<sup>4</sup>

Drone war is supposedly a primary representative of U.S. shifts towards "humane" war conduct in the 21<sup>st</sup> century. Yet, as delineated in the opening of this work, non-governmental organizations and U.N. investigations have challenged the U.S. government's claims to drone strikes conducted with little to no civilian casualties or collateral damage. Some of the obfuscation of civilian deaths in U.S. drone war stem from policy measures taken during the Obama administration to label all males who appear over the age 16 at bombing targets as "militants." This has had the effect of placing the onus upon bombing victims' family members to posthumously prove the

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<sup>4</sup> Ibid.

innocence of those labeled teenaged “terrorists.”<sup>5</sup> Policy changes made by the Trump administration abandoned the limited efforts made by the U.S. government to offer transparency on drone war’s devastation. Drone war is not always conducted by drone weapons platforms like the Predator and Reaper that can simultaneously conduct video surveillance and launch missiles. Instead, drones often perform the role of intelligence gathering, while piloted aircraft like Lockheed manufactured AC-130 deploy munitions. Drone war should not be seen as separate from piloted air war but rather as one war instrument that often directs the other. Being cognizant that intelligence gathered by drones often guides other U.S. military efforts like infantry deployment or piloted air bombing reminds us that recent ventures into massively destructive bombing practices such as the Trump administration’s use of the “Mother of All Bombs” are not separate from drone war.

The U.S. was never the sole nation state engaged in drone war. The drone’s increased global proliferation in the 21<sup>st</sup> century and its violent use by other nation states further evidence the drone is not simply a tool for “humane” war. There is now an active international weapons market for drones. Most militant nation states have drones in their arsenals. Arms manufacturer General Atomics has sold its Predator drone to U.S. approved international customers in Europe, the Middle East, North Africa, and Latin

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<sup>5</sup> Madiha Tahir, “The Containment Zone,” in *Life in the Age of Drone Warfare*, Lisa Parks and Caren Kaplan, eds., Duke University Press, 2017; Sikander Ahmed Shah, *International Law and Drone Strikes in Pakistan: The Legal and Socio-political Aspects*, London: Routledge, 2015.

America amplifying the global proliferation of drone technology. U.S. drone technology has been increasingly studied and reverse engineered by adversaries including the Iranian and Chinese militaries. The onset of a major war in Europe between Russia and Ukraine has also seen the mass deployment of drones for surveillance and bombing purposes. As the Russian war in Ukraine reinvigorates the threat of nuclear war it is worth remembering drones in the past were integrated into U.S. nuclear weapon capabilities. It is not difficult to imagine 21<sup>st</sup> century drones being configured into nuclear weapons platforms. Weaponized drones are available for international sale, transferable, and operable by all sorts of militant actors including non-state actors like Yemen's Houthi rebels who in 2019 deployed a commercial drone turned improvised explosive device to bomb Saudi Arabian oil facilities.

Controversial domestic law enforcement efforts increasingly rely upon drone technology. U.S. police forces have made overflying drones a recurrent presence at protest spaces especially activism that critiques policing practices that disproportionately directs violence and incarceration at people of color. U.S. government agencies that police immigration have increasingly adopted drones – including the Predator drone – into the monitoring of national borders. The FBI and Department of Homeland Security have reportedly lent out Predator drones to local police forces. Other nations have deployed drones to protect their borders or even as

surveillance instruments used to stymie the flow of Syrian war refugees from reaching Europe.

The practices of drone warfare have changed over the course of the 20<sup>th</sup> and 21<sup>st</sup> centuries, but what is striking is that the drone has been an integral part of a longer history of U.S. war-making and its long-standing destructive logics. The logics of machine substitution for soldiers in war established across the 20<sup>th</sup> century remain alive. Contemporary U.S. military leaders echo the discursive practice of juxtaposing problematic pilots with supposedly hyper capable war machines to justify automating violence. U.S. generals quoted in recent years cite the biological delays of human drone operators' reaction times while in control of drones as an inherent limit to their military functionality that necessitates artificial intelligence take over drones' control.

Rather than seeing drone warfare as something that has reformed U.S. war combat for the better in the recent past, we might recognize there are many futures of drone warfare ahead of us including the specter of total drone automation. Scientist led activist groups like the International Committee for Robot Arms Control express serious concerns about drone automation through artificial intelligence and other types of "killer robots." Religious leaders and political activists working through the organization Peace Action have formed an Inter-Faith Network on Drone Warfare that produces films on the destruction caused by drone war, stages protests at drone operation centers located around the country, and lobbies politicians to alter drone

policy. Despite immense public and international scrutiny of U.S. drone war there is no politics in place that offers a viable critique of U.S. machine warfare at the present.

While some are prone to seeing the ascent of drones in war as an irrevocable turn in contemporary war making one role of the historian is to say nothing is inevitable. There is a dire need for a new anti-war politics in the United States and throughout the world. Contemporary anti-war political pressure fails to reach the popularity of the Vietnam War era's protest movement in part because drone war renders U.S. military violence largely invisible to U.S. audiences. Rather than an acceptance of "perpetual war," or arguments critical of war's seeming perpetuity that lend credence to the notion that drones' have created "humane" war, there is a necessity for a shift in U.S. social and cultural life away from the glorification and celebration of violence. Only through the construction of a critical anti-war public can drone war, and war in general, be opposed. The global preponderance of drones and the logics of surveillance and punishment that constitute the war machine's reason for being promises a bleak future for everyone who lives to see it.

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## **Biography**

Garrett McKinnon received a B.A (2012) and M.A. (2014) in History from Louisiana State University before doctoral study at Duke University. In addition to research funding from Duke University, McKinnon's work has received fellowship and grant support from the Smithsonian Institution's National Museum of American History, the U.S. National Archives and Records Administration, the Dwight D. Eisenhower Foundation, the John F. Kennedy Library Foundation, the Lyndon B. Johnson Foundation, the Linda Hall Library of Science, Engineering, and Technology, and the History departments of the University of Michigan, Ann Arbor, the University of Texas, Ann Arbor, and the University of Massachusetts, Boston.