

**Killing in the Intelligence Age: Aspects of Weapons Technology Development Since the
Gulf War**

Senior Honors Thesis

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Foreword

It is worth beginning with a few definitions of terms and fundamental reasoning behind the work. By the Intelligence Age, I refer to the term made prominent by Sam Altman, the CEO of OpenAI, among the leading American companies of the Artificial Intelligence frontier. In a revealing September 2024 blog post, Altman defined this as an age of “massive prosperity,” the path to which will be “paved with compute, energy, and human will.”¹ Its starting point will likely prove a matter of dispute – whether the moment when generative AI became widely available in late 2022 or the onset of Artificial General Intelligence (AGI), when the technology is expected to prove equally or more capable than the average human across a wide range of tasks.² Either way, it is clearly a future-oriented definition. While most of the historical developments treated in this paper predate Altman’s use of the term, I employ “Intelligence Age” to indicate the technologies’ continuities with contemporary and future capabilities, and to integrate a relevant historical term alongside the more common Information and Digital ages. This is no way meant to take away from the historical focus of the work.

Why begin with the Gulf War? The conflict proved transformative to the adoption and development of technologies by the US military. The use of these technologies facilitated a devastating air campaign lasting a little over a month, followed by an overwhelming ground

¹ Sam Altman, “The Intelligence Age,” September 23, 2024. As is explained in Aadya Gupta and Adarsh Ranjan, “A Primer on Compute,” *Carnegie India*, April 30, 2024, “compute” is used here in noun form and refers to the computational power, or processing capability, which “enables AI models to process vast amounts of data, perform complex calculations, and make intelligent decisions by learning from this data.”

² IBM, “What is artificial general intelligence (AGI)?” The article notes an important distinction between such general intelligence – or even superintelligence, which would dominate humans in all domains – from narrow AI, which is focused on specific domains. Some “narrow” systems have already outperformed human experts, with one of the most famous such cases being the victory of IBM’s Deep Blue over chess world champion Garry Kasparov in 1997. Nonetheless, AGI is the subject of much debate and competing definitions. This distinction between particular and broad capabilities carries important implications for the military domain.

assault of a mere hundred hours.³ Widely described as the world's first “space war,” the 1991 Gulf War represented an important step toward the establishment of the US Space Force in 2019.⁴

I have sought to illustrate the important continuities between the historical examples and contemporary developments covered in the work. Such commonalities begin with archival evidence on the US Army’s development of a training simulation based on the tank Battle of 73 Easting, fought during the Gulf War between US and Iraqi forces in late February 1991. The digitized networks and guiding logic of this era paved the way for technologies and themes of warfighting which have become dominant in the following decades. Similarly important is the trajectory between the Signals Intelligence (SIGINT) tracking technologies Coalition forces developed in the Middle Eastern conflicts of the 2000s and the recent AI-driven target generation systems deployed by the Israeli Defense Forces. The similarities include both technical features and the institutional assumptions which drive their adaptation. Last but not least, we learn much about relations between US military institutions and defense contractors in documents drawn from Stanford University’s Silicon Valley Archives: the Joseph D. Cusick Papers and the aforementioned Battle of 73 Easting documents. I consider certain continuities and disruptions generated by the increased dominance of private technology firms in development, in the defense sector as elsewhere. This theme carries implications for both military capabilities and civilian fatalities. Although I initially set out to trace the history of recent developments in the use of AI in warfare, the progression of this research revealed that a deeper historical perspective proved more valuable to institutional and civilian fatality considerations alike.

³ Lawrence Freedman and Efraim Karsh, “How Kuwait Was Won: Strategy in the Gulf,” 5.

⁴ Charles Pope, “30 Years Later, Desert Storm Remains a Powerful Influence on Air, Space Forces,” *U.S. Air Force*; Air Force Lt. General S. Clinton Hinote put it clearly: “The seeds of an independent Space Force were absolutely sown during Desert Storm.” According to him, this is the conflict where space took on a central rather than a supplementary role.

I. Introduction

*“Yes, and how many times must the cannonballs fly,
Before they're forever banned?”⁵*

History has proven these famous lines from Bob Dylan’s “Blowin’ In the Wind” to represent exactly the wrong way to think about weapons technology development. From ancient Greece’s Amphictyonic League to the aftermath of Nagasaki, no attempt at an outright weapons ban has succeeded in full. As Adriaan Lanni reveals, the League’s oath to regulate warfare among its constituent city-states “was routinely broken and, so far as we know, never enforced according to its terms, though we do hear of a couple of attempts to fine violators.”⁶ This remained broadly true even as the means to impose violence grew ever more destructive and, to use historian Wayne E. Lee’s term describing escalation, frightful.⁷ Of more contemporary relevance, the last century has proven the words of Serge Daney that “the human condition and industrial butchery [are] not incompatible,” a core paradox we continue to grapple with.⁸

This work accepts such an inherent shortcoming of human imagination. Given that war has proven enduring, this paper focuses on a key question of how it is imagined, prepared for and conducted. Namely, how do defense institutions and the thinking of their decisionmakers adapt to new capabilities and what impact does this have on civilian fatalities? This analysis will revolve around a theme which the capabilities of weapons technology has introduced over the

⁵ Bob Dylan, “Blowin’ In the Wind,” Track 1 on *The Freewheelin’ Bob Dylan*.

⁶ Adriaan Lanni, “The Laws of War in Ancient Greece,” 471; Described by the fourth-century Athenian politician Aeschines, this is the sole formal agreement seeking to govern the conduct of warfare in the classical period. In contrast to the vast corpus of international law that has built up in the modern period, archaic and classical Greek law of war was largely “informal and customary,” built primarily on norms rather than treaties.

⁷ Wayne Lee, *Barbarians and Brothers*, 4; He describes this as the end-state of war’s escalation.

⁸ Serge Daney, “The Tracking Shot in Kapo,” trans. Laurent Kretzschmar, *Senses of Cinema*, February 2004.

last three decades. We can observe a near-paradoxical two-pronged development: Western militaries have brought an expanding set of targets into their reach while seeing ever-diminishing damage to their own forces, at the same time as an increased focus on precision, in parts as a means of minimizing impacts on civilians. The latter has enjoyed particular prominence in public-facing rhetoric by politicians and defense institutions alike.

The paper focuses on three key historical moments. The first will center around the use of air power and land-based emergent technologies in the Gulf War. Next we turn to a new age of aerial and intelligence capabilities as well as defensive robotic technology introduced in the War on Terror between 2007 and 2014. Lastly, we consider the Israeli context in the 2020s, beginning with the Lavender Artificial Intelligence-driven targeting system in Gaza and the considerations of escalation and indiscriminateness it introduces. The discussion will be completed with an analysis of domestic political debates in the United States about funding for these and related Israeli defense systems. This section will further highlight the difficult questions around the offensive capabilities enabled when a military enjoys superior defensive strength.

The central argument holds that, despite extensive US government pronouncements to the contrary, these developments have led overwhelmingly in the former of the two directions laid out above: an expanded reach of targets impacting civilians more often, and with heightened devastation. As evidence will establish, the theorized gains in precision have not materialized to lessen civilian fatalities and related damage. Both data and detailed descriptions from contexts like Afghanistan and Pakistan will serve to demonstrate the potential of this phenomenon to devastate civilian life and infrastructure.

Institutions

This paper's focus on institutions and their responses to technological developments draws heavily on the work of historians Isabel Hull and Wayne E. Lee. The institutions in focus here are not the sociopolitical ones relatively prevalent in Western discourse, such as the three branches of the US federal government or civil society organizations in the mold of Human Rights Watch and Amnesty International. Rather, they are those entities in the defense and national security spheres which theorize, strategize and execute war plans. Hull describes her consequential work *Absolute Destruction*, in which she traces the development of Imperial German military culture from 1870 to 1918, as "a study of institutional extremism."⁹ This is defined as "the repeated and unlimited application of the military's expertise ... the use of violence." In this dynamic, the means of violence overwhelm the ends, often growing beyond or even in contradiction to a state's own security or political objectives.¹⁰ One of Hull's primary insights is highlighting that though most modern genocides and atrocities have been rooted in ideology, they can also take place in the absence of such frameworks. They can rather result from institutional routines set into high gear to pursue problems identified in wartime.¹¹

Lee builds on this insight, identifying the following factors as being of primary importance in Hull's work: a military's "basic assumptions ... [including] the patterns in their practices ... language, myths, explanations of events, standard operating procedures and doctrines."¹² The scope of his work is broader, including English and early American conflicts from the 16th to the 19th centuries, in which the adversaries ranged from Irish rebels to Native

⁹ Isabel Hull, *Absolute Destruction: Military Culture and the Practices of War in Imperial Germany*, 1.

¹⁰ Hull, *Absolute Destruction*, 1.

¹¹ Hull, *Absolute Destruction*, 2.

¹² Lee, *Barbarians and Brothers*, 8.

American tribes and the Southern Confederacy. His work describes both the stark differences and telling similarities in conduct during conflicts pursued against enemies identified as “barbarians” and “brothers.” In the former case, ideas centered around their incorporation as subjects or citizens after a thorough rearrangement of their society, while with the latter options were often seen as confined to a binary: showing terror or extending mercy to traitors who might yet be reintegrated into the nation.

In the same work, Lee identifies four main factors determining violence and restraint within the “internal logic” of warfare: capacity, control, calculation and culture. For millenia, *capacity* was limited to how much territory and property one could burn and the amount of troops they could wield; this consideration took on dramatic new parameters with the onset of the industrial revolutions. *Control* refers to the discipline enabled within institutions by providing for soldiers’ needs, crucial to preventing them from enacting violence in pursuit of individual interests. This saw fluctuations with the shift from the “libertinism” of the centuries when military institutions failed to provide for their troops – despite European states dedicating upwards of 90% of their budgets to their armed forces – to strictly managed bureaucracies and finally the seismic effects of the eighteenth century’s political revolutions. Consequentially, these movements increased many citizens’ commitment to the state and narrowed the gap between soldiers and officers.¹³ *Calculation* refers to the strategic theories and “rough-and-ready” measures leaders opt for in the heat of war, lacking total precision or premeditated confidence, which reflects the profoundly unclear and shifting conditions of wartime. *Culture* represents the most relevant of Lee’s considerations. Though culture is often conceived as a force restraining violence, this is far from universally the case. Military subcultures often in fact serve to amplify the application of violence. Lee points to the “common cultural insistence on retaliation ... that

¹³ Wayne Lee, *Barbarians and Brothers*, 5-6.

takes no account of calculations of victory” as one example of internal factors accelerating rather than constraining the use of force.¹⁴

This paper’s claims do not rest on the belief that the institutions treated here demonstrate patterns of escalating extremism in ways analogous to the Imperial German military, though some parallels of inter-institutional interactions will prove useful. Furthermore, the considerations of “quantitative and qualitative” escalation Lee sets out will prove crucial in Chapter IV, which deals with Artificial Intelligence-generated targeting in the Gaza War (2023-2025). The primary aim in incorporating these works is to provide a reliable framework through which to analyze institutions, the violence they are capable of and their ability to evolve – particularly in times of conflict. The focus on organizational culture and common assumptions rather than individual decisionmaking will allow for more accurate analysis in direct reference to existing scholarship.

¹⁴ Wayne Lee, *Barbarians and Brothers*, 7.

II. “Always Dominate the Heights:” America and the Gulf War

“Always Dominate the Heights” (*Αἰὲν Ὑψικρατεῖν*) runs the motto of the Greek Air Force.

Greece, a NATO ally, played a small but valuable role in the Gulf War.¹⁵ It is difficult to name an example which saw this vision brought to more complete fruition than the US-led Coalition that prosecuted the Gulf War against Saddam Hussein’s Iraq from August 1990 to February 1991.

The conflict began on August 2, when the Iraqi military’s elite Republican Guard units invaded sovereign Kuwait. Most historians understand the rationale behind the aggression as rooted in the heavy debt burdening the Iraqi economy, in no small part due to the “protracted eight-year with Iran” which had concluded just under two years prior.¹⁶ Hussein, recognizing the Iraqi economy’s dependence on oil revenue, demanded in May 1990 that the Emir of Kuwait decrease the small country’s vast production, which helped depress the global price. Met with the latter’s refusal, the Iraqi state planned and launched the overwhelming invasion that summer. The striking implications are made clear by the figures: the invasion immediately doubled the share of global supply in the Iraqi ruler’s hands from 10% to 20%. However, the move’s strategic

¹⁵ *UPI*, “Bush Thanks Souda Bay Forces for Gulf Help,” *UPI Archives*, July 19, 1991. Greece’s involvement carried considerable controversy domestically. In addition to the firebombings and largely left-wing, student-led protests during President George H.W. Bush’s July 1991 visit to Athens, *The New York Times*, “War in the Gulf: Greek Troops to Aid Police,” January 30, 1991, describes the seven bomb attacks against Western targets in Greece by the anti-American November 17 revolutionary group, which described its activity as taking place “in solidarity with the people of Iraq.” Meanwhile, the then-Greek Prime Minister Konstantinos Mitsotakis placed his country’s involvement in the campaign against Iraq’s “naked aggression” in the context of Turkish rule in Northern Cyprus, with the memory of the 1974 invasion still relatively fresh. The *UPI* article suggests that the Hellenic involvement in the conflict paid strategic dividends, with President Bush announcing that the US would be leasing two Knox-class frigates and fast-tracking the delivery of a total of over 28 F-4E fighter-bombers. Though relatively small, including in comparison to its Turkish rival, the Greek Air Force is known for elite pilots, who have won top NATO awards in several years; this is broadly in keeping with the Greek military’s “defense sufficiency” approach, devised to enable asymmetric warfare in case of conflict with a more formidable Turkey.

¹⁶ David Petraeus and Andrew Roberts, *Conflict: The Evolution of Warfare from 1945 to Ukraine*, 185; Though the economic motive is rather clear and broadly accepted, it must not be forgotten that Iraqi officials had for decades laid a claim to Kuwait as their own province in the aftermath of the British retreat from the region, as demonstrated in US Department of State, *Foreign Relations of the United States, 1961–1963, Volume XVII, Near East, 1961–1962* Document 66, Office of the Historian.

feasibility depended on Hussein's belief that the United States, still reeling from its Vietnam experience, would elect not to intervene; this ultimately proved to be the operation's fatal flaw.¹⁷

The Gulf War Air Power Survey, a sweeping report authored by both military and civilian analysts two years after the campaign's conclusion, offers a unique view of US innovations.¹⁸

The war took place on the heels of massive investment into the technological systems that would prove most relevant in its prosecution, including the Army's renewed focus on space in an era launched by President Ronald Reagan's Strategic Defense Initiative speech in March 1983.

Crucially, the push was centered on making "space products available to provide support to the Army at the small unit level," providing concrete tactical benefit in a short timeframe.¹⁹

It is worth noting that the Survey was modeled on the United States Strategic Bombing Survey, which was conducted in the immediate aftermath of World War II.²⁰ The two reports were, of course, compiled in profoundly different environments, not only in terms of landscape – ranging from the cities of Western Europe in mid-century to the deserts of Kuwait and Iraq – but also in the conditions their data was gathered.²¹ Though the war continued in the Pacific Theater during the early stages of the Strategic Bombing Survey, Europe was by then firmly in Allied hands. This allowed a unique wealth of information, not only in direct access to target sites and documents but also "virtually all of the surviving political and military leaders."²² There was no

¹⁷ Petraeus and Andrew Roberts, *Conflict*, 185-186; The authors describe the motives of US President George H.W. Bush and British Prime Minister Margaret Thatcher as rooted in the vision of a "new world order" not to be defined by aggressive action on the part of other states. Concerns of global oil supply and further Iraqi expansion into the territory of US allies like Saudi Arabia also loomed large.

¹⁸ Thomas A. Keaney and Eliot A. Cohen, et al., *Gulf War Air Power Survey: Summary Report*, ix; This receives some limited recognition in the Survey's Foreword.

¹⁹ James Walker, Lewis Bernstein, and Sharon Watkins Lang, "Renewed Interest in Space and the War in the Persian Gulf, 1985–1991," in *Seize the High Ground: Command History Book*, 145.

²⁰ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, ix-x. The Survey also included findings on the Pacific Theater, but the consideration here rests primarily with Europe as the theater with the more relevant conditions.

²¹ Though driving Iraqi forces out of the Kuwaiti desert was the key aim of the war, the conflict was also pursued within Iraq. The country's major cities, especially Baghdad, also became prominent targets.

²² *United States Strategic Bombing Survey*, 3.

equivalent total access in Iraq after the Gulf War, and especially to the country's leadership, as Hussein's government would remain in power until his US-led deposition some twelve years later. However, satellite and related capabilities, which saw extensive use in the war, also presented new means of assessing the impacts of the Coalition's campaign.²³ Nor was there a complete lack of more traditional access. Then-Captain H. R. McMaster, whose firsthand account of the major tank Battle of 73 Easting will be covered in detail later in this work, describes returning to the battlefield in southern Iraq after the cessation of hostilities. In addition to conversations with soldiers in his unit and analysis of "the Troop log," this experience led him to revise and add to his original account of the battle.²⁴ The April 1991 staff trip that took place while the battlefield remained under Coalition control will also be discussed below, revealing considerable, if limited, access to the sources required to build a full understanding of the conflict.

The Air Power Survey

Scholars have described the transformation of aerial strategic bombardment from the First to the Second World War as representing a "quantum jump."²⁵ Though possessing considerable historical significance, the development belongs to a markedly different period in US air power, and poses different questions from the late-twentieth century focus of this work. As such, these comments will be limited to the commonalities among priorities laid out in both Surveys. The organizing aim of the World War II-era Strategic Bombing Survey is made clear in the following

²³ *United States Strategic Bombing Survey*, 251.

²⁴ The Battle of 73 Easting, Gulf War: simulation project papers, 1991-1993: The Regiment's Perspective: Box 1, Folder 10, "73E McMaster - Eagle Troop," 1.

²⁵ Dale O. Smith, "The Role of Airpower Since World War II", 76.

introductory sentence to a sub-section on civilian life: “A word should *perhaps* be added on the effect of the air war on the German civilian and ... economy.”²⁶ This does not necessarily reflect a will to silence the historical record on the impact of bombardment on civilians, but rather indicates that it did not represent the report’s foremost priority. Even a cursory analysis demonstrates that the primary focus centered on strategically assessing the uses of air power, which included strikes on cities and several modes of civilian infrastructure.

The Gulf War-era Air Power Survey, on the other hand, begins with the description of its primary purpose as presenting “a comprehensive account of how ... air power shaped the confrontation with Iraq ... [for those] who will have to consider and create the instruments of American air power in the future.”²⁷ Both works should be understood, then, as broad reflections on the development, deployment and efficacy of air power in their respective wars rather than accounts of the toll its destruction took on the opposing society. The Air Power Survey considers the operational doors technology opened at length. Among the five systems described as having performed best, we will cover stealth and low observability technology, laser-guided bombs, aerial refueling and High-speed Antiradiation Missiles (HARMs). The fifth, secure STU-III telephones, assisted many of the gains driven by the other developments, but are not of an equally essential nature for our considerations. This analysis will not only focus on the unique capabilities these factors introduced, but generate a broader picture of how their interplay allowed for “the extraordinarily lopsided quality of the war.”²⁸

Three main platforms provided the Coalition’s stealth: the F-117 stealth bomber jet, the Tomahawk Land Attack Missile (TLAM) and the Conventional Air-Launched Cruise Missile (CALCM). These are described as the “keystones of coalition attacks” because they allowed for

²⁶ *United States Strategic Bombing Survey*, 34. Emphasis added.

²⁷ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, xix.

²⁸ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 223, 235.

new reach into Iraqi territory, while necessitating only minimal additional aircraft support. By one measure, F-117 jets flew one in five attack sorties, yet hit about forty percent of strategic targets.²⁹ This provided the initial shock to the Iraqi defense system which it proved unable to recover from.

Laser-guided bombs (LGBs) also expanded the horizons of offensive operations, yet in a markedly different way. These were general-purpose bombs with advanced guidance and computer-control technology, differentiating them from predecessors, known, among other terms, as “dumb” or “gravity” bombs. The latter were simple gravity-powered explosives with fins or early control systems attached for stability and limited guidance.³⁰ LGBs did not necessarily allow for deeper and safer penetration into Iraqi airspace in the same way as stealth aircraft and missiles; rather, they widened the range of targets commanders found sensible to attack.³¹ We find two prominent examples of this: the F-117A-deployed GBU-27 2,000-pound bomb, designed to attack hardened facilities, rendered “any target in Iraq ... open to destruction.”³² The GBU-27 was a derivative of the larger GBU-24, another heavy laser-guided explosive, whose tail assembly was adapted to fit the F-117A’s weapons bay.³³ Its force and precision made it possible to dismantle the Iraqi communications system, as targets like telephone switches and antennae would otherwise have imposed an excessive cost in sorties and danger to service members. Such a prominence in attacking capabilities was accomplished despite precision-guided munitions (PGMs) – of which laser-guided bombs are a prominent sub-category – comprising less than a twelfth of Coalition unguided bombs use.³⁴

²⁹ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 224.

³⁰ The use of such “dumb” bombs paired with far more advanced tracking and targeting technology will be covered in Section IV.

³¹ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 224.

³² Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 226.

³³ Carlo Kopp, "Desert Storm - Precision Guided Munitions," *Australian Aviation*.

³⁴ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 226; Among other figures, the Survey lists 17,000 PGMs, of which 9,342 were LGBs, and 210,000 unguided bombs.

The development of air refueling possessed both strategic and symbolic value. Concretely, the practice allowed the Coalition to conduct consistent and rapid air strikes without needing to maintain bases close to Iraqi lines, which would subject them to easier attack.³⁵ This added layer of protection extended to aircraft refueling in Iraqi airspace after carrying out raids, demonstrating the stretches of their air dominance. This asymmetry carried psychological impacts for both parties to the conflict: the ability to assail targets with unprecedented ease and low probability of damage in return seems to have fueled US and coalition confidence in their operational capabilities. On the other hand, it only complicated efforts to maintain morale and coherent strategy among Iraqi forces.³⁶

Particularly revealing is the use of High-speed Antiradiation Missiles (HARMs), described in the Survey as the most significant weapon of the war. These were used to neutralize Iraqi anti-aircraft artillery and surface-to-air missiles. 2,000 HARMs were deployed to promptly destroy the radar and other guidance capabilities of the Iraqi defense, paving the path for Coalition aircraft to fly lower and at lessened speeds, further expanding the range of accessible targets. This contributed to a striking attrition rate, meaning aircraft lost or damaged, standing at a tenth of the figure seen in the Linebacker II campaign in late 1972, the last major US air offensive into North Vietnam. The extensive impact of the weapons system can be seen not only in immediate damage to Iraqi radars, but through its “indirect effect” on the behavior of their operators. As early as the third day of the air campaign, operators began simply turning off or underutilizing radars when they suspected an aircraft carrying HARM technology was flying overhead, presumably in an effort to save both the technology and their own lives.³⁷

³⁵ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 229.

³⁶ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 228.

³⁷ Keaney and Eliot A. Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 229-230; Notably, most HARM technology was deployed in the first week of the war, with 200 on the first night.

These factors form a striking comprehensive picture of what enabled Coalition dominance. While it offers valuable lessons for military analysts and planners, it must also be assessed for its impact on civilian lives. Stealth aircraft and laser-guided bombs enabled new geographical and target range, HARM and related technologies neutralized existing, otherwise largely effective, defense systems and refueling minimized risk by removing bases from Iraqi reach.³⁸ This picture is clearly reflected in figures from the war. The US lost merely 27 airplanes, which can be compared to half of all F-105 claimed by the Vietnam War – revealing at least in percentage terms. The extensive damage laid on Iraqi defenses further support this picture, as the duration of the two conflicts are vastly different.³⁹ The Survey’s best estimate is that between 10,000 to 12,000 Iraqi troops were killed in the air campaign alone.⁴⁰ The figure stands in stark contrast to the total of 240 Coalition troops killed in action.⁴¹

The air campaign can be thought of as refuting a famous tale of Dante, who warned against seeking superhuman knowledge by stretching our ambitions beyond their limits: this martial Ulysses could now cross the Pillars of Hercules with much more security of life and limb than was previously imaginable.⁴² These systems proved able to not merely improve efficiency but introduce a new fundamental asymmetry between attacker and target. This dynamic leads us to ask what this picture meant for civilians. The Survey speaks of “American sensitivity to casualties – our own and Iraqi civilians,” yet this sentence comes in direct reference to the advantages of stealth aircraft in pursuing strikes on a heavily defended megalopolis such as Baghdad. The lower risks this new ability afforded to attack without receiving an equivalent

³⁸ It is worth noting that this advantage has not remained constant. Most notably, Iran has proven the capacity to reach US bases in the region rather regularly in all engagements since the killing of Major General Qasem Soleimani in early 2020.

³⁹ John A. Tirpak, “Desert Storm’s Unheeded Lessons,” *Air & Space Forces Magazine*.

⁴⁰ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 249.

⁴¹ University of Virginia Miller Center, *The Gulf War*; Namely including its culmination in the brief ground offensive.

⁴² Dante Alighieri, *The Divine Comedy: Inferno*, 174.

response appear evident for Coalition airmen, yet we must more closely examine its implications for the city's civilians. Due to limited information from Coalition sources, the unreliability of Iraqi ones and incomplete access, it remains difficult to speak with confidence of total civilian fatalities. There is cause to doubt John G. Heidenrich's low estimate of total civilian fatalities in the war standing at under 1,000, with Baghdad being the largest source, yet it is among the most detailed treatments of the question available.⁴³ The Survey provides strong evidence that civilians played an important role in the Coalition's strategy during the air campaign, at least in terms of morale. In treating the effectiveness of stealth aircraft and missiles, the authors draw attention to its ability to "bring the reality of the war home to the residents of Baghdad."⁴⁴ This serves as an early example of a pattern that will be further demonstrated: from the perspective of the civilian, the expanded targets and frequency of strikes gained through technological development seems to far overwhelm benefits from gains in precision.

The Stanford Silicon Valley Archives contains a wealth of sources on the Gulf War. Although they do not focus directly on aerial warfare, the sources illuminate US preparations ahead of and following the campaign, including the role of technology and the force's efforts to adapt to the lessons of the conflict. Perhaps the ideal starting point is an account provided by H.R. McMaster, best known as an author on US defense and for serving a little over a year as National Security Advisor during the first Trump administration after retiring from the Army with the rank of Lieutenant General.⁴⁵

⁴³ John G. Heidenrich, "The Gulf War: How Many Iraqis Died?," 119.

⁴⁴ Keaney and Cohen, et al., *Gulf War Air Power Survey: Summary Report*, 249; It is worth noting that this still did not rise to the emphasis placed on this element of psychological impact on both government and populace seen in the "Shock and Awe" strategy behind Operation Iraqi Freedom, which launched in March 2003.

⁴⁵ Mark Landler, "For McMaster, Pomp Under Bittersweet Circumstances," *The New York Times*, April 6, 2018; Nicolas Niarchos, "H.R. McMaster Doesn't Think Donald Trump Is Very Good at Making Deals," review of *At War with Ourselves: My Tour of Duty in the Trump White House* by H.R. McMaster, *The New York Times*, August 27, 2024. The two articles lay out the dynamics of McMaster's role and departure: part appeaser, part voice of difficult

In 1991, then-Captain McMaster commanded the X men and Y vehicles of Eagle Troop of the Second Squadron, Second Armored Cavalry Regiment. McMaster's account of the Battle of 73 Easting begins by providing a background of Eagle Troop's deployment. The unit had completed training in Bamberg, Germany before becoming one of the first units to arrive in the theater of conflict from Europe. Despite the war's aim being the expulsion of Iraqi forces from occupied Kuwait, the Troop staged on the south end of the Saudi-Iraqi border on February 23, 1991, three days before the major battle. He describes the Troop arriving to the desert as a "cohesive team" yet coming "together as a family" in the months of living and training in its difficult conditions.⁴⁶ McMaster's emphasis on the unit's culture, paired with brief, intimate biographies of unit members ranging from senior officers to privates, reveal much about the enduring importance of the age-old consideration of *esprit de corps*. Broader questions of culture will be considered later in the analysis of his testimony. Yet by far the most relevant aspect that emerges from his account concerns the technological gaps between the two belligerents.

This is evident well before the battle begins in earnest. Having advanced some 100 kilometers north into Iraqi territory, Eagle Troop halted to resupply and, ordered by squadron headquarters to remain in place for the night, set up a "hasty troop defensive position."⁴⁷ At sunset on February 24, a first platoon scout notified McMaster that an enemy defensive position, made up of three distinct squad trenches along with bunkers, lay ahead. Joined by first platoon leader Lieutenant Michael Petschek, he advanced to investigate – yet the pair did not need to rely on their own eyesight. As McMaster reports, they "could see enemy soldiers milling about the trenchline from two kilometers away through the Bradley armored fighting vehicles' and tanks'

truths to the president, he was regarded by the latter as "pedantic and condescending" and seems to have been removed as part of a campaign to secure free reign for more aggressive foreign policy actions via a more willing cast.

⁴⁶ "73E McMaster - Eagle Troop," 1-2.

⁴⁷ "73E McMaster - Eagle Troop," 3-5; This is the total of 20 kilometers on February 23, another 20 kilometers the following dawn and another 60 several hours later.

thermal sights. The enemy soldiers had no idea that they were under observation.”⁴⁸ This equipment, tracing the heat radiation of enemy soldiers, detected their movements in detail some 2,000 meters away – all while the latter were none the wiser, and thus unable to mount a response. Two staff sergeants’ Bradleys shortly commenced hostilities with high-explosive rounds, making relatively quick work of the identified Iraqi position. A similar episode unfolded later in the battle, when two Iraqi MTLBs, Soviet-produced armored personnel carriers, were approaching McMaster’s Troop some 30 minutes after dark had descended. McMaster explains that “they had no chance at night.” Sergeant Timothy Hovermale detected their approach through thermal sight and destroyed the force with 25-millimeter fire.⁴⁹

Another instance highlighting the technological disparity between the two forces came on February 25, after the Troop had collapsed more Iraqi defenses and made further territorial headway. On a trip to Second Squadron headquarters, McMaster and other troop commanders took a detailed look at captured Iraqi equipment, maps and documents. Among the losses were MTLB vehicles, which made up much of the Iraqi arsenal. Though McMaster describes all of the equipment as being in “vintage condition,” the most revealing details come when he drives an MTLB. “It was cramped,” he reports, “and I found it difficult to work my way through its eight gear manual transmission. It was very thinly armored and, loaded with ammunition, it looked like a death trap.”⁵⁰ The description stands in stark contrast to the capabilities US forces consistently relied on.

The next day, three more Iraqi MTLBs had been spotted scouting the squadron’s positions. By the time McMaster’s M1A1 tank arrived within sight, Ghost Troop scouts had destroyed two of the enemy force with 25-millimeter cannons, while the third was evading the

⁴⁸ “73E McMaster - Eagle Troop,” 3-5.

⁴⁹ “73E McMaster - Eagle Troop,” 26.

⁵⁰ “73E McMaster - Eagle Troop,” 8.

US advance. After confirming with the first platoon Sergeant that his tank should engage the target, McMaster details the following process: the tank's gunner "laid ... sight on the center of the target. He engaged the laser rangefinder and the digital display showed that the enemy vehicle was over two thousand meters away. The tank's computer allowed for the range, crosswind, and the speed of the target. A [High-Explosive Anti-Tank] HEAT round was already in the breach of the 120 millimeter main gun." A second after firing, he reports, the MTLB erupted into flames.⁵¹ The highly digitized and precise process allowed for deep disparities with the adversary in both speed and accuracy of execution.

It was this accumulating dominance which led to a "rout" once Eagle and Ghost Troops reached 73 Easting, a location traced along a "north to south running grid line on a military map," a system which came especially handy in the largely uniform Iraqi desert.⁵² The final contrast was particularly stark, as Iraqi tanks and Soviet-made BMPs, armored personnel carriers, stood separated from their hulls, strewn among dead Iraqi Republican Guard soldiers. In a remarkable contrast, Eagle Troop forces did not suffer a single casualty. Indeed, the final figures tell a striking story: the Bradleys and tanks of Eagle Troop alone destroyed over 30 tanks, around 20 personnel carriers and other armored vehicles as well as 30 trucks. An artillery strike at the tail end of the battle alone – by which time the opposing force was largely depleted – managed to destroy 35 trucks, large fuel and ammunition stocks and several more armored vehicles.⁵³ The human cost on the Iraqi side tells a similar story. The night of the battle, an Iraqi major and 41 soldiers under his command became the first to surrender to the Troop. Apart from some brief and promptly retracted arms fire from nearby dirt mounds, over 200 of their fellow

⁵¹ "73E McMaster - Eagle Troop," 10.

⁵² "73E McMaster - Eagle Troop," 32-34.

⁵³ "73E McMaster - Eagle Troop," 29.

soldiers also surrendered either the night of the battle or the following morning.⁵⁴ The result reflects a combination of tactical, technological and institutional advantages which made it possible for the Troop to emerge “unscathed from the ... battle.”⁵⁵

This is not to say that the campaign passed without any technological challenges. McMaster reports that the Troop’s navigation devices experienced temporary malfunctions during their northward advance, while desert sandstorms complicated long-range observation. We can observe that even the most elemental aspects of what the foundational thinker Carl von Clausewitz identified as the “fog” and “friction” of war can serve to hamper technologically advanced and well-coordinated campaigns – even in the GPS era, factors as simple as desert sand can get in the way. Nonetheless, the archive confirms that Coalition technological superiority created an unbridgeable gap on the ground as in the air.

A final important element to highlight from McMaster’s testimony is the cultural picture it presents. We have considered culture as a factor that exists within a given institution, yet in military contexts it is equally important how they interact with – and provide either strategic benefits or impediments – in engagements with adversaries. McMaster offers a rather clear understanding of culture’s role in the Coalition’s victory. It must be noted early that he at no point outright denounces Iraqi culture, military or otherwise, nor explicitly deploys Orientalist tropes. Yet the contrast one is left to draw between the two forces is hard to miss. The reader derives an understanding of US forces as governed by “great compassion and discipline,” laid bare through several cases of restraint even amidst risk to their own life and limb.⁵⁶ Perhaps the most potent of these images comes when Eagle Troop’s medics were treating and evacuating Iraqi wounded. In the back of a tracked ambulance, Sergeant George Piwetz, a medic, was

⁵⁴ “73E McMaster - Eagle Troop,” 27.

⁵⁵ “73E McMaster - Eagle Troop,” 30.

⁵⁶ “73E McMaster - Eagle Troop,” 26.

attending to an Iraqi soldier who suffered a bullet wound to the leg. Yet the latter did not repay the courtesy; rather, he is described as attempting to stab the medic with a set of loose needles. Perhaps most revealing is the claim that Sergeant Piwetz knocked the patient unconscious to be able to continue treating his wounds.⁵⁷

McMaster's account of the Troop's treatment of prisoners expands this image of American magnanimity. Not only did medics continue bandaging their erstwhile enemy's wounds but the Troop also returned their belongings along with provisions of food and water. Scouts even led small parties of Iraqi troops to identify their slain comrades, allowing some to simply pray over the corpses and others to leave messages on their persons, as they preferred. McMaster presents how the Iraqis viewed this approach: "The surprise with which the enemy regarded their humane treatment was obvious. They had been told that Americans would shoot them. Many of the prisoners wept and some tried to kiss our soldiers' feet to express their gratitude."

Yet the glimpse into cultural dynamics is not limited to stringent American moral and legal compliance. McMaster also subtly shapes the reader's view of the Iraqi culture of combat. After an early assault, he describes the Troop's scouts clearing a set of Iraqi bunkers. One of them "appeared particularly elaborate," with its rugs and other adornments making it a "showpiece" observation post – which he concludes must have belonged to the Iraqi commander.⁵⁸ McMaster imagines his counterpart observing westward from the ridge as the Americans robustly advanced toward his position, before he seems to have fled. Though not explicitly stated, one conceives the image of a vigorous, austere US commander in contrast to an

⁵⁷ "73E McMaster - Eagle Troop," 24.

⁵⁸ "73E McMaster - Eagle Troop," 23.

Iraqi leader myopically focused on comfort and official trappings, to the detriment of the mission at hand.

There also seems to be a certain eagerness in McMaster's description of Iraqi surrenders. Even the few "more resilient enemy soldiers" who did continue firing at the Troop as others had already been taken prisoner yield their resistance at the sight of McMaster's approaching M1A1 tank. Several similar episodes of somewhat unreluctant capitulation in the face of overwhelming force amount to a conception, if not of outright cowardice, then at the least of lacking morale under a dictatorial regime. After an interaction with a surrendered Iraqi commander, McMaster describes his uncertainty at having shaken his counterpart's hand, tentatively offering an explanation based on perceived obligation under military tradition. He explains that he "felt no remorse or great pity for these men. I knew what they had done to defenseless civilians."⁵⁹ Thus the image of Iraqi forces is somewhat suddenly expanded from one of questionable commitment, to one of wanton cruelty to the defenseless.

* * *

The Battle of 73 Easting became the basis for a virtual reconstruction project led in part by Illusion Engineering, a Southern California-based firm contracting with the Department of Defense. The simulation aimed to "capture and replicate battlefield events" in "a fully distributed, interactive virtual world environment."⁶⁰ The battle was chosen among the eligible engagements of the Desert Storm conflict, with the development team explaining that this model can be replicated if proven successful. This indicates the battle's relevance, and especially that of

⁵⁹ "73E McMaster - Eagle Troop," 31.

⁶⁰ The Battle of 73 Easting, Gulf War: simulation project papers, 1991-1993: 1.2 Data: Box 1, Folder 1 "73 Easting Re-Creation Databook Draft." 1.

its defining technologies, both to the broader conflict and subsequent US technological adaptation. The project's genesis is particularly telling. It did not originate, as might be expected, with technologists at the defense contractor firm or even battle participants. Rather, it began the month after the conflict's conclusion, in a late March 1991 discussion between contractor firm representatives, General Gordon Sullivan – the US Army Chief of Staff at the time the document was drafted but the Vice Chief of Staff at the time of the conversation – and Colonel Jack Thorpe, then the Special Assistant for Simulation to the Director of the Defense Advanced Research Projects Agency (DARPA).⁶¹ The two officials' senior rank demonstrates a high-level commitment to integrating these emerging technologies into future force preparations. For one, the mere existence of a Special Assistant for Simulation role among DARPA leadership speaks to a prominence of investment well before such simulation technologies' capabilities became evident to the broader public.

Illusion Engineering's databook aims to provide a brief explanation of how the project team members collected and analyzed battle data, and subsequently used to develop the simulation. This does not amount to a detailed look at the raw data or its acquisition and analysis, but rather “an audit trail from each simulated event back to its origin.”⁶² There is significant emphasis on incorporating the battle's details, from a precise sequence of events to individual buildings and vehicles. These factors indicate that the project's creators perceived its value as based not merely in compiling data in one platform, but rather the ability to train troops with specificity and accuracy, appealing to an authentic historical test case. That is, scale itself was not the primary objective, but rather a reliable means to heightened instructive precision.

⁶¹ Illusion Engineering, “73 Easting Re-Creation Databook Draft.” 3.

⁶² Illusion Engineering, “73 Easting Re-Creation Databook Draft.” 1.

The Illusion Engineering document speaks to the US Army's willingness to invest in the project as a means of learning from an overwhelmingly successful battle. It also sheds light on the relationship between defense institutions and contractors. Work began with an early April 1991 feasibility assessment. DARPA officials were joined by other defense organization representatives as well as contractor personnel. All parties concurred that the project was feasible and promising, and swiftly secured General Sullivan's approval. The Army provided extensive data at the outset, including "after-action review" reports, maps, organizational logs, audio recordings from all three Troops and access to battle participants for interviews.

Yet most telling is a trip held later that month to the battlefield in Iraq, at a time when the area remained under Coalition control. Retired Colonel Gary Bloedorn, then a consultant for the Institute for Defense Analyses (IDA), a private nonprofit which receives federal funding, led the expedition. The most senior active-duty officer was Colonel Michael Krause, then the Army's Deputy Chief of Military History. Other representatives hailed from the Army's Armor Center Cyber & Space Department, its Aviation Center and Army Engineering Topographic Laboratories.⁶³ The trip demonstrates the broad scope of expertise and institutional investment poured into the project. While the simulation the trip was aimed at supporting represented a new technological generation, the "staff ride" was by no means novel. Rather, it was based on a longstanding practice first developed by the famed mid-19th century Prussian Army Chief of Staff, Helmuth von Moltke. These educational expeditions have long been utilized in the American military: a prominent example can be found in a 1919 trip of US Military Academy

⁶³ Illusion Engineering, "73 Easting Re-Creation Databook Draft." 4.

cadets to the battlefields of World War I with the aim of better understanding trench warfare. The practice endures among academics and practitioners into the present day.⁶⁴

The Middle East trip focused on surveying the battlefield, logging destroyed Iraqi vehicles and defensive works and gathering relevant information from battle participants, both through interviews and previously prepared reports. The document explains that, upon the joint team's return to the United States, this information was identified, coded and logged by Army staff, after which point it was delivered to Illusion Engineering to pursue its analysis.⁶⁵ It is not surprising that the expedition's planners would elect not to include technical contractors on the trip, likely driven by concerns of security or confidentiality. Yet the choice to undertake certain preparations of the data before delivering to the contractors indicates a specific vision for how this work was to be pursued on the latter's end. The Army's significant direct investment is further exemplified in the summer of 1991, when analysts flew to Germany to consider Eagle, Ghost and Iron Troops battle participants' reviews of Data logger tapes of the initial simulation. Such examples speak to a willingness to deepen investment if it was viewed as impacting accuracy.⁶⁶

The document breaks the project into four stages of analysis: initial data reduction, data aggregation, sequence of events and resolution of conflicts in how phenomena appeared in the simulation. The overarching aim remained the accurate reflection of vehicle locations and firing events – including their timing and sequences.⁶⁷ To this end, at several stages developers at the contracting firm undertook further research or contacted battle participants again to eliminate discrepancies. This reflects a will to include this novel model in more accurate and interactive

⁶⁴ Liam Collins and Lionel Beehner, "A Leader's Guide to Conducting Staff Rides," *Modern War Institute at West Point*; The enduring prevalence of the practice is demonstrated by the document's framing as a guidebook rather than mere historical reflection.

⁶⁵ Illusion Engineering, "73 Easting Re-Creation Databook Draft." 4.

⁶⁶ Illusion Engineering, "73 Easting Re-Creation Databook Draft." 6.

⁶⁷ Illusion Engineering, "73 Easting Re-Creation Databook Draft." 6-8.

training of troops preparing for new battlefields. Yet this did not represent the first chapter in simulation technologies' development in defense contexts. Indeed, the document explains that the project was developed on existing systems known as SIMNET and ODIN. The first receives more attention, as its "physical constraints of time, terrain, distance and fortifications" proved useful for reflecting troops' recollections on vehicle locations and related facts.⁶⁸

The SIMulator NETworking platform better known as SIMNET was not conceived in the context of the Gulf War. It launched in 1983 under the sponsorship of DARPA. By the time of the Gulf War, SIMNET was listed as one of the six most influential programs for the Department of Defense, alongside ARPANET, the forerunner to a minor innovation called the internet as well as stealth aircraft such as the F-117 fighter and the B-2 bomber.⁶⁹ The ODIN system, on the other hand, was launched in 1991 with the aim of building on SIMNET's features to "provide an adjunct to the US Military battlefield command and control systems."⁷⁰ Initially meant to be deployed in Operations Desert Shield and Desert Storm, it never saw the battlefield. The platform was designed to enable commanders to track live threat status, including estimated enemy locations and strengths, all based on the SIMNET platform.

It is important for considerations of the relations between the military and defense contractor firms to highlight that there were more than one such companies involved in the project. Namely, the "current battle recreation scenario" which was developed by August 1991 was implemented into the ODIN system by BBN, a company based in Cambridge, Massachusetts.⁷¹ Then an independent firm with a long history of DARPA collaborations, including a leading role in ARPANET's development, it became a subsidiary of the defense giant

⁶⁸ Illusion Engineering, "73 Easting Re-Creation Databook Draft." 4.

⁶⁹ Duncan C. Miller, "SIMNET and Beyond: A History of the Development of Distributed Simulation," 1.

⁷⁰ Miller, "SIMNET and Beyond," 23.

⁷¹ Illusion Engineering, "73 Easting Re-Creation Databook Draft." 8.

Raytheon (RTX) in 2009.⁷² BBN deployed the existing ODIN system to provide “timed ‘snapshots’ of events” in the battle. This centered around accurately placing individual vehicles and firing events, including identifying attacking US vehicles and destroyed Iraqi targets.⁷³ The developed simulation allowed the project team to hold a “Work in Progress” presentation late that August, tellingly, in front of “interested industry and government analysts and historians.” After this point, most of the work focused on verifying rather than adding new data. Verification efforts included the integration of terrain information from the Army’s Engineer Topographic Laboratories (ETL), drawn from classified sources.⁷⁴ IDA and Illusion Engineering analysts performed a “Validation and Verification of the simulation” in late October 1991, and particular attention was paid to confirming information with battle participants, attested by much of the correspondence available in the archives.⁷⁵ The integration of two contractor firms in the process demonstrates a preference for somewhat decentralized development, in which each company contributes its area of expertise, albeit based on precise guidance provided by Army officials.

Illusion Engineering, the contractor firm behind the 73 Easting simulation, appeared on some of the most prominent American media outlets covering novel technologies in the 1990s. The company is featured in a *New York Times* article on the “military-entertainment complex” which emerged primarily in the Los Angeles region amid the immediate post-Cold War era’s decreasing defense spending and booming film ecosystem. It is described as Illusion Inc. a company based in Southern California’s Westlake Village, which began in the military sector before seeking to expand its simulation technologies into entertainment.⁷⁶ Indeed, the original

⁷² “Raytheon BBN Technologies,” *National Science and Technology Medals Foundation*.

⁷³ Illusion Engineering, “73 Easting Re-Creation Databook Draft.” 8.

⁷⁴ Illusion Engineering, “73 Easting Re-Creation Databook Draft.” 8-9.

⁷⁵ Illusion Engineering, “73 Easting Re-Creation Databook Draft.” 9.

⁷⁶ Bernard Weinraub, “From Science to Fiction, Military and Entertainment Industries Swap Expertise,” *The New York Times*.

enterprise merged with an entertainment technology company in 1994, diverting its focus away from defense.

A *Los Angeles Times* piece from the year prior of a more local focus traced a gradual resurgence in the regional defense industry, which it credited in part to “a continuing ‘digitalization’ of military systems.” In this context, Illusion is described as a firm employing technologies first developed to design aircraft and military training exercises to disparate pursuits such as museums and special effects. This broadened economic approach seems to have proven fruitful as the company doubled its revenues each of the preceding three years, projecting that its employee base would expand from 20 to 50 by 1997.⁷⁷ This provides an example not only of the increasing utility of such simulation technologies, first cultivated in close collaboration with defense institutions, but also of a dual-use business model which would become more prevalent in the decade ahead. The ability to adapt technologies’ applications would prove crucial to companies’ ability to survive, as evidenced by the establishment of the Los Angeles Regional Technology Alliance, a regional nonprofit.

The initiative’s founder described it as taking shape “when the cry in California was defense conversion and defense downsizing, and the idea was that we needed to leverage every resource we could.”⁷⁸ Illusion was one of the firms to receive a \$250,000 grant from the California Technology Investment Partnership (CalTIP) in collaboration with the Los Angeles nonprofit. Yet the company was not pursuing its original defense work – or, for that matter, its initial shift to entertainment technology. Instead, Illusion aimed to develop an intranet system to increase communication efficiency in emergency management, prominently including natural disasters. This shift serves as a valuable example that defense investment, contrary to popular

⁷⁷ Joel Kotkin, “The ‘Silver’ Age of State’s Defense-Aerospace Economy,” *The Los Angeles Times*.

⁷⁸ Leo Smith, “Illusion Hopes to Make Better Emergency Response a Reality,” *Los Angeles Times*.

belief, has not always eclipsed that of other sectors, rather shifting with political and investment priorities. Contractor firms accordingly adjusted the services they provided based on such economic conditions.

* * *

Institutional Shifts

This work analyzes the institutional shift in weapons technology development from the hall of the state's agencies to the glass-panelled conference rooms of private, for-profit companies. The aim is twofold: to clearly present the history of this monumental shift from the heyday of the traditional roles played by major defense companies to the continuously evolving picture of the post-Internet Revolution. The second element will be an analysis of this development's implications on defense technology decisionmaking as well as its downstream impact on civilian lives.

We begin this analysis with the Joseph D. Cusick Papers, housed at Stanford University's Silicon Valley Archives. Cusick is a particularly revealing figure in the development of post-war defense contractor-military relations. Following his 1951 graduation from Stanford University, he was commissioned in the US Navy and served as a pilot on the USS *Princeton* during the Korean War.⁷⁹ After a brief Navy career, he became a supervisor at Lockheed Missiles and Space Company (LMSC), a part of the Lockheed Corporation, until late 1968 when his position was converted to Civil Service status, classified as a civilian federal government worker.⁸⁰ Converted

⁷⁹ *The Mercury News*, "Joseph D. Cusick Obituary," March 27, 2013,

⁸⁰ Joseph D. Cusick: Papers relating to Lockheed Missiles & Space Co. and the U.S. Air Force Satellite Test Center, 1962-1991, Box 2, "Personal files of J.D. Cusick during conversion process; correspondence with LMSC." May 29,

into a US Air Force employee, he rose from a senior operations planning coordinator to the supervisor of the Air Force Satellite Control Facility (AFSCF), leading the management and implementation of a vast network of satellite testing and deployment.⁸¹ In a letter dated late May of 1968, Cusick wrote the president of Lockheed Missiles & Spaces Co. to request a pro rata settlement of vacation pay from his voluntary termination earlier that month. Notably, Cusick described his duties and responsibilities remaining “unchanged” in his new classification as a DAF-Civilian.⁸² This is despite extensive correspondence elsewhere in the archive detailing how relationships with contractors ought to be managed, including laying out specific criteria and boundaries. The documents speak to a close and structured reliance with a handful of partner firms.

* * *

The Gulf War also sits at a particularly important juncture in this shift. We can once more draw a useful parallel with the work of Hull in terms of the complex interactions between institutions with differing assumptions and competing priorities. As she explains, Imperial German forces were not distinguished from other Western militaries in the late nineteenth century by an innate tendency to gravitate toward extremes – with one among many points of evidence being the conduct of British forces in the Boer War (1899-1902). Yet in conflicts of the era, the “dysfunctional, pure violence” of other militaries soon had to halt in the face of interventions by the civilian government or broad public opinion.⁸³ The same could not be said

1968; This information is provided in a letter by Cusick to L. Eugene Root, then-President of Lockheed Missiles & Space Co. (LMSC), requesting pro rata vacation pay missed as a cause of the conversion from LMSC to Air Force employee.

⁸¹ Cusick, “Correspondence with LMSC.”

⁸² Cusick, “Correspondence with LMSC.”

⁸³ Hull, *Absolute Destruction*, 2.

for Germany, where different government institutions, including the legislature, were each vertically integrated under the Kaiser and thus unable to effectively check one another's activities. Thus, the isolation afforded by the state's political structure set up conditions under which "its military culture reinforced itself and became ever stronger."⁸⁴

The supervision of the US military and intelligence community by elected legislators in both houses of the US Congress has been a topic of much debate and change through time, with the push and pull continuing into the present day. Yet this is not the most revealing parallel to draw here. Rather, a unique trajectory of development between the state's defense institutions and their external partners was recently pointed out by David Petraeus, the four-star general who famously commanded the Multi-National Force in Iraq during the troop surge beginning in early 2007, and the author Andrew Roberts. The pair describe a shift not only in the kinds of technologies seeing major investment – with the principal theme being the shift from hardware and combat equipment to software – but which entities are driving this change:

“In wars of the twentieth century, militaries pioneered technological advances. Areas such as computing, cryptography, radar, plastic surgery and the internet would have taken far longer to emerge [without] military funding. Today, something of the reverse is happening. Having spent so much time on traditional forms of warfare ... Western armies now find themselves ever more reliant on civilian developments in robotics and increasingly autonomous systems to illuminate their blind spots and provide the means for identifying and responding to such threats.”⁸⁵

⁸⁴ Hull, *Absolute Destruction*, 2.

⁸⁵ Petraeus and Roberts, *Conflict*, 407.

Considerable insight can be gained on this matter, as with several others covered in this project, through the work of the author and strategist P.W. Singer. His near-omnipresence on defense questions is indicated by the fact that he has the most books on professional US military reading lists of any author, dead or alive. This led Army AL&T magazine, which focuses on acquisitions, logistics and technology to describe him as “the Army's must-read thinker.”⁸⁶ Reflecting the orientation of his focus, *The Wall Street Journal* cited a Navy official describing him as “the premier futurist in the national-security environment.”⁸⁷ Among the first themes of his important 2009 work *Wired for War*, where he seeks to fill a perceived gap in public policy and scholarly attention to the transformational emerging robotics industry, is the increasingly intertwined development of civilian and military-use technologies.

Singer presents an illustrative example in an otherwise unremarkable corporate park outside Boston. The facility houses the headquarters of iRobot, a company launched in 1990 by the leading Massachusetts Institute of Technology (MIT) professor Rodney Brooks with two former students, Colin Angle and Helen Greiner. The company’s first years focused on a string of less-than-successful products, both for specialized government agencies, primarily NASA, and for consumer use, finding only a limited market for robots.⁸⁸ Its fortunes began to shift with the release of the Roomba, a small, disc-shaped gadget that became the first broadly marketed robot vacuum cleaner. Yet the technology behind it was not necessarily developed with

⁸⁶ Peter W. Singer, *pwsinger.com*, accessed March 19, 2026; Margaret C. Roth, “Everywhere Man,” *Army AL&T Magazine*, November 28, 2018. The acronym in the publication’s name stands for Acquisition, Logistics and Technology, a focus which is reflected in much of the conversation with Singer, which begins with questions on procurement before switching emphasis to technologies of the future and institutional adaptation.

⁸⁷ Dion Nissenbaum, “Author Warns U.S. Military to Focus on China,” *The Wall Street Journal*, June 28, 2015; While his work in the Pentagon and later works centered heavily around technology and its future, Singer’s first two books focused on the emerging private military industry and children recruited as soldiers, respectively, in part explaining the range of his influence on defense thinking.

⁸⁸Peter W. Singer, *Wired for War*, 21.

household tidiness in mind. The technology behind Roomba was developed from Fetch, a robot designed in 1997 to be utilized by the US Air Force. Singer emphasizes the stark contrast between the technology's dual uses: "Fetch cleaned up cluster bomblets [tiny explosives] from air fields: Roomba cleans up dust bunnies under sofas."⁸⁹

The PackBot is another of the firm's products with important military applications. Roughly lawn mower-sized, it comes in at a little over 42 pounds and just under \$150,000. The machine originated in a 1998 contract with DARPA, which *The Economist* has described as "the agency that shaped the modern world" for helping create the aforementioned ARPANET, among other pathbreaking accomplishments.⁹⁰ In a detail which reveals its multifaceted development, the robot's hard, patented rubberlike polymer tracks are designed for use on any surface, "ranging from the mud of a battlefield to the tiled floor of an office building."⁹¹ The technology left a marked impact, somewhat ironically, when it debuted amid the recovery efforts in the aftermath of the September 11 attacks in New York City. It was later deployed in the booby-trapped caves deep in Taliban territory early in the Afghanistan War. In Iraq, the robots stood out by allowing soldiers to approach, closely examine and either disassemble or safely explode the ever dangerous Improvised Explosive Devices (IEDs) from a life-sustaining distance. By one – admittedly anecdotal – measure, soldiers deployed in Afghanistan refused to return the first test robots the company sent them.⁹²

The economics which sustained this development help shape the durability of this model at the intersection of civilian and military innovation. iRobot's business model split its sales efforts between consumer and "government and industrial" wings, with the latter primarily

⁸⁹ Singer, *Wired for War*, 22.

⁹⁰ "A Growing Number of Governments Hope to Clone America's DARPA," *The Economist*, June 3, 2021.

⁹¹ Singer, *Wired for War*, 22.

⁹² Singer, *Wired for War*, 20-23.

focused on the military. The company's military business had grown up to 60% annually and by the end of the decade a third of its total revenue originated from these defense services, with investment analysts projecting that this could shortly reach half the total. Gross revenue increased tenfold in the first half of the 2000s, with over 3 million Roombas sold, and crowned by a 2008 Pentagon contract for \$286 million to provide up to 3,000 more machines.

Demonstrating the potential of a model which combines consumer sales and defense contracts, the company's November 2005 initial public offering (IPO) was backed by two of the world's foremost investment firms, Morgan Stanley and JP Morgan, and reached a public value of \$682 million on its first trading day. iRobot's meteoric rise, mostly in the War on Terror era after a slow first decade, was represented by its PackBot becoming the first robot to ring the New York Stock Exchange bell.⁹³

The example demonstrates certain characteristics which also hold true for other prominent enterprises operating in this field and era. Since its beginnings, the company's viability and growth depended on initially small government contracts, which supported the trial-and-error phases of initial research.⁹⁴ Importantly, consumer products were launched and accrued significant demand on the back of successful, specific government services.

Furthermore, the company's continuous revenue streams relied on both of these sectors, without either of which they would be unlikely to sustain themselves for long, let alone secure public investments. This double reliance is deeply relevant to the consideration of the institutional shift in development to private companies. It simultaneously opens these companies up to pressure from consumers and the government agencies they contract for – we will treat the latter in detail in the paper's conclusion.

⁹³ Singer, *Wired for War*, 23-24.

⁹⁴ Singer, *Wired for War*, 21-22.

M. G. Zimeta draws some of the most important themes shaping these companies' actions shortly after the August 2015 restructuring of Google under a new parent company by the name of Alphabet, Inc. Zimeta contextualizes this by citing a 2014 Transnational Institute annual "State of Power" report, which found that 37 of the globe's 100 largest economies were not nation states, but private corporations. The picture that emerges is one where the lines between "corporate entities and political entities are increasingly blurry."⁹⁵ Recognizing the company's role in public life, Zimeta compellingly argues that co-founders Larry Page and Sergey Brin were not solely engaging in sound business practices but *statecraft*. She explains that their conduct closely corresponded to the counsel of Niccolò Machiavelli that the ruler must distance himself from unsavory activity and relieve himself of old commitments whose driving reasons no longer apply. Thus, "Don't be evil," the company's famed unofficial motto, expressed in their first, April 2004 letter to shareholders, gradually fell from prominence.⁹⁶

Notably, other elements of the first annual letter are quoted in subsequent years, but the slogan, which was set to remain rather ambiguous, is never repeated – though it was featured in the Code of Conduct presented to staff and the "company philosophy" guiding its advertising programs.⁹⁷ Zimeta identifies the acquisition and investment into several enterprises outside Google's initial area of focus as the primary development behind this shift. These include life

⁹⁵ M. G. Zimeta, "Don't Be Evil," *The Paris Review*, August 12, 2015.

⁹⁶ Larry Page and Sergey Brin, "Letter From the Founders," *The New York Times*, April 29, 2004.

⁹⁷ Zimeta, "Don't Be Evil"; Larry Page and Sergey Brin, "Founders' Letter 2012," *SEC EDGAR*, April 2012; Larry Page, "G is for Google," Google (blog), August 10, 2015; Larry Page and Sergey Brin, "A Letter from Larry and Sergey," *The Keyword* (blog), Google, December 3, 2019. The 2012 letter cites heavily from the 2004 original, including detailing its post-IPO corporate structure and ends on a quote about the founders' commitment. The 2015 issue, referred to in the 2019 one as "the Alphabet founding letter," begins by citing the original's opening and another brief section on investing in areas which might seem outside the company's immediate focus. In the 2019 letter, the pair build on the 2015 letter's announcement of Sundar Pichai as CEO of Google, and name him chief executive of the Alphabet parent company. They spare brevity this time, citing the entire opening paragraph of the original and a brief section from the second founders' letter. This record illustrates that the citations seem to indicate something more than a time-saving penchant for repetition; the pair developed a pattern of pointing to the company's foundational principles, to which they appealed in explaining new developments. "Don't be evil," the best-known of their early statements, simply does not figure among the items referenced.

sciences research and development, the “internet of things” and more; the most relevant for our purposes is the leading robotics company Boston Dynamics. Tracing its roots to MIT much like its iRobot competitor, Zimeta highlights that half of the company’s listed products at the time “were developed with funding by, or in association with, DARPA.”⁹⁸ *Wired*, a leading publication on emerging technologies, summarized the internet-based responses of those paying attention to Google’s restructuring as: “now it can be evil!”⁹⁹ This is despite pledges by Boston Dynamics – which seems to have been at the center of ire – alongside other major robotics firms, that it would not weaponize general-purpose robots or software, nor support other entities seeking to do so.¹⁰⁰

Companies such as Google are not solely concerned about such reactions – which largely come from a small, if dedicated, section of the public. Rather, opposition from their own workforces have played a powerful role for years. Though Google maintains contracts with the Pentagon and is seeking to deepen this collaboration, it notably backed out of an agreement with the Department of Defense in 2018 after employees protested against the integration of the Artificial Intelligence technology they developed into weaponry.¹⁰¹ A particularly revealing view of this dynamic, and the concern it brought to the leadership of major technology companies, comes from Marc Andreessen, co-founder of Andreessen Horowitz, one of Silicon Valley’s premier venture capital firms. Andreessen describes a shift from the mid-2000s to the early 2010s which could be best observed among the firm’s new recruits from elite universities. Whereas the earlier generation were primarily concerned with advancing their career as quickly

⁹⁸ Zimeta, “Don’t Be Evil.” Acquired by what was then Google in 2013, Boston Dynamics was sold to the Japanese SoftBank Group in 2017 before Hyundai Motor Group took a controlling 80% stake in 2020.

⁹⁹ *Wired*, “Now It Can Be Evil! Twitter Reacts to Google’s Alphabet,” August 10, 2015.

¹⁰⁰ Joe Hernandez, “Some leading robot makers are pledging not to weaponize them,” *NPR*, October 6, 2022.

¹⁰¹ Kate Conger and Julian E. Barnes, “Google Sits Pretty as A.I. Rivals Compete for Pentagon Favor,” *The New York Times*, March 18, 2026. This is only the most consequential among several such protests opposing contracts with various government agencies.

as possible, he describes their successors as coming in with the aim of “burning the system down” under the belief that “capitalism is evil [and] tech is evil.”¹⁰²

Andreessen estimates this demographic of these “professional activists” seeking to advance their agenda through efforts to “destroy a company from the inside” at 20-30% of the field’s workforce, also influencing a sizable section of less politically active yet broadly sympathetic coworkers. This is far from an observation of a mundane workplace dispute, but rather a development with profound implications for the American political landscape and Silicon Valley's relationship with the federal government. Andreessen’s narrative of an employee base gone “feral” in pursuit of a social revolution, paired with perceived excessive regulation under the Biden administration, led him and several other captains of technology to dramatically switch alliances from the Democratic Party to back the return to office of Donald J. Trump, which has enabled new opportunities and limited restraint for Silicon Valley.¹⁰³

Singer usefully points out that the Pentagon's spend in Silicon Valley “is not going to be enough to alter the behavior of the large tech companies ... [like] the Googles or the Apples.”¹⁰⁴ This reality is connected to the business model described above, as the balance between revenues from the consumer and defense sectors are far more delicate and necessary to maintain for start-up and smaller enterprises; the calculus is naturally much different for companies controlling vast market share, primarily from consumer use. Another important element complicating deeper collaboration for major companies is the reliance on the Chinese market, which requires precautions about US government connections which smaller firms do not generally have to take into account. Nonetheless, Singer, like most experts, expressed support for

¹⁰² Ross Douthat, “How Democrats Drove Silicon Valley Into Trump’s Arms” (Interview with Marc Andreessen), *The New York Times*.

¹⁰³ Douthat, “How Democrats Drove Silicon Valley Into Trump’s Arms.”

¹⁰⁴ Roth, “Everywhere Man.”

the Pentagon's deepened communication with technology firms across the United States. He recognized that on the major items, such as artificial intelligence, robotics and big data, breakthroughs will not originate exclusively from Department of Defense labs but rather "lots of different directions." Not only its origins, but the applications of these technologies, are set to be tied to both military and civilian applications.¹⁰⁵

It is precisely this multi-directional nature which makes it difficult to speak with any certainty about the implications of this shift to the private sector on how weapons are developed, their final products and the downstream effects on civilian life and infrastructure. Not only are these institutions built on fundamentally different assumptions and cultures but they face distinct pressures. In the case of defense agencies, these come in the form of high geopolitical competition while for private firms it can be political backlash or responses from shareholders, employees and consumers. This is to say nothing of the economic need to maintain access to markets under governments adversarial to the United States. We are best able to identify ever-shifting sets of incentives and disincentives; one may have an edge at a given point in development and later be outweighed by another, complicating the determination of enduring patterns.

The issue of accountability is rather evident. The mundane functions of defense agencies have long remained largely insular from public view or pressure which may meaningfully challenge their actions. Bodies of elected officials such as the US Senate and House Committees on Armed Services and Select Committees on Intelligence may call their leadership or experts to testify, but there is certainly no direct elected mechanism. Nonetheless, senior officials are appointed and serve under the elected leadership of the Executive Branch, providing an, albeit delayed, path from public opinion to defense decisions. The shift to private development,

¹⁰⁵ Roth, "Everywhere Man."

particularly by non-publicly traded companies, serves not only to narrow the range of potential inputs, but introduces an altogether different relationship between citizenry and the entities driving defense innovation.¹⁰⁶ Namely, it is no longer a dynamic between the citizen and the defense institutions responsible for their security, but rather a web through which private firms pursuing value for their shareholders or owners provide a service to the public agency, which is ultimately accountable. This reliance on funding from private investment firms and government development agencies to drive defense innovation can be thought of as a strong counterweight to the presumed humanitarian pacifism of the technology sector based in largely liberal cosmopolitan centers.

This fundamental shift in the interaction between military institutions and largely for-profit companies has not been sufficiently analyzed in recent scholarship, particularly in relation to their impact on civilians. One route of analysis might argue that the broader scrutiny of the market and public opinion may serve as a force of “restraint,” per Lee’s use of the term, protecting against the stratification of an isolated military subculture which can escalate violence on its own terms.¹⁰⁷ The profit motive and structures of shareholder capitalism are bound to introduce new opportunities and pressures to the already complex defense procurement system, especially with the inexorable rise of “small-tech” firms like Palantir.

One illustration of how deeply considerations of profit and growth penetrate even into the basic assumptions underlying the work of leading technologists comes from outside the defense sector. Mustafa Suleyman is a British AI entrepreneur who co-founded DeepMind, one of the world’s leading AI firms, and led AI policy at Google some years after its 2014 purchase of the

¹⁰⁶ "Aerospace & Defense Stocks," *Yahoo Finance*, accessed March 19, 2026. Major traditional defense contractors, such as GE Aerospace (General Electric), RTX Corporation (formerly Raytheon Technologies Corporation), The Boeing Company, Lockheed Martin Corporation, Northrop Grumman Corporation and General Dynamics Corporation are all traded on public markets, with all but the last sitting at market caps exceeding \$100 billion.

¹⁰⁷ Wayne Lee, *Barbarians and Brothers*, 8.

startup.¹⁰⁸ At the time of writing, he was serving as CEO of Inflection AI, the new start-up he had co-founded the year prior, in which role he would remain until the following year, when Microsoft secured a “highly unusual” licensing deal which acquired most of the Inflection’s leading staff yet fell short of an outright merger; under the new arrangement, he became CEO of Microsoft AI.¹⁰⁹ In the summer of 2023, Suleyman published an influential article in the lead-up to a book on the future of AI published later that year. He proposed a twenty-first century take on the Turing test, the classic approach developed by its pioneering British namesake in the mid-20th century, which posited that if a machine could communicate convincingly enough that a human was unable to distinguish between its output and that of another person, it could be considered intelligent.¹¹⁰

Suleyman claimed that the Turing test is soon to be passed, if not already achieved, depending on the source. More broadly, according to his view, it no longer met the needs of this stage in AI development, despite its enduring influence. Instead, as part of an approach he termed “Artificial Capable Intelligence” (ACI) – which aims to conceptualize forthcoming developments between the two poles of existing Large-Language Models (LLMs) and speculative AGI – is the Modern Turing test. Its benchmark is rather simple: an AI system must prove able to gain \$1 million on a retail web platform with an investment of \$100,000.¹¹¹

Suleyman claims that this feat would demonstrate the capacity to execute on a broad range of tasks beyond mere business strategizing, which would carry implications well beyond finance.

Commentators have reasonably expressed concern that a focus on economic output would prove “prohibitively narrow” and present “significant alignment risks,” yet the issue stretches well

¹⁰⁸ Samuel Gibbs, “Google Buys UK Artificial Intelligence Startup DeepMind for £400m,” *The Guardian*,

¹⁰⁹ Kylie Robison, “Why Microsoft’s Surprise Deal with \$4 Billion Startup Inflection Is the Most Important Non-Acquisition in AI,” *Fortune*.

¹¹⁰ Mustafa Suleyman, “My New Turing Test Would See If AI Can Make \$1 Million,” *MIT Technology Review*.

¹¹¹ Suleyman, “My New Turing Test.”

beyond this consideration.¹¹² The proposed benchmark shifts the goalposts of the philosophical and strategic thinking behind AI development in primary financial terms. As such, it both represents the culmination of longstanding trends in this direction and a bellwether for future developments which must be a fundamental part of public conversation.

Two texts are of particular relevance in drawing out the broader institutional shift in question. The first is a work for which it is difficult to find a parallel: *The Technological Republic*, authored by Palantir CEO Alex Karp and his legal counsel, Nicholas W. Zamiska. Karp has served for years as the captivatingly eccentric public face of arguably the premier new-generation technology company in the defense sector. Having received early seed funding shortly after its 2003 founding from In-Q-Tel, the venture capital firm closely associated with the Central Intelligence Agency (CIA), Palantir's two most consequential software offerings to date are Gotham and Foundry, which "gather and process vast quantities of data in order to identify connections, patterns and trends that might elude human analysts," primarily in defense contexts.

In *The Technological Republic*, Karp and Zamiska make a sweeping case for Silicon Valley's leading companies shifting their energies away from "the trivial and ephemeral" digital advertising-driven products which have dominated the last two decades, and towards bona fide contributions to a worthwhile national project – prominently including collaboration with the US and allied governments on their defense infrastructure. Much of the argument rests on the belief that US technological development has suffered from a profound "misdirection" toward items which will not outlast the decade. This argument does not emerge in a vacuum or from a single individual. A co-founder of Palantir alongside Karp and primary early financial backer was Peter Thiel, a seemingly omnipresent figure in the major Silicon Valley success stories of the last few decades. Karp and Thiel, former classmates at Stanford Law School, describe their relationship

¹¹² IBM, "What is artificial general intelligence (AGI)?"

as that of longstanding interlocutors with broadly opposing views. The fact that the foundational connection behind the firm is a friendship of thirty years based on differing ideologies but similar business instincts – and support for renewed collaboration between the technological vanguard and US defense institution – is far from a triviality. To the contrary, such networks ought to be considered all the more seriously when defense innovation is driven primarily by the private sector rather than established governmental institutions. This matters not only within the technology industries' own terms but, as the Andreesen case and Thiel's electoral funding activities demonstrate, also how they seek to shape the political process and its outcomes.

In his influential book *Zero to One*, authored with his Stanford student and future US Senate candidate Blake Masters, Thiel laid out his core beliefs for building successful companies and ultimately, as the subtitle grandiosely puts it, “the future.” The prescriptive element is based on the argument that, contrary to near-universal belief, since the early 1970s technological development has largely stalled outside of the world of computing, largely because previous generations erroneously came to view such progress as automatic. In an important similarity to his colleague, Thiel calls for renewed investment and societal focus on grand projects which revitalize basic elements of national life.

These texts are best understood not as historiographical works but as polemics of sorts, making the case for the direction this crucial industry, in which the authors hold a unique stake, should head. This might be somewhat obscured in Karp's work, which deals with such seemingly unrelated phenomena as the fading of Western Civilization courses from American campuses to the triumph of Edward Said's concept of Orientalism in academia. Yet this is an integral part of the picture he presents: the West's loss of faith in itself helps shape what Karp frames as the company's mission. The major difference is that Karp and Thiel's accounts do not merely

interpret or gripe with the past but rather offer the direction for a future which will leave little unimpacted. The forceful rejection of what they perceive as a culture of stagnation, Silicon Valley's reluctance to aid US defense institutions and ideas on the West's rejuvenation, must be considered in the development of a new landscape for US defense. The implications concern both relevant defense institutions and those on the receiving end of its products. It is hard not to draw parallels between the cases presented here and Sir Winston Churchill's description of his World War II memoirs: "This is not history, this is my case."

Developing With(out) Allies

"There is only one thing worse than fighting with allies, and that is fighting without them" runs another of Churchill's best-remembered sayings.¹¹³ The implicit tension between international partners present in the observation remains a force in the weapons technology development landscape of the last several decades. Karp places the United States at a clear world primacy in technological development, with Israel in second place – which he characterizes as striking given its significant population disparity with Europe – this partly because, in his view, "Europe has not engaged at all."¹¹⁴

There is strong evidence for this interpretation. By one striking measure, Germany, the continent's strongest economy, only ordered its first combat drones at the outset of 2026. This delay cannot be interpreted as a consequence of its industrial frailty but rather a "political consensus ... generally against [combat drones]" related to the prevailing sentiment which led to decades of funding cuts to the Bundeswehr, the federal military. The historical trajectory is

¹¹³ Kenneth Harris, "Wartime Lies" Review of *Forged in War: Roosevelt, Churchill, And The Second World War* by Warren F Kimball, *New York Times*, April 27, 1997.

¹¹⁴ "Palantir's Alex Karp on the intersection of big tech and politics," *CNBC*, video, 20:26-20:46, 21:39-21:42.

starkly different from that of the United States.¹¹⁵ On the international scene, there has been debate about whether Germany can be characterized as a "reluctant ally" which remains highly selective of the conflicts for which it joins coalitions and invests only minimally in its defense capabilities, with its spending halving from 2.8% to 1.4% in the two decades since unification.¹¹⁶ This is not a uniform phenomenon amongst European allies, with France taking a leading role in the continent's strategic autonomy and the construction of a properly European defense infrastructure.¹¹⁷ The strongest evidence of this process' acceleration has been President Emmanuel Macron's announcement that the French defense budget would be doubled from €32 billion to €64 billion in the decade from 2017 to 2027, three years prior to the original planned date.¹¹⁸

The divergence of approaches and depth of investment demonstrate that, in partially analogous ways to the institutional shift to private company-driven development in the US context, both the political will and technical capability of partners have the potential to profoundly shape key weapons technologies. As Karp's comment indicates, a lack of investment also carries its own significance, presenting a limited alternative to the dominant US approach and opening the path for smaller powers, such as Israel, to play a prominent role in development.

¹¹⁵ Nina Werkhäuser, "Germany's Bundeswehr Goes on Military Spending Spree," *Deutsche Welle*.

¹¹⁶ Bertel Schreer, "The Reluctant Ally? Germany, NATO and the Use of Force," in *NATO's European Allies: Military Capability and Political Will*, 161-162.

¹¹⁷ Tara Varma and Mathilde Ciulla, "The Lonely Leader: The Origins of France's Strategy for EU Foreign Policy," *European Council on Foreign Relations*; President Macron has increasingly sought to crystallize this concept with the term *l'Europe de la défense*.

¹¹⁸ Christina Mackenzie, "France to Raise Military Spending to \$75b in 2027, Three Years Earlier Than Planned," *Breaking Defense*.

III. “Collect it All”: Afghanistan, Iraq and Northern Pakistan in the 2000s

Technologies which change the nature and scope of war are by no means limited to weapons themselves. A prime example is the Signals Intelligence (SIGINT) system which helped the US-led International Security Assistance Force (ISAF) coalition in Afghanistan identify targets and carry out strikes. The system was based around the Real Time-Regional Gateway (RT-RG) platform, which intercepted, stored, mined and analyzed vast metadata on telephone calls and other telecommunications.¹¹⁹ First developed by the National Security Agency (NSA) in Iraq in 2007, it was deployed in Afghanistan the following summer. The chief difference between the two contexts was the much deeper cooperation with coalition partners in the latter. This was based on a multi-tiered system which ranged from the core Five Eyes partners – otherwise known as the Anglosphere: the United Kingdom, Australia, Canada and New Zealand – to a broader Fourteen Eyes circle including intelligence services from Western Europe and beyond, based on both demonstrated reliability and capacity to contribute.¹²⁰

The system represented a fundamental shift away from reliance on Human Intelligence (HUMINT), a traditional, human source-based form of gathering military target information, to one which prioritized tracking mobile phone SIM cards and developing voice recognition and life-pattern technologies, which track a target’s daily activities for more precise identification. The system’s benefits ranged from completing various duties that would previously have

¹¹⁹ Henrik Moltke, “Mission Creep: How the NSA’s Game-Changing Targeting System Built for Iraq and Afghanistan Ended Up on the Mexican Border,” *The Intercept*; The report also situates the public revelation of the technology in the context of the Edward Snowden leaks and the broadly publicized initial perception that it revealed the United States spying on its allies, rather than what has since been established: a joint surveillance network established in the combat zones of the Middle East, not Europe, and with the collaboration of allies.

¹²⁰ Between these two is a grouping called the Nine Eyes, also made up of Denmark, France, the Netherlands and Norway. The full fourteen is rounded up by Belgium, Germany, Italy, Spain and Sweden.

required significant analyst input, decreasing the number of troops needed on the ground and tracking real-life operations, which saved Coalition service members' lives on several occasions.¹²¹

Why did the mobile phone become a new venue for military intelligence? Analyzing this development at a more fundamental level allows us to grasp both its context and implications. As Carter Malkasian writes in the beginning of his expansive history of the Afghanistan War: “The heart of Afghanistan was the countryside ... Other than cell phones, cars, and assault rifles, the 21st century was invisible.”¹²² Malkasian spends much time treating the tribal structures and related conditions that govern much of Afghan life; by one telling measure, between 70 and 80 percent of the population resides in the countryside.¹²³ Under these conditions of small rural settlements and long-standing structures of social control, it is by and large prohibitively costly and dangerous for a foreign military to invest in integrating human assets. This process requires significant time, valuable assets and ultimately places the lives of Coalition forces on the line, which carries domestic political consequences for participating states. It is also important to note that the conditions of such Afghan communities left little space for easy surveillance outside of telecommunications. The sharply defined residential, religious and communal spaces which remain the central pillars of rural life did not produce anywhere near the prodigious quantities of data that define contemporary Western societies. Thus, Coalition forces looking to track the bearers of the assault rifles Malkasian mentions found the traces left by their cell phones to be the most reliable method.

¹²¹ Moltke, “Mission Creep.”

¹²² Carter Malkasian, *The American War in Afghanistan: A History*, 1;

¹²³ Malkasian, *The American War in Afghanistan*, 12.

The commonality between the RT-RG system and the pattern observed in the Gulf War lies in what Wayne E. Lee describes as “quantitative escalation” – the introduction of new resources into a conflict which expands its potential destruction in time or space.¹²⁴ Then-NSA Director Keith Alexander revealingly described this expansion in a directive to his agency to move away from aiming to find a needle in a haystack and begin to “collect the whole haystack.”¹²⁵ Simply scaling up the number of human agents to cover more terrain would not prove feasible; this approach could only be accomplished through prioritizing Signals Intelligence.

The problems began here. Termed an “industrialization of warfare,” the approach could produce a rapidity and breadth of intelligence that could not be matched by painstaking human sources – yet this did not necessarily translate to high-quality information.¹²⁶ Tracking targets’ SIM cards could prove unreliable for several reasons: someone other than the intended target could be carrying the card at any given time, or the target could be otherwise misidentified. The figures demonstrate the results here, too: in 2011 alone, the RT-RG system contributed to 6,534 “enemies killed in action.”¹²⁷ What is most striking when we consider the expansion of targets in relation to the increased precision often associated with Signals Intelligence-informed drone strikes is that the latter was found ten times more likely than conventional aircraft to cause civilian casualties in Afghanistan. Here, too, this is attributed to the intelligence-gathering process rendering it little more than “death by unreliable metadata.”¹²⁸

Yet these figures have prompted challenges from some prominent US sources. In March 2011, Brian Glyn Williams, a professor and veteran of the CIA and other defense institutions in

¹²⁴ Lee, *Barbarians and Brothers*, 4.

¹²⁵ Moltke, “Mission Creep.”

¹²⁶ Moltke, “Mission Creep.”

¹²⁷ Moltke, “Mission Creep.”

¹²⁸ Jeremy Scahill and Glenn Greenwald, “The NSA’s Secret Role in the U.S. Assassination Program,” *The Intercept*.

the War on Terror, challenged the prevalent claims in Pakistan that civilian fatalities were disproportionate to those of Taliban and al-Qa`ida militants. He partly attributes the problem to the difficulty journalists face in accessing the tribal areas of Northwest Pakistan where most strikes occurred, thus rendering government statements the primary source.¹²⁹ Williams points to online reports of militants amounting to only 1% of strike fatalities, with the other 99% being Pakistani civilians, with 75% of them being teenagers aged 10 to 15. Claims of civilian-to-militant fatality ratios fell in the broad range of 50 to 140 for one, with the former even being cited in a May 2009 *New York Times* opinion article.¹³⁰ A study by Williams and university colleagues of media reports on specific drone strikes in the region pointed to a significantly lower rate of 5% of drone strike victims being reported as civilians, which closely matched with research by New America Foundation putting the figure at 6%.¹³¹ Of particular interest is the statement of Pakistani Major General Ghayur Mehmood, who led troops in the strategically key region of North Waziristan, which included a heavy Taliban presence. The Major General stated that “there are a few civilian casualties in such precision strikes, but a majority of those eliminated are terrorists, including foreign terrorist elements.”¹³² This seems to challenge perceptions of Signals Intelligence targeting and its impact on civilian fatalities.

Mehmood’s statement, however, must be placed in historical context. The assertion came shortly after the arrest of CIA contractor Raymond Davis for killing two men in Lahore, Pakistan. Davis was released in January of 2011 after compensation to the families in March of that year. As Williams himself indicated, for Pakistani authorities this could have represented “an olive branch to the Americans.”¹³³ Yet a single characterization could also be misleading. US

¹²⁹ Brian Glyn Williams, “Accuracy of the U.S. Drone Campaign: The Views of a Pakistani General,” 9

¹³⁰ Glyn Williams, “Accuracy of the U.S. Drone Campaign: The Views of a Pakistani General,” 9.

¹³¹ Glyn Williams, “Accuracy of the U.S. Drone Campaign: The Views of a Pakistani General,” 9.

¹³² Glyn Williams, “Accuracy of the U.S. Drone Campaign: The Views of a Pakistani General,” 10.

¹³³ Glyn Williams, “Accuracy of the U.S. Drone Campaign: The Views of a Pakistani General,” 11.

officials had long been frustrated by the Pakistani government's practice of privately collaborating on drone strikes to later publicly attack them. Then-Chair of the Senate Armed Services Committee Carl Levin argued that this public-private distinction put the US "at a very severe disadvantage ... with the Pakistani people."¹³⁴ It cannot be viewed as inconceivable, then, that some level of coordination between US and Pakistani authorities may have led to this pronouncement, particularly considering the source's rank, the absence of a denouncement from any superiors and its delicate timing.¹³⁵

The question of civilian fatalities incurred in the War on Terror remains complex. A November 2018 report by the Brown University Costs of War project provides an extensive picture compiled toward the end of these enduring conflicts. While the general figures are striking – the total of deaths in the conflicts in Iraq, Afghanistan, and Pakistan, in descending order is estimated between 480,000 and 507,000 – several nuances have to be taken into consideration. For one, "most direct war deaths of civilians [were] caused by militants," not US or allied forces.¹³⁶ This clearly demonstrates the limitations of our ability to ascertain the impact of advanced weapons technologies on total fatality figures on the ground in such multipolar conflict environments.

It is also important to distinguish key characteristics of the conflict's different theatres. Almost twice as many US Military personnel were killed in Iraq than in Afghanistan, which shows both the intensity of the conflict and characteristics of the coalition which pursued them.¹³⁷ The number of countries which fought as part of the "Coalition of the Willing" in the early 2000s stood at 30, almost as many as those in the Desert Storm Operation.¹³⁸ This,

¹³⁴ Glyn Williams, "Accuracy of the U.S. Drone Campaign: The Views of a Pakistani General," 10.

¹³⁵ Glyn Williams, "Accuracy of the U.S. Drone Campaign: The Views of a Pakistani General," 10.

¹³⁶ Neta Crawford, "Human Cost of the Post-9/11 Wars: Lethality and the Need for Transparency" *Costs of War Project*. 2.

¹³⁷ Crawford, "Human Cost of the Post-9/11 Wars: Lethality and the Need for Transparency" *Costs of War Project*. 1.

¹³⁸ Michael E. O'Hanlon, "Coalitions in Iraq: '91 vs. Now," *Brookings Institution*.

however, belies the realities on the ground: by October 2004, there were 24,000 non-US troops in Iraq, which pales in comparison to the 150,000 deployed in 1991, along with other coalition forces available in the region.¹³⁹ This required a much larger US troop presence in the Iraq War, partially explaining the higher fatality count. There are also significant differences in terms of civilian fatalities. In Afghanistan, the civilian to “opposition fighter” death count ratio was almost one to one while in Iraq there were more than five times more civilian than opposition fighter deaths.¹⁴⁰ This disparity highlights the importance not only of the weapons technologies employed but also the landscape in which a conflict is fought. In this context, a significant difference can be presumed to be the much more developed and dense urban environments of Iraq.

In direct response to high civilian fatalities, along with ensuing media and public outcry, President Barack Obama issued a July 2016 Executive Order on “post-strike measures to address civilian casualties.” The document contains several important factors, both for the practices and precedent it set as well as what it reveals about the Obama national security team’s approach to civilian casualties – one of the most problematic foreign policy issues the administration faced. This includes how far they were willing to go to turn a new page, and which steps were perceived as out of reach. The Order began by framing the practice of civilian protection as “fundamentally consistent” with the deployment of force to further US national interests. The practice is described as possessing both strategic and moral value as a means of securing mission objectives and retaining the support of allies and vulnerable populations.¹⁴¹

¹³⁹ O’Hanlon, “Coalitions in Iraq: ’91 vs. Now,” *Brookings Institution*.

¹⁴⁰ Crawford, “Human Cost of the Post-9/11 Wars: Lethality and the Need for Transparency” *Costs of War Project*. 1.

¹⁴¹ The emphasis on the ability of these measures to “further mission objectives” may be reminiscent of the treatment of civilian casualties in the *Strategic Bombing Surveys*, which framed them as secondary, and directed at serving the interest of, US strategy in the theater of conflict in question. It may also have been intended to communicate to US forces and their commanders that the mission and their wellbeing remained superior to civilian protection.

Among the most important actionable steps implemented was an annual report, to be released by the Director of National Intelligence (DNI) by May 1 of each year, compiled on information sourced from “relevant departments and agencies” to track and prevent civilian casualties.¹⁴² Not only does this recognize the issue of casualties as important enough to warrant high-level coordination, but it directs the DNI to consult with information compiled by non-governmental organizations (NGOs). It even adds that the reports will, “as feasible and appropriate ... address the general reasons for discrepancies between post-strike assessments from the U.S. Government and credible reporting from nongovernmental organizations.”¹⁴³ While the administration’s presumed wish to signal to such civil society organizations that they were seriously addressing the issue may have been a strong motivator, this seems, at least in part, to recognize the legitimacy of figures reported by NGOs. This may undermine attempts by government officials, including the aforementioned work of Brian Glyn Williams, to broadly call into question the information-gathering process and figures presented by relevant organizations and media sites.

The annual report was not the only actionable step delegated to senior administration officials. The Order also tasked the National Security Advisor, through the National Security Council (NSC), to convene relevant agencies “to consult on civilian casualty trends, [and] consider potential improvements to U.S. Government civilian casualty mitigation efforts.”¹⁴⁴ The emphasis on trends seems to recognize that civilian fatalities may result from structural patterns of action or even technological development rather than a series of isolated incidents. Paired with

¹⁴² The White House, “Executive Order — United States Policy on Pre- and Post-Strike Measures to Address Civilian Casualties in U.S. Operations Involving the Use of Force,” July 1, 2016.

¹⁴³ White House, “Executive Order to Address Civilian Casualties.”; As will be seen with other aspects of the Order, qualifiers including “as feasible and appropriate” and “credible reporting” call into question whether the stipulations here are universally applicable and the leverage the administration retains to avoid them in various situations.

¹⁴⁴ White House, “Executive Order to Address Civilian Casualties.”; The official position title is the Assistant to the President for National Security Affairs. The shortened version used here is far more common in government, media and common parlance.

a repeated emphasis on developing and exchanging best practices with international partners, it can be interpreted as a partial acceptance by the administration that there were concrete, hitherto untested, steps to minimize civilian casualties. The systemic approach is further supported by the stipulation that this review process would not treat individual incidents, which were to be left to relevant agencies; rather, at the NSC level, the focus would remain on broad practices. This appears to run in a direction counter to the measures above, in protecting senior national security officials from having to directly acknowledge or address individual cases of concern. A similar institutionally conservative element can be observed in its efforts to make clear that the Order does not modify either “the chain of command of the U.S. Armed Forces or the authority of U.S. commanders.”¹⁴⁵

The most relevant, and among the most consequential, measure for our purposes states that: “No part of this order modifies priorities in the collection of intelligence or the development, acquisition, or fielding of weapon systems and other technological capabilities.”¹⁴⁶ There are several factors to unpack here. This refusal to revisit US intelligence-gathering methods and technological development systems indicates how central these capabilities were to the war effort.¹⁴⁷ To open the door to their modification might be interpreted as conceding that it might be reasonable to question the fundamental American combat mission. However, it must be noted that this decision ignores the evidence building by this point that these systems were contributing factors to the processes behind concerning civilian fatality levels. A fitting representation of problems surrounding intelligence-gathering can be seen in the reliance on

¹⁴⁵ White House, “Executive Order to Address Civilian Casualties.”

¹⁴⁶ White House, “Executive Order to Address Civilian Casualties.”

¹⁴⁷ It is important to note that the clause follows the same sentence structure as the assertion on preserving the chain of command, which immediately precedes it. This seems to indicate parity in both legal terms and priority to the administration.

Signals Intelligence treated above, which muddled the quality and accelerated the generation of targets.

The Order ends by noting that the principles it lays out are “consistent with” US obligations under international law, and do not either abrogate or introduce any such new responsibilities. The rationale behind this stipulation is rather clear, and connected to the final one, which states that the Order does not intend to “create any right or benefit, substantive or procedural, enforceable at law or in equity by any party.”¹⁴⁸ Such a step, aimed at preventing legal action against the government, is perhaps to be expected. However, among the steps relevant agencies are tasked with taking, presented in tandem with acknowledgement of “responsibility for civilian casualties” is the provision of *ex gratia* payments – compensation which is not legally mandated – to those injured or the families of those killed.¹⁴⁹ This step is important in committing the government to concrete steps after civilian casualties, and should be kept in mind as we consider the application of these measures.

We are able to assess the extents of the Order’s applications and its results through a *New York Times* report released in December 2021, months after the US withdrawal from Afghanistan in August of that year, and several years since high-intensity conflict had ceased in Iraq. The report accessed previously unreleased Pentagon archives beginning in 2014 of the US air war in the Middle East. It was based on more than 1,300 instances in which civilian casualties were reported. This was complemented by over a hundred site visits and conversations with both residents of impacted areas and US officials.¹⁵⁰ The picture it paints stands in stark contrast to President Obama’s description of America’s “extraordinary technology” enabling “the most

¹⁴⁸ White House, “Executive Order to Address Civilian Casualties.”

¹⁴⁹ White House, “Executive Order to Address Civilian Casualties.”

¹⁵⁰ Azmat Khan, “Hidden Pentagon Records Reveal Patterns of Failure in Deadly Airstrikes,” *The New York Times*, December 18, 2021. The impact of the series which this article was part of was such that it won the 2022 Pulitzer Prize for international reporting.

precise air campaign in history.”¹⁵¹ The article argues that the evidence points instead to a campaign defined by “deeply flawed intelligence, rushed and often imprecise targeting, and the deaths of thousands of civilians, many of them children.”¹⁵² In one of several striking representative examples, a November 2015 strike was called on what was thought to be an Islamic State of Iraq and Syria (ISIS) defensive combat position, where analysts reported an “unknown heavy object” being carried into a building. Post-strike analysis found that this was “a person of small stature” – or in common English, a child.¹⁵³

An important factor is the scale and frequency of strikes. President Obama reported 14,000 strikes and over 100,000 sorties by August 2016, two years into the air war.¹⁵⁴ The Pentagon estimates that 1,417 civilians lost their lives in the full air campaign against ISIS in Iraq and Syria, while they place the figure of civilians killed in Afghanistan from 2018 until the end of operations in 2021 at a minimum of 188. The articles make a strong case that this is a significant undercount, considering that many reports of civilian casualties had been dismissed without much assessment.¹⁵⁵ This is by no means exclusive to this conflict, as civilian casualty figures have historically been difficult to aggregate with certainty, both due to logistical difficulties and obstruction. The article also presents findings relevant to the institutional considerations central to this project. In practice, many of the civilian protection procedures that had been established were repeatedly sidestepped. This failure of implementation is perhaps best

¹⁵¹ Barack Obama, "Press Conference by the President After Meeting with National Security Officials," August 4, 2016.

¹⁵² Khan, "Hidden Pentagon Records Reveal Patterns of Failure in Deadly Airstrikes."

¹⁵³ Khan, "Hidden Pentagon Records Reveal Patterns of Failure in Deadly Airstrikes."; Another example which speaks to the scale of civilian casualties that can be produced by one erroneous interpretation of data came in July 2016, when US Special Operations forces targeted what they thought were three ISIS staging areas in northern Syria, after which they reported 85 militant fatalities. Follow-up analysis found that these were residences where local villager families were seeking refuge; 120 of them lost their lives.

¹⁵⁴ Obama, "Press Conference by the President After Meeting with National Security Officials."; Helene Cooper, ma Allows Limited Mark Landler and Alissa J. Rubin, "ObaAirstrikes on ISIS," *The New York Times*, August 7, 2014. This shows that Obama began the air campaign two years prior almost to the day of the press conference above, which he notes in his address.

¹⁵⁵ Khan, "Hidden Pentagon Records Reveal Patterns of Failure in Deadly Airstrikes."

represented by the Talon Anvil strike cell, which secretly continued its Middle East activities in apparent contradiction of the Order's primary stipulations, and was responsible for some of the most flagrant civilian fatality cases.¹⁵⁶

The record shows less than complete adherence to the reporting procedures laid out in the 2016 Executive Order. Whereas the annual reports rely on constant and thorough information and communication with NGOs, the investigation found that the Pentagon published “bare-bones summaries,” with failings rarely acknowledged, in which cases they are framed as “unfortunate, unavoidable and uncommon.” The status of compensation payments is particularly important, as it presents arguably the most concrete measure of follow-through with victims and their families. The Executive Order plainly established that civilians injured or the families of those wrongfully killed would be entitled to both an acknowledgement and compensation.¹⁵⁷ Yet the article reports under a dozen such condolence payments in total, though, in addition to fatalities, many more civilians were left disabled and in need of costly care. This reality sharply demonstrates the gap between the procedures laid out – and, importantly, the message communicated – by the Obama administration, and the political will and institutional structure set up to enact them. The picture which emerges is one where “efforts to identify root causes or lessons learned are rare” and the steps taken remain largely at the level of rhetoric.¹⁵⁸

¹⁵⁶ Khan, “Hidden Pentagon Records Reveal Patterns of Failure in Deadly Airstrikes.”; Dave Philipps, Eric Schmitt and Mark Mazzetti, “Civilian Deaths Mounted as Secret Unit Pounded ISIS,” *The New York Times*, December 12, 2021, updated December 27, 2021.

¹⁵⁷ White House, “Executive Order to Address Civilian Casualties.”

¹⁵⁸ Khan, “Hidden Pentagon Records Reveal Patterns of Failure in Deadly Airstrikes.”

IV. “Lavender” and the Era of AI-Driven Target Generation

The aim of this chapter is to present and analyze key Israeli Defense Forces tracking and targeting technologies employed in the Gaza war of 2023-2025. We will be tracing important continuities with such US technology in recent Middle Eastern conflicts, as well as some important points of divergence. The focus will be on the new technical capabilities these systems unlocked, the institutional logic that drives their development and use, as well as the internal cultural shifts that can be observed in this period.

The 2021 Israeli campaign in Gaza, known as Operation Guardian of the Walls, has been termed “the first Artificial Intelligence War” due to its extensive use of machine learning systems.¹⁵⁹ The international interest this consequential innovation introduced, and the parallels with the US systems which have been the primary focus of this analysis, significantly deepen with the onset of the Gaza War in late 2023. A major point of analysis is the continuities and disruptions between US integration of technologies, and that of the Israeli army in its more recent conflicts. Primary among these is the “Lavender” Artificial Intelligence-targeting system developed by the Israeli Defense Forces and deployed early in the last Gaza War following the Hamas-led attacks of October 7, 2023. As the work of journalist Yuval Abraham has revealed, “Lavender” employed various forms of information, from visual to cellular, digital and Gaza population records to identify Palestinian militants. After reaching a 90% successful identification rate, it began to be employed in the third week of combat.

Crucially, the system generated 37,000 targets at this initial stage, far higher than could have been produced by human intelligence agents of the elite Signal Intelligence Unit 8200 of

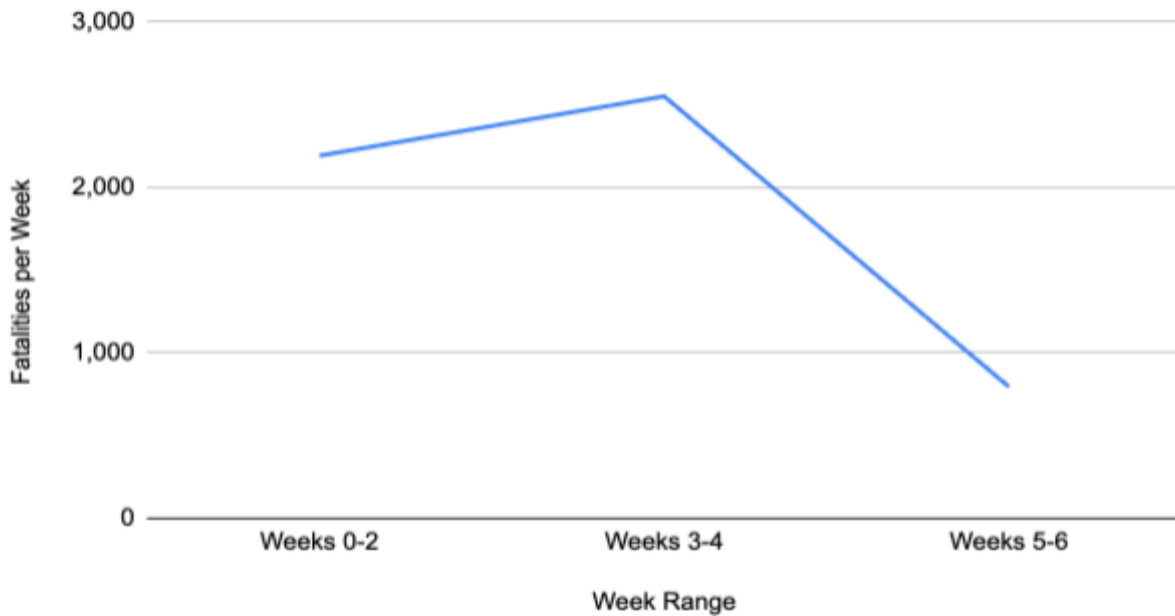
¹⁵⁹ Anna Ahronheim, “Israel's operation against Hamas was the world's first AI war,” *The Jerusalem Post*.

the Israeli Defense Forces' Intelligence Corps, which developed and housed the platform.¹⁶⁰

Many of the same problems identified in the US context are also present here, as removing the “human bottleneck” associated with intelligence-gathering also opened the path for low-quality information, fueled by poorly understood Artificial Intelligence algorithms, to dominate strike decisions. Paired with an unprecedentedly permissive collateral damage policy and sister systems which allowed strikes in non-combatant zones, including family homes, the system was associated with a sharp increase of 16.38% in civilian fatalities from one fortnight to the next. Both of these examples demonstrate that technological innovations which present new operational possibilities and impose a new, often more dangerous, reality on civilians need not emerge from weapons systems themselves. The fatality figures dropped in subsequent weeks, as targets rapidly depleted; these fatality figures are the most direct proxies to frequency of strikes, which remain classified.

¹⁶⁰ Yuval Abraham, “‘Lavender’: The AI Machine Directing Israel’s Bombing Spree in Gaza.” *+972 Magazine*.

Fatalities per Week vs. Week Range



Weekly Gazan fatalities in the first six weeks post-October 7, divided into three fortnights. (Source: Gaza Health Ministry figures, drawn from UNRWA reports).

As set out in the Introduction, the work of Wayne E. Lee will provide a central lens of analysis to this dynamic. The most direct application is the consideration of qualitative and quantitative escalation, with the former being a more recent addition to the latter’s comparatively longstanding consideration amongst historians. Lee defines qualitative escalation as the adoption of practices a military would previously have found disturbing, often as a form of retaliation. To escalate quantitatively, on the other hand, means to dedicate fresh commitment of resources to a conflict, which can mean expanding it geographically, temporally or both.¹⁶¹ The deployment of “Lavender” is somewhat rare in that it can be clearly classified as both a qualitative and quantitative escalation. The latter is more straightforward to prove, as the 37,00 targets generated

¹⁶¹ Wayne Lee, *Brothers and Barbarians*, 4.

at the onset of the war constituted a sharp – and intentional, as shown through commanders’ repeated insistence on new target generation – increase from previous human-generated figures.

The picture would be woefully incomplete, however, without considering the cultural implications that came with this shift. In defining this consideration of culture, it is imperative to lay out what it does *not* mean. Namely, it does not seek to essentialize Israeli culture as such as the sole determining factor of a given policy, nor to attribute direct and sole causality to rhetorical or psychological phenomena that can be observed in the course of the conflict.¹⁶² Rather, it is concerned with internal military subcultures as initially defined by Hull, as forces capable of generating and escalating their own patterns. Abraham notes that previous IDF policy did not tolerate *any* civilian collateral damage, whereas the new figures ranged from 15 to 20 civilians for junior operatives and over 100 civilian deaths for senior commanders. By one striking measure, this latter figure rises to over three times the Non-combatant Casualty Value of 30 assigned to Osama bin Laden by American forces in the decade following 9/11.¹⁶³ Furthermore, the newly introduced lax policy on collateral civilian harm was paired with the use of less expensive and relatively inaccurate “dumb bombs” when targeting lower-level commanders’ homes. These were prone to collapsing sections of or entire buildings atop their targets, carrying clear consequences for civilian lives and infrastructure.

Further research, whose complexity places it beyond the scope of this paper, ought to clarify the connection between these escalations and the widespread trauma caused by the unprecedented attack on October 7. By one figure often featured in Israeli media, the proportion of fatalities to the national population stands 12 times higher than 9/11 in the United States and

¹⁶² Dr Jonathan Krause at Oxford University’s Hertford College, who supervised some of the early research that led to this work, helpfully contributed the concept of “essentializing” a national culture as unreasonably extrapolating the observations that can be made about military behavior as representative of the society it hails from as whole. This conversation took place on August 7, 2025.

¹⁶³ Abraham, “‘Lavender’: The AI Machine Directing Israel’s Bombing Spree in Gaza.”

138 times higher than the July 7, 2005 Bombings in the United Kingdom.¹⁶⁴ Similarly telling is the claim that “virtually every Israeli [knew] one of the victims.”¹⁶⁵ Though, as previously noted, it is imperative that the military subculture be distinguished from its national context, Israel’s status as a “people’s army,” with substantial representation of its society, must be considered. By one revealing measure, after October 7, the IDF mobilized 360,000 reservists, amounting to as much as 4% of the national population.¹⁶⁶ It is similarly worth evaluating the implications of AI on what Lee identifies as the “four Cs” of warfare: capacity, control, calculation and culture.¹⁶⁷ We may consider here the phenomenon of officers reporting shifting definitions of a “ Hamas operative” as the perceived need for ongoing target generation evolved. Such phenomena speak not only to culture but carry serious implications for control in a military’s internal functions, especially when these are influenced by a far more permissive policy. These considerations can also change the process of strategic calculations on the part of commanders, as described by Lee.¹⁶⁸

¹⁶⁴ Human Rights Watch accepts Agence France-Presse’s 1,195 fatality figure in “I Can’t Erase All the Blood from My Mind,” and The Times of Israel reports the Central Bureau Statistics’ statement that the national population reached 9.795 million by September 2023; New York Magazine counts 2,819 killed in the attacks, not counting those who died of conditions caused by the attack, which makes for a more accurate picture of the proportion at the time of the attack. The Population Reference Bureau cites the U.S. Census Bureau’s figure of 284.8 million American inhabitants as of mid-year 2001; The British Transport Police reports 52 deaths in the 7/7 Bombings, while the UK Office for National Statistics tallied a national population of 58.7 million in mid-year 2005. The comparison in Israeli and pro-Israeli media is framed along the lines put forth in Robert Satloff’s “Why 10/7 Was Worse for Israel Than 9/11 Was for America”: “In America, that would be equivalent to killing nearly 40,000—13 times more than the number of Al Qaeda victims on 9/11.”

¹⁶⁵ Hillel Schenker, “The horror! Hamas’s Oct. 7 atrocities and Israel’s actions in Gaza - excerpt,” *The Jerusalem Post*. The contrast is drawn even more forcefully in Satloff’s aforementioned article: “As terrible as 9/11 was, tens of millions of Americans woke up the following morning ... not knowing any of the victims or their families. In Israel ... not a single family was untouched by the attack, either directly, through a neighbor, friend or classmate.” This level of impact, of course, interacts with the IDF’s status as a citizen army, in which an unusually broad section of the population is represented. Interestingly, New York Magazine also presents a figure of Americans who knew someone affected by the attack: 20%, though it does not lay out its methodology, and the claim seems on the face of it rather implausible. Even this estimate, however, indicates the different magnitude of personal connection in the two attacks.

¹⁶⁶ Jennifer Hassan and Adam Taylor, “Israel’s massive mobilization of 360,000 reservists upends lives.” *The Washington Post*.

¹⁶⁷ Lee, *Barbarians and Brothers*, 5.

¹⁶⁸ Wayne E. Lee, *Barbarians and Brothers*, 9.

The consideration of culture must also be placed in the meaningfully international context in which modern conflicts begin and develop. To trace this evolution, we must begin with Carl von Clausewitz's foundational, if structurally incomplete, *On War*. The Prussian Napoleonic-era general and thinker identified a "paradoxical trinity" constituted of primordial violence, the interplay of chance and probability, and the rational subordination of warfare as an instrument of policy.¹⁶⁹ Emphasizing the chaotic oscillation of war between these three pillars, he identified three segments of society as shaping it: "the people ... the commander and his army, [and] the government."¹⁷⁰ Though this dynamic has brought much value to the analysis of war since its nineteenth-century introduction, there seems to be something missing from the framework we have inherited from Clausewitz. Namely, the classification of "the people," understood through other references in his work as referring primarily to domestic society, does not capture the influence of worldwide public opinion, both at the individual and institutional levels, as well as the unprecedented digital and social networks that have rendered the observation of conflict a globally shared experience.¹⁷¹

This dynamic is thoroughly treated in Emile Simpson's 2012 work *War from the Ground Up*. Rooted in his experience as a Royal Gurkha Rifles officer during the Afghanistan War, Simpson explains that contemporary conflicts convey messages to more than one national audience. In the Afghan case, he explains: "[The] definition of the outcome of the Afghan conflict for the international coalition extends into the perceptions of audiences well beyond the insurgency," ranging from Muslim neighbors in the region to Chinese observers seeking to ascertain Western geopolitical might.¹⁷² In relevant and analogous ways, the use of escalatory

¹⁶⁹ Carl von Clausewitz, *On War*, 28.

¹⁷⁰ von Clausewitz, *On War*, 28.

¹⁷¹ von Clausewitz, *On War*, 479-489; Most relevantly, in Chapter Twenty-Six, Clausewitz explores Western European "popular uprisings [as] a phenomenon of the nineteenth century."

¹⁷² Emile Simpson, *War from the Ground Up*, 3.

tools in Gaza conveys different messages to different audiences. We can still gain some insight from the foreword's description of previous Gaza campaigns as seeking to demonstrate "both to Hamas and to the Israeli electorate, that the Israeli people would tolerate no further aggression" while being interpreted as symptoms of cruelty by much of the Arab – and, increasingly, Western – worlds.¹⁷³ In this and future conflicts, the deployment of technology will also develop distinct meanings for its various audiences. This evolution does not mean that we ought to discard the framework provided by Clausewitz, but rather that we must integrate it with the new complexities of a contemporary system in which resonant local conflicts cannot remain such for long.

Tracing the use of tracking and targeting technologies across the US wars in the Middle East and Israeli campaigns in Gaza also draws another important distinction on precision. Government officials, military spokespeople and analysts have long framed precision in terms akin to a universal, tangible reality: you either *have* precision or you do not. Such rhetoric misses important distinctions and nuance, primarily in terms of scale. The American near-total reliance on Signals Intelligence and targets automation, as well as the Israeli intensification of the process in the Intelligence Age, have presented real problems of accuracy and indiscriminateness in producing targets out of vast troves of data. As a contrast to this picture, we can consider a case highlighted by P.W. Singer of the 2006 strike that killed Abu Musab al-Zarqawi, the leader of al-Qaeda in Iraq. The operation itself, consisting of two 500-pound bombs dropped by two US Air Force F-16 Fighting Falcon jets on the safehouse al-Zarqawi was located in, took a grand total of 10 minutes; yet it was made possible by over 600 hours of surveillance on the target.¹⁷⁴ This clearly demonstrates that the capabilities introduced by satellites and drone technologies to

¹⁷³ Sir Michael Howard, *Preface to War from the Ground Up*, xv-xvi.

¹⁷⁴ Singer, *Wired for War*, 345; US Air Force, "U.S. Air Strike on Al-Zarqawi," video, Defense Visual Information Distribution Service, June 8, 2006.

extract geographic and physical information virtually around the clock, and to track extensive telecommunications, can indeed open new possibilities in tracking specific, often high-level targets and translate in precision. Their use across a vast range of targets, however, can corrode many of these gains, as seen in both the conflicts laid out above.

This distinction highlights the central importance of the quantity of data being processed. In pursuing a single target, these new capacities seem to lead far more directly to advertised gains in precision and accuracy, whereas at the systematic level, where data is multivariied and complex, there is far more room for both error and human decisions which stray significantly from the stated aim of precision. A particularly prominent example of this is Israeli forces' aforementioned decision to lower Lavender's threshold for what qualified as a militant when numbers of high-rated targets began to dip. This shift indicates that there remains significant agency in deciding when, and to what ends, to employ these capabilities. Distinguishing between their application at the micro and macro levels is essential if we are to understand how these technologies are changing the nature of targeting, and conflict more broadly.

V. Conclusion

It is best to conclude by seeking to address, with as much confidence as the historical record allows, the central questions this project presents. These are the competing narratives of increased precision or expanded target reach and the implications of the shift in military technology innovation from state institutions to private enterprises. It will also cover certain related notes, namely the implications of strengthened defense on a military's ability to pursue offensive action. Indeed, much has been noted about the importance of defense to a military's ability to fight effectively. This seemingly simple reality, however, poses more complex questions about the extent to which we can successfully distinguish between offensive and defensive weapons technology development. As we will see, the waters are muddled further when moral questions of aggression and self-defense are incorporated.

To develop an understanding of the logistical importance of defense capabilities, consider the example presented in P. W. Singer's *Wired for War*, where he lays out the parallel commercial and military tracks that defined robotics development in the United States in the early twenty-first century. Technologies first successfully used in vacuum cleaners like iRobot's Roomba could be traced all the way to the Iraq War, where they were employed to defuse or safely explode the IEDs which presented the primary threat to American forces following the initial invasion stage.¹⁷⁵ This, of course, could hardly have been an issue of higher importance to the American military presence, as US Central Command (CENTCOM), the entity in charge of operations in the Middle East, estimated that some 196 US servicemembers were killed by these "explosively formed penetrators" in a period spanning five-and-a-half-years.¹⁷⁶ CENTCOM

¹⁷⁵ Peter W. Singer, *Wired for War*, 19, 22.

¹⁷⁶ Marcus Weisgerber, "How Many US Troops Were Killed By Iranian IEDs in Iraq?" *Defense One*. September 8, 2015.

attributed these losses to the support Iran's Quds Force granted to Iraqi insurgents, placing the figure of US troop deaths at the hands of other "Iranian activities" – largely in attacks of improvised rocket assisted munitions (IRAMs), or "flying IEDs" – at 300.¹⁷⁷ At face value, the implications seem simple: the service members of the nation deploying such technology enjoy a new source of safety. Yet the chain of consequences does not stop here. As demonstrated in the Gulf War, we can trace the introduction of such technologies not only to lower fatalities incurred on one's own side, but also to escalating attacks on adversaries, with the expansion of these targets often imposing new threats to civilians.

A rather unexpected illustration of this dynamic could recently be observed in a different kind of conflict zone: the US Congress. In the summer of 2025, Representative Marjorie Taylor Greene introduced an amendment to a defense spending bill which would remove half a billion dollars of spending for the Israeli Iron Dome system, which protects its territory from incoming missiles.¹⁷⁸ The move promptly exposed fissures among the American left, as one of its most prominent voices, Representative Alexandria Ocasio-Cortez, joined the overwhelming majority of her colleagues in voting for the funding. Though having stated four years prior that she was opposed to such defensive support, the Congresswoman stated that she did "not believe that adding to the death count of innocent victims to this war is constructive to its end."¹⁷⁹

Representative Ocasio-Cortez's decision in turn prompted a sharp response from the Democratic Socialists of America, a left-wing political group previously closely associated with

¹⁷⁷ Marcus Weisgerber, "Military Revises Count, Says 500 Americans Likely Killed in Iraq By 'Iranian Activities,'" *Defense One*; Some political controversy developed around these figures, as Republican members of Congress used the 500 figure to make the case against the Obama administration's nuclear deal with Iran, appealing to the latter's role in attacks against US soldiers during the War on Terror. This number was disputed by the *Defense One* publication, who placed the figure at about half that presented by lawmakers, citing the CENTCOM document. Yet CENTCOM promptly followed up claiming that the 500 figure was *also* not inaccurate, as it included deaths from IRAMs and other IED weapons, not limited to IEDs on land, in this new tally.

¹⁷⁸ Nicholas Fandos, "Ocasio-Cortez's Office Is Vandalized After Vote on Funds for Israel," *The New York Times*, July 22, 2025.

¹⁷⁹ Fandos, "Ocasio-Cortez's Office Is Vandalized After Vote on Funds for Israel," *The New York Times*.

the Congresswoman. “The Iron Dome,” their statement ran, “has emboldened Israel to invade or bomb no less than five different countries in the past two years.”¹⁸⁰ Separate from the varied moral connotations and political commitments at hand, both positions hint at something more universally applicable about the nature of defensive weapons technology. At the most immediate level, they are designed to protect the service members – and, in this last case, also the civilian population – of the nation deploying them. At a secondary level, however, they are naturally included in the offensive decisions – in Lee’s term, calculations – made by military planners and commanders. This reflects the simple reality that one’s offensive actions are inevitably informed by their ability to prevent overwhelming harm in return.

President Obama pointed to this dynamic in a 2013 address to a National Defense University audience: “The very precision of drone strikes and the necessary secrecy often involved in such actions can end up shielding our government from the public scrutiny that a troop deployment invites ... [and] lead a President and his team to view drone strikes as a cure-all for terrorism.”¹⁸¹ The cost being circumvented here is twofold: the direct one in troops lost and wounded, and the ensuing drop in public support which has affected long-term campaigns pursued by powers as disparate as the Soviet Union, France and the United States to count but a few. The underlying theme that stands out in the is that there may be other costs, borne by civilians in conflict zones and international opinion of US actions, which the simple calculation of boots on the ground obscures.

The last three decades of weapons technology development have made promises to the militaries deploying them, and the societies they represent, in at least two directions. The first is an increased lethality through an expanded range of targets being brought within reach, and the

¹⁸⁰ Democratic Socialists of America, “On the Iron Dome Vote.”

¹⁸¹ Barack Obama, "Remarks by the President at the National Defense University" Speech, 23, May 23, 2013.

second a heightened precision, expected to minimize civilian fatalities. As this analysis of several relevant conflicts has demonstrated, the former development has overwhelmed the latter. The evidence indicates that militaries have enjoyed more success with increasing the lethality and range of their strikes than the surgical precision which has figured prominently in their public messaging. Yet it must be noted, on an empirical rather than a normative basis, that across the conflicts covered here, the element of human will remains a powerful force. This materializes both in technological development itself as well as decisions such as targeting cut-offs, and what loss in civilian life is acceptable. Indeed, Sam Altman's recipe for summoning Artificial General Intelligence (AGI) ended on the note of "human will."¹⁸² It would be irrational to remove this fundamental component from the analysis of these technologies' applications to humanity's most dangerous occupation: deploying violence to achieve political ends.

It is also worth noting that the implications considered here are by no means limited to the United States. A prominent example comes from the Gulf War. The technology displayed in the conflict spurred development not only among allies, but also emerging adversaries. Of primary importance here is China, to whom the Gulf War served as the "epitome' of information warfare."¹⁸³ Central to this picture were stealth, precision-strike and joint operational capabilities, which stood worlds away from the then-dominant "People's War" concept focused around a total-war counterinvasion strategy, driven by significant ground formations and nationwide mass mobilization.¹⁸⁴ These interrelated objectives seemed lofty in the early 1990s, yet China has registered nothing short of "stunning progress" in this direction, marked by milestones such as the official 2004 shift toward an "informationized warfare" strategy and President Xi Jinping's 2021 announcement of the People's Liberation Army's (PLA) goal of achieving the status of a

¹⁸² Altman, "The Intelligence Age," September 23, 2024.

¹⁸³ Michael Dahm, "China's Desert Storm Education," *Proceedings* 147.

¹⁸⁴ Dahm, "China's Desert Storm Education."

“world class military” by the centennial of the People’s Republic’s founding in 2049.¹⁸⁵ Though the US campaign was not the sole factor – rather compounding the effects of the Chinese military’s failures during the 1979–9 engagement with Vietnam and longstanding border tensions with the Soviet Union, this development demonstrates the global range of the transformations introduced in the Gulf War. This example sets out not only the importance of an emerging Chinese ability to impose its will militarily, but also the need to identify the second- and third-order effects of innovations being driven by Western militaries – which will not remain exclusive to them. P.W. Singer rightly noted that “war will remain as unpredictable as it is enduring.”¹⁸⁶ Part of this picture is the reality that, closely reflecting developments in global politics, military technology is also bound to grow increasingly multipolar.

The enduring nature of war lends all the more importance to the effort of accurately tracing its developments into the present day. Indeed, the themes of this project seemed to grow more topical by the day throughout the process of writing. and it would be remiss not to comment on how this history factors into ongoing processes. In early March 2026, Anthropic, one of the leading artificial intelligence companies in the United States, was declared a “supply chain risk” – a label usually reserved for firms with ties to major geopolitical adversaries such as China – by the Department of Defense.¹⁸⁷ Anthropic had been contracting with the Department for well over a year and broadly supported its warfighting mission, before it sought to negotiate narrow exceptions for the use of its technology, namely on “fully autonomous weapons and mass domestic surveillance.”¹⁸⁸ The Department responded by canceling the contract negotiations and applying the rare designation.

¹⁸⁵ Dahm, “China’s Desert Storm Education,” *Proceedings* 147.

¹⁸⁶ Singer, *Wired for War*, 195.

¹⁸⁷ This remains the Department’s official name until any permanent change is made by the US Congress, though Executive Order 14347 allows the “Department of War” to be used as a secondary title.

¹⁸⁸ Dario Amodei, “Where Things Stand with the Department of War,” *Anthropic*.

The day after this decision was made public, OpenAI, the foremost US artificial intelligence firm, reached an agreement with the Pentagon on deploying advanced AI for classified purposes. The company's announcements took great pains to explain that it laid out even more stringent boundaries on the ends to which its technology could be used, including but going beyond the prohibition on Anthropic's two red lines.¹⁸⁹ The claim that there was not a retreat on these key demands makes it difficult to ascertain the negotiation differences which led to confrontation in one case and success in the latter. Even without full details, we can note that this is not an isolated incident but rather belongs to a long history of tensions and competing interests between defense agencies and their contractors, especially new firms which provide uniquely capable services, yet seek to abide by their own terms.

The second contemporary endpoint worth noting concerns targeting and its impact on civilian life. On February 28, 2026, the very first day of the joint US-Israeli Operation Epic Fury which struck military and political targets throughout Iran, came one of the most devastating targeting failures in American history. The Shajarah Tayyebah elementary school in the southern Iranian town of Minab, which stood adjacent to several buildings actively used by Iran's Islamic Revolutionary Guards Navy, was struck by a Tomahawk missile. Iranian authorities have estimated that there were 175 fatalities, the vast majority of them school children.¹⁹⁰ The *New York Times* broke the report that a preliminary US military investigation found that outdated targeting data may have been to blame. US Central Command officers provided the target coordinates based on data provided by the the Defense Intelligence Agency (DIA) which did not indicate that the school was no longer part of the neighboring Navy complex since last tracked a decade ago.

¹⁸⁹ *OpenAI*, "Our agreement with the Department of War."

¹⁹⁰ Julian E. Barnes, et al., "U.S. at Fault in Strike on School in Iran, Preliminary Inquiry Says," *The New York Times*.

This example harkens back to the phenomenon that high technological capability is not inherently paired with cutting-edge practices or equipment. We could observe this in the combination of AI-driven targeting and the use of “dumb” bombs in the Gaza context. In the present case, a weapon as powerful and precise as a Tomahawk missile can lead to catastrophic consequences through an oversight as mundane as the failure to update a database. Yet again we return to the foundational reality that human will, action or the lack of it shape the landscape of conflict – for its belligerents and the civilians whose lives remain in the eye of the storm.

Works Cited

Abraham, Yuval. April 3, 2024. "‘Lavender’: The AI Machine Directing Israel’s Bombing Spree in Gaza." *+972 Magazine* ([online](#)).

"Aerospace & Defense Stocks." *Yahoo Finance*. Accessed March 19, 2026.

Alighieri, Dante. *The Divine Comedy*. Translated by Allen Mandelbaum. New York: Everyman’s Library, 1982.

Altman, Sam. September 23, 2024 "The Intelligence Age." Sam Altman Blog.

Amodei, Dario. March 5, 2026. "Where Things Stand with the Department of War." *Anthropic..*

Bergmann, Dave, and Cole Stryker. "What Is Artificial General Intelligence (AGI)?" *IBM Think.*

Clausewitz, Carl von. 1984. *On War*. transl. and edited by Michael Howard and Peter Paret.

Princeton, NJ: Princeton University Press.

Conger, Kate and Julian E. Barnes. March 18, 2026. "Google Sits Pretty as A.I. Rivals Compete for Pentagon Favor," *The New York Times*.

Crawford, Neta C. November 2018. "Human Cost of the Post-9/11 Wars: Lethality and the Need for Transparency." Providence, RI: *Costs of War Project*, Watson Institute for International and Public Affairs, Brown University.

Cooper, Helene, Mark Landler and Alissa J. Rubin. August 7, 2014. "Obama Allows Limited Airstrikes on ISIS," *The New York Times*.

Dahm, Michael. "China's Desert Storm Education." *Proceedings* 147, no. 3 (March 2021): 1,417. U.S. Naval Institute.

Daney, Serge. February 2004. "The Tracking Shot in Kapo." transl. Laurent Kretzschmar. *Senses of Cinema*, no. 30. (Original in *Trafic*, no. 4, Fall 1992.

Democratic Socialists of America. "On the Iron Dome Vote." July 19, 2025.

Douthat, Ross. January 17, 2025. "How Democrats Drove Silicon Valley Into Trump's Arms" (Interview with Marc Andreessen), *The New York Times*,

Dylan, Bob. "Blowin' In the Wind." Track 1 on *The Freewheelin' Bob Dylan*. Columbia Records, 1963. Vinyl. Digital reissue, 2005.

Fandos, Nicholas. "Ocasio-Cortez's Office Is Vandalized After Vote on Funds for Israel." *The New York Times*, July 22, 2025.

Foucault, Michel. 1995. *Discipline and Punish: The Birth of the Prison*. Translated by Alan Sheridan. New York: Vintage Books.

Freedman, Lawrence, and Efraim Karsh. "How Kuwait Was Won: Strategy in the Gulf War." *International Security* 16, no. 2 (Fall 1991): 5–41.

Gibbs, Samuel. January 27, 2014. "Google Buys UK Artificial Intelligence Startup DeepMind for £400m." *The Guardian*.

Gupta, Aadya and Adarsh Ranjan. April 30, 2024 "A Primer on Compute." *Carnegie Endowment for International Peace*.

Harris, Kenneth. April 27, 1997. "Wartime Lies," Review of *Forged in War: Roosevelt, Churchill, And The Second World War* by Warren F Kimball, *New York Times*.

Hassan, Jennifer and Adam Taylor. October 10, 2023. "Israel's massive mobilization of 360,000 reservists upends lives." *The Washington Post*.

Heidenrich, John G. "The Gulf War: How Many Iraqis Died?" *Foreign Policy*, no. 90 (Spring 1993): 108–25.

Hernandez, Joe. October 6, 2022. "Some leading robot makers are pledging not to weaponize them," *NPR*.

Hull, Isabel V. 2005. *Absolute Destruction: Military Culture and the Practices of War in Imperial Germany*. Ithaca, NY: Cornell University Press

Karp, Alexander C., and Nicholas W. Zamiska. 2025. *The Technological Republic: Hard Power, Soft Belief, and the Future of the West*. New York: Crown Currency.

Keaney, Thomas A., and Eliot A. Cohen, et al. 1993. *Gulf War Air Power Survey: Summary Report*. Washington, D.C.: U.S. Government Printing Office.

Khan, Azmat. December 18, 2021 "Hidden Pentagon Records Reveal Patterns of Failure in Deadly Airstrikes," *The New York Times*.

Kopp, Carlo. July 1992. Updated 2010. "Desert Storm - Precision Guided Munitions." *Australian Aviation*.

Kotkin, Joel. July 7, 1996. "The 'Silver' Age of State's Defense-Aerospace Economy." *The Los Angeles Times*.

Landler, Mark. April 6, 2018. "For McMaster, Pomp Under Bittersweet Circumstances," *The New York Times*.

Lanni, Adriaan. "The Laws of War in Ancient Greece." *Law and History Review* vol. 26, no. 3 (Fall 2008): 469–89.

Lee, Wayne E. 2011. *Barbarians and Brothers: Anglo-American Warfare, 1500–1865*. Oxford: Oxford University Press.

Mackenzie, Christina. July 14, 2025. "France to Raise Military Spending to \$75B in 2027, Three Years Earlier Than Planned." *Breaking Defense*.

Malkasian, Carter. 2021. *The American War in Afghanistan: A History*. New York: Oxford University Press.

Miller, Duncan C. "SIMNET and Beyond: A History of the Development of Distributed Simulation." Paper presented at the Interservice/Industry Training, Simulation and Education Conference (I/ITSEC), Orlando, FL, 2015.

Moltke, Henrik. May 29, 2019. "Mission Creep: How the NSA's Game-Changing Targeting System Built for Iraq and Afghanistan Ended Up on the Mexico Border." *The Intercept*.

Nicolas Niarchos, August 27, 2024. "H.R. McMaster Doesn't Think Donald Trump Is Very Good at Making Deals," review of *At War with Ourselves: My Tour of Duty in the Trump White House* by H.R. McMaster, *The New York Times*.

Nissenbaum, Dion. June 28, 2015. "Author Warns U.S. Military to Focus on China," *The Wall Street Journal*.

Obama, Barack. May 23, 2013. "Remarks by the President at the National Defense University." Speech, Fort McNair. Washington, DC.

Obama, Barack. August 4, 2016. "Press Conference by the President After Meeting with National Security Officials." Press conference, The Pentagon, Washington, DC.

O'Hanlon, Michael E. October 19, 2004. "Coalitions in Iraq: '91 vs. Now.'" *Brookings Institution*.

OpenAI. February 28, 2026, updated March 2, 2026. "Our agreement with the Department of War."

Page, Larry and Sergey Brin. April 29, 2004. "Letter From the Founders," *The New York Times*.

Page, Larry. August 10, 2015. "G is for Google," *Google* (blog).

Page, Larry, and Sergey Brin. December 3, 2019. "A Letter from Larry and Sergey." *The Keyword* (blog), Google.

“Palantir’s Alex Karp on the intersection of big tech and politics,” *CNBC*. June 29, 2022. Video.

Petraeus, David Howell, and Andrew Roberts. 2023. *Conflict: The Evolution of Warfare from 1945 to Ukraine*. New York, NY: Harper, an imprint of HarperCollins Publishers.

Pope, Charles. February 23, 2021. “30 Years Later, Desert Storm Remains a Powerful Influence on Air, Space Forces.” *U.S. Air Force*.

“Raytheon BBN Technologies.” [National Science and Technology Medals Foundation](#). Accessed May 22, 2026.

Robison, Kylie. March 19, 2024. “Why Microsoft’s Surprise Deal with \$4 Billion Startup Inflection Is the Most Important Non-Acquisition in AI.” *Fortune*.

Roth, Margaret C. November 28, 2018. "Everywhere Man." *Army AL&T Magazine*.

Scahill, Jeremy and Glenn Greenwald. February 10, 2014. “The NSA’s Secret Role in the U.S. Assassination Program.” *The Intercept*.

Schreer, Bertel. 2013. “The Reluctant Ally? Germany, NATO and the Use of Force.” In *NATO’s European Allies: Military Capability and Political Will*, ed. Janne Haaland Matlary and Magnus Petersson, 161–177. London: Palgrave Macmillan.

Simpson, Emile. 2012. *War from the Ground Up: Twenty-First-Century Combat as Politics*.
Oxford: Oxford University Press.

Singer, Peter W. 2009. *Wired for War: The Robotics Revolution and Conflict in the 21st Century*.
New York: Penguin Press.

Singer, Peter W. pwsinger.com, Accessed March 19, 2026.

Smith, Leo. September 23, 1997. "Illusion Hopes to Make Better Emergency Response a
Reality," *Los Angeles Times*.

Suleyman, Mustafa. July 14, 2023. "My New Turing Test Would See If AI Can Make \$1
Million." *MIT Technology Review*.

The Economist. June 3, 2021. "A Growing Number of Governments Hope to Clone America's
DARPA."

The New York Times. January 30, 1991. "War in the Gulf: Greek Troops to Aid Police.

The United States Strategic Bombing Surveys: Summary Reports. 1945. Washington, D.C.: U.S.
Government Printing Office.

Thiel, Peter A., and Blake Masters. 2014. *Zero to One: Notes on Startups, or How to Build the Future*. New York: Crown Business, Crown Publishing Group (imprint of Random House LLC).

Tirpak, John A. December 1, 2020. "Desert Storm's Unheeded Lessons." *Air & Space Forces Magazine*.

The United States Strategic Bombing Surveys: Summary Reports. 1945. Washington, D.C.: U.S. Government Printing Office.

University of Virginia Miller Center. "The Gulf War."

UPI. July 19, 1991. "Bush Thanks Souda Bay Forces for Gulf Help," *UPI Archives*.

US Air Force. June 8, 2006. "U.S. Air Strike on Al-Zarqawi." Video. Defense Visual Information Distribution Service.

US Department of State. *Foreign Relations of the United States, 1961–1963, Volume XVII, Near East, 1961–1962*. Document 66. Office of the Historian. Accessed May 2, 2026.

Walker, James, Lewis Bernstein, and Sharon Watkins Lang. 2003. "Renewed Interest in Space and the War in the Persian Gulf, 1985–1991." In *Seize the High Ground: Command History Book*. Army Space and Missile Defense Command.

Weisgerber, Marcus. September 8, 2015. "How Many US Troops Were Killed By Iranian IEDs in Iraq?" *Defense One*.

Weisgerber, Marcus. September 11, 2015. "Military Revises Count, Says 500 Americans Likely Killed in Iraq By 'Iranian Activities.'" *Defense One*.

Werkhäuser, Nina. January 29, 2026. "Germany's Bundeswehr Goes on Military Spending Spree." *Deutsche Welle*.

The White House. July 1, 2016. "Executive Order — United States Policy on Pre- and Post-Strike Measures to Address Civilian Casualties in U.S. Operations Involving the Use of Force."

Weinraub, Bernard. October 10, 1997. "From Science to Fiction, Military and Entertainment Industries Swap Expertise." *The New York Times*

Williams, Brian Glyn. March 2011. "Accuracy of the U.S. Drone Campaign: The Views of a Pakistani General." *CTC Sentinel*, vol. 4, Issue 3. Combating Terrorism Center at West Point.

Wired, August 10, 2015. "Now It Can Be Evil! Twitter Reacts to Google's Alphabet."

Zimeta, M. G. August 12, 2015. "Don't Be Evil." *The Paris Review*.

Archival Materials

Stanford University Libraries, Silicon Valley Archives. Stanford, California

Collection

Joseph D. Cusick : Papers relating to Lockheed Missiles & Space Co. and the U.S. Air Force Satellite Test Center, 1962-1991

Box 2, "Personal files of J.D. Cusick during conversion process; correspondence with LMSC."

The Battle of 73 Easting, Gulf War: simulation project papers, 1991-1993:

The Regiment's Perspective: Box 1, Folder 10, "73E McMaster - Eagle Troop."

1.2 Data: Box 1, Folder 1 "73 Easting Re-Creation Databook Draft."