FEATURE

Airmen and Unmanned Aerial Vehicles

The Danger of Generalization

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Military operations involving unmanned aerial vehicles (UAV), also known as "drones,"[1] represent a complex sociotechnical system with the human element at its core.[2] UAVs are "valuable assets in achieving a variety of strategic, operational, and tactical objectives, including ISR [intelligence, surveillance, and reconnaissance] missions and kinetic-strike operations."[3] Because of their numerous battlefield advantages over manned systems, UAVs continue to proliferate on a global scale at an accelerated speed. The estimated market[4] is expected to grow from around $6 billion in 2015 to about $12 billion in 2025.[5] In 2018, the RAND Corporation, tasked to produce a report on how the proliferation of UAVs will impact US national security interests, concluded that these systems pose an incremental but growing threat to US and allied military operations, predicting that, in future conflicts, US forces will have to cope with adversaries equipped with different types and sizes of UAVs, with and without ordinance on board.[6] More than 90 states operated military UAVs as of 2017, and almost 30 possessed or were capable of using armed UAVs.[7]

The past decade has witnessed a steadily growing popular and academic interest in these systems, the legal and ethical questions surrounding their use, and their impact on armed conflict and society more generally. Much ink has been spent to present independent analysis on different facets of these developments. To date, however, only a handful of protagonists (pilots and sensor operators) have spoken about their experience openly. As a rule, their daily labor is systematically protected from public scrutiny. Official security policies prohibit aircrews from discussing the details of their work with anyone who does not hold a security clearance and a need to know.[8] Information sharing has been further dis-incentivized with aircrews having been publicly criticized for showing disloyalty to the services.[9] Those few, however, who braved an opportunity to tell their story in detail, lament that the exhausting US government censorship processes take longer to complete than an aircrew member may require to successfully

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publish a book-length monograph.[10] The challenges of gaining insight into the work of UAV operators notwithstanding, a number of narratives have been fashioned and maintained early on in the popular and scholarly discourse presenting operators in a particular light. For example, the aircrew members are portrayed either as courageously restrained heroes who, due to the nature of their profession, suffer under heavy psychological trauma or as gung-ho joystick warriors responsible for fashioning and sustaining the culture of "convenient killing."[11]

While occasionally supported by reference to first-person accounts, the narratives are fashioned in nearly absolute terms implying the invalidity of any possible counter-representations. In social critic Laurie Calhoun's view, as a non-psychologist, operators are trained "to kill in the manner of sociopaths with no feelings whatsoever for their victims [who] are but icons on computer screens."[12] Given that little insight on the topic has been offered by the operators themselves, the assertiveness and even boldness of some of the suggested narratives is indeed striking. That said, a few commentators who acknowledge the dearth of available testimonies, disagree on the implications. Alex Edney-Browne, for example, contends that such testimonies nevertheless offer rich empirical information that may be generalizable to a wider group of active-duty and retired personnel.[13] Conversely, Joseph "Joe" Chapa, pointing out that references in the literature to the available data have become circular, advises to exercise caution in selecting evidentiary data points, "not because they are without value, but because they are so few."[14] While accuracy of both contentions arguably depends on what aspects of UAV operations form the focus of a particular investigation, this paper asserts that limited data on operators' personal experiences obstructs the attempts of the research community to gain adequate knowledge and develop and share an informed opinion on the subject.[15] As the firsthand testimonies examined for the purposes of this paper show, creating a black-and-white narrative of the operators' experiences undermines the informative value of already limited data and artificially reinforces images that this data frequently seeks to reverse.

The present inquiry is motivated foremost by continuous developments in technology. As military systems incorporate ever more elements of autonomy, it is essential to assess their potential to become successfully integrated in existing force structures. Given that a human operator is projected to remain a central element of such systems, the success of the integration process is squarely dependent on how humans will adapt to increasing automation. While current UAVs have only limited autonomous functionality, they nonetheless offer the only example of some of the most technologically advanced systems that have tested human capacity to adapt and where the experience of adaptation has been described by the users of such systems.

Methodology

Before proceeding to analysis, some words on the applied methodology are necessary. Researchers have recurrently relied upon personal accounts of military personnel as a valid and valuable source of data for academic inquiry.[16] This approach has its limitations, however. Personal testimony is necessarily subjective. It cannot be treated as an immediately quantifiable set of data but must be contextualized to ensure that interpretation is not distorted.[17] While none of the firsthand accounts would be sufficiently informative on their own, combined they inform our understanding of operators' experiences in a more balanced fashion. The current analysis focuses on the experiences of pilots tasked with controlling the aircraft and sensor operators responsible for handling the payload: cameras, missiles, and remote sensors.

The data set draws from the material available in the public domain and includes firsthand accounts by former UAV operators in the form of monographs, book chapters, opinion editorials, and interviews given to newspaper outlets; we also draw our findings from interviews prepared for radio and television broadcast and first-person opinions presented in a number of documentaries, such as *5000 Feet Is the Best* (2011), *Drone* (2014), *Eye in the Sky* (2015), and *National Bird* (2016). The analysis follows American- and British-centric perspectives. Many operators who shared their experiences did so under the condition of anonymity.

A general observation is that almost two decades after the MQ-1 Predator flew its first armed mission,[18] Airmen who have told their stories can be counted with one hand.[19] Only three personal book-length perspectives have been offered on what it means to be a Predator pilot. To begin with, *Predator: The Remote-Control Air War over Iraq and Afghanistan: A Pilot's Story* (2010) is retired US Air Force lieutenant colonel Matt Martin's first-person account on fighting the Global War on Terror over Iraq and Afghanistan from the controls of an UAV.[20] Then, in *Hunter Killer: Inside America's Unmanned Air War* (2015),[21] retired US Air Force lieutenant colonel T. Mark McCurley, a veteran Predator pilot, recounts his career progression from a trainee to a commander of the Predator squadron that executed the Anwar al-Awlaki mission. Finally, in *Drone Warrior: An Elite Soldier's Inside Account of the Hunt for America's Most Dangerous Enemies*, Brett Velicovich offers an account of the complex nature of UAV operations from the perspective of a former member of Special Forces Operational Detachment-Delta.[22]

US Air Force photo by SSgt Carolyn Herrick

Figure 1. Local and international media outlets film a US Air Force sensor operator inside the 16th Training Squadron MQ-1/MQ-9 simulator at Holloman AFB, which served as a training base for crews of the MQ-1 Predator and the MQ-9 Reaper.

Notably, these important, comprehensive contributions on the subject appear to have gone largely unnoticed, enjoying only occasional reference in the research field and public discourse. Likewise, the only study to date focusing specifically on characterizing the psychological responses to killing from UAV operators and understanding their level of mental engagement with combat, conducted by US Air Force colonel Joseph Campo, has hardly received attention it deserves.[23] In contrast, the media's focus on the issue of psycho-emotional responses to remote killing has allowed some voices to become exceedingly vocal in the discourse on what it means to be a UAV operator. Brandon Bryant, a former UAV sensor operator diagnosed with Post-Traumatic Stress Disorder (PTSD) as a consequence of his duties in the UAV program, is a case in point.

Road Map

This paper analyses the dominant narratives created around UAV operators and the technology itself. It shows that the images created in public perception can be supported by reference to the firsthand testimonies as much as they can be opposed

by reference to the same testimonies. The firsthand testimonies shed light on many challenges in the human dimension of remote air operations that require adjustments on different levels, depending either on the inherent characteristics of technology or the operator's personal and professional background. Considering the rudimentary autonomous functions that UAVs are capable of, the success of human-machine teaming is largely dependent on the operator's engagement and his or her skills.

PlayStation Mentality

One of the narratives strongly rooted in popular and academic perception is that the remote fighting is more akin to playing a video game than real warfare. Philip Alston, UN special rapporteur on extrajudicial executions, infamously labeled the psychological act of distant killing as a "PlayStation mentality" suggesting that drone warfare stimulates the mental and emotional responses of playing a computer game:[24] "Young military personnel raised on a diet of video games now kill real people remotely using joysticks."[25] John Yoo, the Emanuel Heller Professor of Law at the University of California, Berkley, concurs, stating, "It is like a video game; it's like Call of Duty."[26] The concept of PlayStation mentality is used to promote the image of operators as detached from the battlefield and the deaths that their UAVs administer thereupon. In popular perception particularly, Airmen are regarded as "the unfeeling videogame warriors."[27]

Admittedly, computer games deserve a place in the discussion. As UAV operations have outpaced current training regimes, a shortage of qualified UAV pilots emerged. As a result, military organizations have turned to targeting gamers in their recruiting strategies, the reason being the skill set that video-game players can bring to the field—better hand-eye coordination, the ability to multitask, and others.[28] Moreover, the material easily accessible on the internet heavily influences the way Western societies tend to regard UAV technology. Numerous short video clips displaying UAV strikes (occasionally set to music) invite the viewer to think of killing via drones as less-than-serious and almost game-like to the operators.[29] Such clips also omit crucial details—they neither explain the background and context of the mission nor the extent of preparation required before the decision to lethally engage the target is relayed to the aircrew; they also generally fail to show the additional sensory inputs of voice, data, and cockpit displays that connect the aircrew to the troops they support on the ground. It is therefore, perhaps, not surprising that such media provide writers an easy avenue to declare that war has become a video game. Finally, modern-day society devotes a significant amount of personal time to playing video games, and aircrew members are not an exception. They too turn to video games as a form of relaxation, a way of decompressing from

their work.[30] For example, interviews with 111 MQ1/9 aircrew members from 13 different squadrons across the United States reveal that study participants averaged 2.4 hours of video gaming per week in their personal time.[31]

Notably, in the academic sphere, the relationship between the psychology of video gaming and operating an UAV is quietly but steadily growing as an area of inquiry. In a number of related studies, the scientific community has demonstrated that video-game players outperform traditional pilots in certain skill sets, such as being able to track more targets,[32] possessing improved psychomotor skills,[33] having faster reaction times,[34] and exhibiting enhanced spatial skills.[35] The comparison between the UAV ground control stations (GCS) and the traditional video-game environments has been justified on the basis that the player is trying to achieve certain goals (the aircraft mission) and interacts with the game via screens and inceptors that provide sufficient but limited information to allow this to happen (the aircraft sensor feed, displays, and controllers).[36] Research in the area of cognitive science and neuroscience has recently found that video-game players possess skills that make them capable of successfully navigating an UAV.[37] In comparison to general aviation pilots and professional pilots from airlines and the military, video gamers show the best awareness of the accuracy or inaccuracy of their decisions in relation to the increased levels of danger and risk and, overall, are less likely to exhibit overconfidence in decision judgments.[38]

Firsthand accounts show that for a number of operators the prospect of playing video games for living "all day" served as one of the leading motivators for joining the UAV program.[39] Some liken their time as trainees to "playing Dungeons & Dragons."[40] Looking at the next generation of warriors, "Taylor," an experienced UAV pilot charged with training the 19-year-old recruits, openly voices her concerns that, being extremely native to the world of first-person gaming, the younger generation of operators could be less sensitized to the gravity—the life and death nature—of this work.[41]

Still, the operators' objections to the popular image of a video-game warrior appear not less vocal, suggesting that a few visual similarities notwithstanding, the analogy between the UAV operators and video-game players has been extended beyond its legitimate reach. To begin with, the most-recent research emphasizes the discrepancy between video games and the sense of reality experienced when watching enemies die on the screen of the GCS. For example, while observing the MQ-9 Reaper crew shooting down enemy fighters from inside the GCS, Peter Lee reports to have suddenly experienced a strong, "putrid smell"—hints of "burnt flesh mixed with surgical disinfectant"—that nobody else was acknowledging but which Lee had experienced previously when caring for the wounded in Cyprus during the 2003 invasion of Iraq. Specialists in memory function explain such

occurrences as instances of olfactory memory, the capability of the human brain to recall odors in response to powerful events. In other words, the brain connected the visual image from the screen with a smell embedded in memory.[42]

Further, in the largest study available on the level of mental engagement among UAV operators in their daily combat activities, Joseph Campo concludes that none of 111 MQ-1/9 aircrew members consider operating an RPA (remotely piloted aircraft, a synonym for UAV) comparable to playing a computer game.[43] Every single interview participant, regardless of whether they were an 18Xer (i.e., aircrew with no prior manned-aircraft or combat deployment experience),[44] previously flew a fighter or bomber aircraft that launched from within the combat theater (A-10), or experienced a positive or negative psychological reaction to killing, was united in asserting that UAV combat operations do not resemble video gaming.[45] Other voices join in support of these findings:[46] "Well, people do not die in videogames. And you're not able to save people's lives in videogames. I cannot cause an aircraft to have a collision with another aircraft in a videogame. Flying RPAs is simply not a videogame."[47]

In agreement, a former F-16 pilot, US Air Force major Bryan Callahan, adds, "We're well aware that if you push that button somebody can go away. It's not a video game. You take it very seriously. It's by far nowhere near a video game."[48]

Other firsthand testimonies, however, are less radical in their reflection. For example, the protagonist in a short documentary titled *5000 Feet is the Best* accepts the comparison to video games in principle, yet adds a qualifier: "I guess Predator is similar to playing a video game, but playing the same video game four years straight every single day on the same level. One time I just watched the same house for a month straight—for at least eleven hours, every day, for a month."[49]

Matt Martin offers yet another qualifier, suggesting that part of the operator's experience rather resembles watching an infinite reality TV show: "With the Predator, as well as the media, I followed the mosque siege as it unfolded day by day, as captivated by the situation . . . as the rest of the world. It was almost like watching some reality TV program that went on endlessly. . .. I watched the entire drama play itself out in real time."[50]

Taken quantitatively, the available firsthand testimony suggests that those supporting the concept of PlayStation mentality are likely to be outnumbered by the opponents of the video-game analogy.[51] However, the ultimate relation of video gaming to UAV operations is yet to be fully understood and defined. The first and foremost step to better understanding the aircrew members and their relationship to the UAV technology requires at the minimum acknowledging the complex nature of their experiences to which the firsthand testimonies clearly point. Above all, the foregoing discussion demonstrates the danger of generalizing personal

experiences of operators, as some of them do not categorically exclude comparison with computer games. It is also striking that the discussion has been dominated by the gamer-versus-nongamer dichotomy, while other comparative samples, such as a radar-approach controller at an airport or the combined force air component commander have been mostly excluded from the debate on the subjective experiences of UAV operators.[52] Yet, in both these other professions, duties are performed in a dark room with numerous monitors, no exposure to the physiological pressures of flight, and an even greater potential for destructive capability than RPA pilots have: in the first case, the controller may be in charge of multiple airliners, each carrying hundreds of people; in the second, the officer is responsible for numerous missions, objectives, and air assets.[53] Last, but not least, some have also suggested that comparison to artists is more apposite to explain the essence of experience: being professionally trained to observe situations, record environments, and analyze images, artists are believed to be ideal recruits for flying UAV missions.[54]

Distance

Another narrative that has pervaded the popular and academic literature since early on focuses on the distance between the operators and the combat zones where the effects of their actions take place. Engaged in "the labor of surveillance and bureaucratized killing,"[55] Airmen are said to "administer" life and death with the push of a button from a GCS located thousands of miles away from the physical warzone.[56] By enabling emotional detachment and psychological disassociation from the consequences of targeting decisions, physical distance is believed to desensitize operators to the very act of killing.[57] Political activist Medea Benjamin captures this opinion quite succinctly: "When military operations are conducted through the filter of a far-away video camera, there is no possibility of making eye contact with the enemy and fully realizing the human cost of an attack."[58]

The arguments about the implications of distance and its potential to dehumanize one's enemy often draw upon US Army lieutenant colonel David Grossman's seminal work, *On Killing*, which examines the relationship created between soldiers when they confront one another on the battlefield and the emotional consequences of that encounter. Drawing on historical studies and the personal accounts of ex-combatants Grossman argues that "there is a direct relationship between the emphatic and physical proximity of the victim, and the resultant difficulty and trauma of the kill."[59] Fighting "eyeball to eyeball with the sweat and the emotions of combat"[60] renders the act of killing exceedingly more difficult when compared to the experience of a bomber pilot who, operating at a range where he is unable to perceive his enemy without using some form of mechanical

assistance, i.e., binoculars, radar, or remote TV camera,[61] may be "fascinated and satisfied with his work."[62] While intellectually the pilots undeniably grasp the horror of what they are doing, emotionally, the distance involved permitted them to deny it.[63] Most interestingly, Grossman concludes that in the years of research on the subject of killing in combat he could not identify "one single instance of individuals who have refused to kill the enemy under these circumstances, nor [has he] found a single instance of psychiatric trauma associated with this type of killing."[64]

With Grossman's study concluded before the development of armed UAVs it is questionable, however, to what extent it meaningfully applies to the experiences of the aircrew. Above all, several operators with prior manned-aircraft experience and prior combat deployments deny Grossman's findings. They point out that the manned-aircraft pilots are not psychologically disengaged when attacking the enemy and, importantly, insist that distance from their targets does little to desensitize them to the real-life consequences of their actions.[65] Ryan, who used to fly a B-52 bomber, explains: "Oh yeah, you still get buck fever; you know you're about to do some damage. The heart rate goes up."[66] Former F-16 pilot, US Air Force colonel D. Scott Brenton concurs, relating that, when the call comes for him to fire a missile and kill a militant, the hair on the back of his neck stands up just as it did when he used to line up targets in his F-16 fighter jet.[67] Another US F-16 pilot recalls, "Even though we were sitting in a box on the ground miles away from the action, I could feel my heart rate rising and my adrenaline start flowing when those friendlies took fire. It felt real and I did not think it was going to be like this."[68] With or without prior manned-aircraft experience in active warzones, UAV operators repeatedly describe undergoing combat sensations that are remarkably like those experienced by fighters operating on the frontlines: elevated heart rate, rising adrenaline, shaking hands, and increased respiration, leading to a heightened level of awareness and vigilance.[69]

It is therefore increasingly challenged in literature that distance involved in the UAV missions helps pilots to emotionally detach themselves from the act of killing.[70] The views expressed in support are unambiguous: "Distance does nothing to numb the emotional impact of taking a life."[71] "They are human beings, right? That is the bottom line, so it affects you to watch the impact of a kinetic strike. . .. Just because you are separated by technology does not mean you are separated emotionally."[72]

The account of the death of two children stricken down by a Predator missile is also far from a sense of carefree detachment: "Pilots and sensors congregated in solemn denial around the GCS screens, still in shock over what we have just witnessed another of the dirty little horrors of war that lost none of its impact

whether you were actually there or you viewed it all remote. Death observed was still *death*."[73]

Many other firsthand narratives provide examples demonstrating that distance hardly desensitizes pilots when it comes to engaging in remote combat.[74] They also emphasize the experience of closeness to the battlefield: "One of the biggest misconceptions surrounding the RPA community is that the aircraft allows us some distance from the killing, since we are thousands of miles away. The opposite is true. We are too close. We know too much, and when it is time to shoot, we can zoom in until our target fills the screen."[75]

Philosophers ascribe the phenomenon of simultaneously experiencing distance from and proximity to the battlefield to the unique features of UAVs. Even though designed to provide near complete physical isolation between combatants, the nature of technology is such that it ultimately "bring[s] war straight into a pilot's face."[76] Sophisticated electro-optical/infrared sensors and synthetic-aperture radar modes that enable the aircrew to locate and identify targets and to complete battle damage assessment after a strike, bridge geographical distance to an unprecedented extent.[77] Significantly, due to the lion's share of remote piloting consisting of aerial surveillance operations, i.e., an endless loop of scanning roads, circling compounds, tracking suspicious activity and similar, UAV operators have come to be regarded as and perceive of themselves as "ultimate voyeurs"[78] by means of technology that paradoxically magnifies a sense of closeness to the target.[79] One of the drone operators termed this phenomenon "cognitive combat intimacy,"[80] a relational attachment forged through close observation of combat events in high resolution.[81] Another operator, expressing similar sentiments,[82] explains:

> Flying an RPA, you start to understand people in other countries based on their day-to-day patterns of life. A person wakes up, they do this, they greet their friends this way, etc. You become immersed in their life. You feel like you're a part of what they're doing every single day. So, even if you're not emotionally engaged with those individuals, you become a little bit attached. I've learned about Afghan culture this way. You see their interactions. You're studying them. You see everything.[83]

Thus, in bridging geographical distance between the GCS and the area of hostilities, UAVs also enable "emphatic bridging" between the operator and the enemy. The long hours of aerial surveillance, watching targets go about their daily lives, getting dressed, doing household work, playing with their kids, are accompanied by active interpretation of what is seen on screen and heard in the headset. As a result, the opponent on the ground becomes re-humanized, refaced, and re-embodied,

making killing more difficult.[84] Cian Westmoreland, a former US Air Force technician who helped build a station in Afghanistan for relaying RPA data, illustrates how it becomes possible to form emotional bonds with targets: "You watch people day in, day out—you might even start to realize they're not bad people."[85] Similarly, Brandon Bryant reports that he found it particularly challenging to direct a shot at the target after seeing it engage with family. He felt that he was depriving children of their father.[86] "They were good daddies," he adds.[87]

Emphatic responses to remote killing prompts some commentators to portray aircrew members as "victims of drone warfare" who face psychological harm with physiological consequences.[88] Such claims find perhaps their most vividly illustrated support in *The Guardian* opinion editorial by the former US sensor operator Heather Linebaugh:

> I may not have been on the ground in Afghanistan, but I watched parts of the conflict in great detail on a screen for days on end. I know the feeling you experience when you see someone die. Horrifying barely covers it. And when you are exposed to it over and over again it becomes like a small video, embedded in your head, forever on repeat, causing psychological pain and suffering that many people will hopefully never experience.[89]

Conversely, in his seminal theoretical work on drone warfare, *Drone Theory*, French philosopher Grégoire Chamayou, expresses his skepticism toward the "media picture of empathetic drone operators suffering psychic trauma." In his view, "the attention drawn to soldiers' psychic wounds was in the past aimed at contesting their conscription by state violence, [while] nowadays it serves to bestow upon this unilateral form of violence and ethico-heroic aura that could otherwise not be produced."[90]

Notably, both claims find support in firsthand testimonies. Thus, cognitive combat intimacy[91] experienced by some is countered by the inclination of others to "compartmentalize" and focus on excelling in performing professional duties. Strong sentiments of excitement about the first opportunity to use live ordnance against the enemy are recalled to be followed by the determination to execute mission to the best of one's abilities: "I wanted the shot, my first, to be a good one."[92] A missile that has successfully engaged not only the initial target—a truck with a .50-caliber machine gun mounted in its bed—but also its driver, is presented in a style of television advertisement: "Poor bastard. . . . Call him a bonus. Truck and driver. Blue light special, Kmart shoppers. Two for the price of one."[93]

Operators' responses to the voyeuristic nature of UAV operations range from getting "immersed" in the adversary's life to preserving mental and cognitive separation from the target. Thus, Matt Martin confesses, "I was almost ashamed

to admit . . . the thrill I felt at the moment I prepared to squeeze the trigger."[94] When asked about feeling any sense of attachment to his opponent after extended hours of surveillance, another operator (using a pseudonym "Mike") replied, "Whether it gives me empathy or sympathy or just familiarity I'm not sure. We compartmentalize the job like anyone else."[95] Colonel Brenton, a Reaper pilot, emphasizes professional duty: "I feel no emotional attachment to the enemy. I have a duty, and I execute the duty."[96] Similarly, US Air Force major Vanessa Meyer's[97] account of targeting procedures shows the extent to which the awareness of professional obligation influences operators' cognitive and emotive responses to engaging the adversary: "When the decision had been made, and they saw that this was an enemy, a hostile person, a legal target that was worthy of being destroyed, I had no problem with taking the shot."[98]

The reference to the target as "worthy of being destroyed" deserves extra consideration. While the media and scholarly attention has largely focused on operators' emotional responses to incidentally engaging civilians (as part of collateral damage), what seems to have mostly escaped analysis is the "image of enemy" and its role in shaping emotional responses of pilots to pulling the trigger. Matt Martin's account in *Predator* demonstrates vividly the extent to which the image of the enemy—Abu Musab al-Zarqawi, an al-Qaeda ally—which follows as a red thread through the narrative, influences Martin's perception of his duties as an UAV pilot. Witnessing on his Predator's screen brutal atrocities committed by al-Zarqawi and his cohort against civilians, Martin's response is straightforward: "Nothing would have satisfied me more in my Air Force career than to be involved in taking down the mad butcher of Fallujah."[99] In other words, despite the determination to maintain professional distance between Airmen and their mission, once a target is an agent of malice perpetrating unspeakable atrocities against civilians while using the latter as reality TV props, the act of killing is likely to be conveyed in a language suggesting emotional disengagement.[100]

The selected sets of firsthand testimonies reveal a wide array of cognitive and psychological responses to remote warfighting. Some of the accounts presented challenge persuasively the assertion that distance protects pilots from emotional pressures associated with carrying out lethal military strikes.[101] Conversely, visual proximity to the area of active military operations enabled by UAV technology appears to play either little or no difference at all for military personnel inclined to compartmentalize and determined to focus on the fulfillment of their combat duties. Considering the wide diversity of experiences, it is striking that not only popular accounts but also academic work has insisted upon certain, rather black-and-white narratives. Even though the amount of firsthand testimonies remains limited, it demonstrates with sufficient clarity that generalization of personal

perceptions and experiences is fallacious. Those few in the academic community who investigated the issue carefully, suggest that the emotional impact of engaging in remote warfare remains both unclear and under-investigated.[102]

Campo, for example, has identified that aircrew with nearly identical backgrounds experienced different emotions to very similar events (263):

> I had pride and felt an accomplishment in preventing terrorists from harming American soldiers. After I killed somebody, I thought about it. But I see them as terrorists; so I'm ok with it.[103]

> I felt bad for him and his family. It's different now that I've taken human life.[104]

Moreover, the study showed that the same person may experience conflicting emotive responses to remote killing,[105] often, yet not always, displaying happiness for the mission success but remorse for the taking of human life:[106]

> I felt like a complete failure because we didn't kill all those enemy. JTAC [ground controller] called us later [via phone] and said our weapon helped them break contact [with enemy]. I felt much better.[107]

> On my first strike I was numb with adrenalin afterward . . . elated for a job well done. But the next day I became sad. I never doubted they needed to die, but it took me a couple days to recover.[108]

> A pilot was nearly in tears after his first strike, claiming the mission and errors made during the engagement placed a harsh reality of operations into his mind. But on his second strike, the pilot experienced a completely different set of positive emotions after successfully supporting a group of Marines engaged in a firefight with enemy personnel.[109]

The current stage of findings suggests that to better understand the relationship between the surveillance and fighting practices of UAV operators and the resultant psychological responses, more qualitative and quantitative empirical work should be conducted.[110] Most importantly, "without a comprehensive data set from which to compare MQ-1/9 aircrew to other combatants, we cannot state for certain that RPA aircrew are more or less mentally engaged and psychologically impacted than their manned-aircraft counterparts or the sniper who kills from distances that were considered blasphemous several centuries ago."[111]

Cowardly Button Pushers[112]

There is a widespread support for the view that UAV missions bear no risks for the operators.[113] While akin to long-range artillery or high-altitude bombing, UAVs enable distancing between the operators and warzone; however, the difference is that there remains an element of risk in each of the former activities: artillery gunners may themselves be shelled or killed (for example, in case of weapon's malfunctioning), and bombers remain vulnerable to air-defense systems. UAVs, on the contrary, have succeeded in removing the operators from the theater of operations entirely.[114] As New America Foundation strategist and senior fellow Peter Singer observes, "If you are fighting from a computer far from the front line, there is no real threat other than carpal tunnel syndrome."[115] There is also a criticism that by failing to take any risk in combat, this form of military pravctice exhibits cowardice and lacks the honor inherent to combat in which the soldiers on both sides can kill and be killed.[116] Most importantly, it has been argued that unlike more traditional forms of soldiering, the operators of UAVs have neither need for courage nor opportunity to develop or exercise it.[117]

Courage is commonly conceived of as the ability to face fear and overcome it. In the context of UAV missions, speaking of physical courage—for example, the "willingness to face fear of bodily discomfort, injury, and death"[118]—is argued to be out of place until such time that UAV operators become part of a conflict against technologically advanced adversary. By reference to the asymmetric nature of modern-day conflicts, the likelihood of facing opportunity to show physical courage is argued to be extremely low.[119] One must note, however, that such claims are based on an erroneous assumption that aircrew operate exclusively "in garrison," i.e., from the bases located in their home territory or the territory of their coalition partners. Yet, operators' testimonies offer several examples of deployment in the area of hostilities.[120] The claim that aircrew would have near to nil chances of showing physical courage would thus be yet another hasty generalization.

It has also been argued, however, that the definition of physical courage is built upon "an unreasonably truncated conceptualization of risk that fails adequately to capture the real and serious nonphysical risks" that aircrew members face.[121] As psychological trauma suffered by UAV operators can, in some cases, be as debilitating as physical injury, it is moral courage to face psychological injury that comes to the fore in the context of UAV missions. In other words, aircrew who realize that the risk of psychological trauma exists and nonetheless undertake the action required by the mission are argued to exhibit moral courage.[122]

With steadily growing research on UAV operators suffering from PTSD and experiencing other adverse mental health outcomes, claims that UAV technology desensitizes operators to the act of killing become increasingly more ungrounded.[123] It remains questionable, however, whether these findings allow us to conclude that, in principle, operating drones "requires significant courage."[124] Where operators suffer severe forms of psychological distress in reaction to the traumatic battlefield experience, it may serve as an indicator that they may have found themselves in situations where moral courage was required. Yet, an ultimate characterization of any combat action as morally courageous is impossible without considering circumstances of each individual scenario. Moreover, the gravity of psychological response required for such combat actions remains open to debate. With *psychological injury* being inherently open to extensive interpretation, it is unclear whether response as severe as PTSD diagnosis is the only acceptable criterion. Given that PTSD represents only the narrow end of a much broader spectrum of psychological effects that aircrew members risk to face when on mission, other adverse mental health responses should not be disqualified from consideration either. While a comprehensive analysis of this issue is not possible within the confines of the present article, more rigorous academic debate on the issue is certainly welcome.

It has also been argued that because UAV missions are recorded, commanders are likely to be exceedingly cautious about the nature of the commands they issue. As a result, aircrew are likely to have less need for moral courage to disobey illegal or immoral orders.[125] However, one does not need to investigate the nature of a particular command to see the room for aircrew to exercise moral courage. Campo, for example, has identified 22 remarkably similar case studies where aircrew reported that their personal intervention in a mission likely prevented unintended casualties. In each account, the aircrew were directed to strike a target, but something just "did not feel right" to them regarding the target identification, the surrounding area, or other aspects of the situation. In each scenario, the aircrew took active steps to understand the situation, develop their own mental model of the battlespace, and thereafter advise on a different course of action besides immediate weapons engagement via UAV.[126]

Peter Lee describes similar instances in his research. Thus, one of Lee's subjects, Josh, recalls an instance where an armed adult male emerged from a compound occupied by Taliban cadres as friendly forces approached. The Taliban fighters had been successfully engaging friendly forces from within the compound over the preceding several days, thus meeting the criteria needed for a strike. All the approvals and required authorizations were given. And yet, the Reaper pilot had some misgivings and insisted that the armed man under the crosshairs was not an

enemy fighter but most likely a farmer in the wrong place at the wrong time. The social and institutional pressure was immense. The joint terminal attack controller (JTAC) scolded the pilot over the radio for carelessly exposing troops on the ground to the risk of death. Nonetheless, the pilot refused to strike the man. "Trying to reassure the ground troops is not so easy, especially when you had just withheld a seemingly valid request for a shot. From the perspective of those on the ground waiting for a Taliban fighter to open fire at them was not a good tactic—but this was not a Taliban fighter."[127] Joe Chapa's commentary in the instance is unequivocal: "If this is not moral courage, then I do not know what is."[128]

These examples demonstrate that moral courage certainly has its place in remote warfare. It would therefore be wrong to argue that UAV operations cannot be courageous by design.

Robotic (Autonomous) Precision Weapons

The narrative to have perhaps acquired the most widespread allegiance in the literature on the subject is that UAVs constitute *robotic* or *autonomous* precision weapons that lower an operators' task load to the point where boredom negatively affects vigilance.[129] However, these claims are grounded on an erroneous understanding of both the technology and the nature of aircrew involvement in the overall operation of the system.

Autonomy

Even though a wide range of automated functions have been enabled, such as take-off and landing or loitering over a geographical area for many hours at a time, personnel monitoring UAV activity play a crucial role in the overall functioning of the system. Simply put, technology depends on aircrew's tactical and technical competence.[130] In contrast, it is generally believed that in a case of autonomous UAV the role of the human would be reduced to the preprogramming of the system, which then, once activated, can select and engage targets without further human intervention.[131] Notably, those who have operated MQ-1 and MQ-9 UAVs for many years put it unequivocally, "The technology controlling the Predator and Reaper is anything but robotic or autonomous"[132] but instead subject to "[t]he requirement for human guidance at every step of its operations."[133] By means of illustration, an overview of some of the challenges that aircrews had to grapple with at different points in time to get the aircraft under control demonstrates the vital role of the human operator in the UAV human-machine teaming.

1. **Adjustment to control settings** is the first of many challenges to be overcome. Pilots with prior manned-aircraft experience blamed engineers for not caring about human factors when designing the aircraft. A case in point would be the trigger located differently to the aircraft that a pilot used to fly previously: "[Y]ou're getting ready to fire a missile and then hit one of two buttons . . . but if you hit the wrong one, it was on the wrong side of the stick, you shut the engine down. So we put Velcro on that switch to avoid the problem."[134] Another example offered was a danger of committing a mistake as simple as typing an incorrect sequence on the keyboard (for example, M0-M1-M2 instead of M1-M2-M3) when initiating the process of shutting down the engine—a classic error that causes an aircraft crash, courtesy of the poorly designed off-the-shelf interface of the Predator cockpit.[135] Aircrew also had to work around new bugs in the systems that occasionally emerged after a manufacturer had run software updates or responded to "improvement" requests. For example, a space bar on the keyboard would act as a hot key, repeating the previous command. If a sensor operator armed the laser as his last command, then hitting the space bar would arm it again whether the operator intended this action or not.[136]
2. **Learning to land the aircraft** was identified as "the single most challenging aspect of learning to fly."[137] Being susceptible to adverse atmospheric conditions, such as storms and inclement weather, UAVs heavily depend on human to stay aloft.[138] Landing the aircraft, retired US Air Force lieutenant colonel T. Mark McCurley recounts feeling drops of sweat running down his back despite the arctic cold temperatures inside the GCS, because even the lowest level of carelessness when operating in adverse weather conditions, especially fighting turbulence, could make the aircraft soar or crash almost instantaneously.[139]
3. **Sustaining the data link** has been identified as another battle to be fought out on a daily basis.[140] The ability of aircrew to perform their job is squarely dependent on the surveillance imagery from synthetic-aperture radar and video cameras, distributed in real time via satellite communication links.[141] Learning to become caretakers for the datalinks that connected them to the aircraft they operated, continually required operators to mobilize both technical and environmental knowledge to compensate for the link's fragility.[142]
4. **Firing weapons** at moving targets presented, in the opinion of some, "an almost unsurmountable challenge" from a technical point of view, because of the two-second control delay inherent in the satellite link.[143] Others

maintain that, at the minimum, this task required advanced operating skills. For instance, the AGM-114 Hellfire missile, designed for helicopters, was not intended to be shot from an aircraft in motion. Firing this missile from the Predator, a light plane bouncing in air currents while in motion at all times, "was a huge challenge": "Release too early and the missile would fall short. Shoot too close and the missile might not see the target when armed. If I overshot, the errant missile could hit [a wrong object]. Precision was key."[144] The task of sensor operator to guide the missile to its target has been pictured as equally challenging; if the operator's hand twitched at the last instant, if he or she breathed wrong, the missile might go astray and take out the object nearby, "a house full of people next door or the group of old men smoking and joking down the block."[145]

5. **Communication** is no longer subordinate to the real work of flying due to the incessant participation in the media infrastructure underpinning UAV operations, in comparison to manned aircraft.[146] Requesting blocks of airspace from controllers, providing instructions to ground units for which they are providing air support, communicating with the rest of the aircrew, and receiving instructions from their own chain of command is a process that starts at the moment when pilots sit down at the aircraft controls and lasts till the end of their shift when they stand up and disconnect their headsets. Studies have found that one of the most difficult aspects of an UAV operator's job was the coordination of precise hand-eye tasks along with complex verbal tasks.[147] Indeed, Lieutenant Colonel McCurley recounts the difficulty of communicating with the JTAC through secure chat room during mission support. As messages came in streams, they had to be followed closely or vital information would be missed, being pushed off the screen too soon. Typing while flying effectively meant texting while behind the wheel of a vehicle.[148]
6. **Other challenges** are present as well. The nature and level of adjustment may depend on the pilot's professional background. For example, to a former Boeing E-3 Sentry (AWACS) pilot, flying a Predator was "harder than flying a traditional aircraft."[149] Without the usual feel of an airplane in flight, with no sound to indicate the speed and engine performance, with no feeling of the wings that could point to an impeding stall or malfunction, and devoid of the traditional sense beyond sight, he "had to abandon three thousand hours of experience in handling aircraft with traditional controls and relearn how to fly Predator." Other pilots too were "battling [their] years of flying experience to learn how to pilot" a

> UAV, with many pilots being under protest and possessing no intention of making a career in the UAV community.[150]

As first-person testimonies reveal, ensuring appropriate level of aircraft management is a challenging and, at times, daunting task. Nonetheless, the eagerness to perform well in one's job that shines through most of the testimonies proves that humans have been and remain involved and invested participants in the Predator and Reaper operations.

Precision Weapons

Regarding their performance on the battlefield, UAVs are frequently described as precise instruments of warfare, carrying out surgical strikes while minimizing risks to armed forces.[151] In vocal disagreement, opponents insist on the indiscriminate nature of UAVs due to the excessive civilian casualties associated with them.[152] There is neither scope within this paper to address the often highly contentious statistics of casualties suffered in conflicts where armed versions of Predator and Reaper have been deployed nor the need for such a conversation. What cannot be emphasized often enough is that no weapons system, including UAVs equipped with lethal payloads, is inherently precise or discriminate. Rather, any system can be used in a discriminate, or conversely, indiscriminate manner. Importantly, in comparison to most traditional manned aircraft, the use of UAVs permits for greater precision in targeting,[153] offering higher opportunities for compliance with such law of war requirements as distinction and proportionality.[154] This also holds true of more autonomous weapons. The employment of high-precision ordinance certainly plays an important role in this.

To an even greater part though, the enhanced precision ascribed to UAVs depends on the combined efforts of many people involved. Establishing, for example, situational awareness in preparation for an attack is the result of deliberate efforts of operators, mission intelligences coordinator, intelligence analysts, force structures on the ground, and the command authorities. Having access to high-resolution imagery of the same situation is only a starting point. Building and maintaining situational awareness is impossible without first interpreting and analyzing the visual content of the camera feed and subsequently negotiating the results of the analysis between the stakeholders involved.[155]

Bored Senseless for Hours

Some have argued that UAVs handle what humans cannot—G forces, speed, tedium, and even boredom.[156] The latter aspect is particularly contentions, however, with an argument made that UAVs lower aircrews' task load to the point where

boredom governs the operating activity.[157] Even though an essential skill in any military organization is the ability to hurry up and wait, reference to boredom resultant from constant drudgery of repetitive sorties factors prominently in UAV missions.[158] "I'm overpaid, underworked, and bored," comments one operator on his experience.[159] "[F]lying Operation Enduring Freedom could be almost as exciting as watching paint dry. Tonight was going to be a caffeine overload night."[160]

Some missions are likely to exert a stronger emotional response, particularly those missions that may require reliving the same day repeatedly, so that the tedium of following the same actions becomes mind numbing. McCurley describes

> an awful sixty days of trailing [the target] across the countryside. . .. For a total of sixty days, we watched the same thing over and over again … the mission wore on our nerves. There was no variety, no new targets, and no disruption of his [target's] routine. For the first time, I started to dread flying. I was becoming a zombie. It was like stamping and endless line of widgets at a factory. I knew before the chill of the GCS hit me what I'd see or do.[161]

Simultaneously, however, operators also report on how they learned to adjust: "Our missions were often boring, so we'd all become skilled at staying engaged."[162] Plaining hangman on the white boards mounted to the GCS walls or just talking about upbringing helped.[163] Others came up with little subterfuges to pass the long hours at the controls, including sneaking water and snacks into the GCS, despite regulations banning both; mending uniforms; and swapping off 20-minute naps with the pilot or sensor operator.[164] Brandon Bryant even admits to having mastered reading novels while simultaneously monitoring the seven screens of his station, glancing up every minute or two before returning to the page.[165] Finally, statements suggesting that boredom has no place in UAV missions are not infrequent either: "we had unlimited patience. We were always present over the war front, watching, waiting."[166]

Transition

Fighting war from the comfort of a GCS in familiar home environment is believed to significantly reduce, if not eliminate the stresses associated with deployment to war zones. Yet, every single firsthand testimony emphasizes, perhaps, one of the major challenges that UAV operators face—the constant transitioning between the home and combat-zone environments. Although the challenge of reconciling work and personal life is also manifest within troops returning from longer-term deployments,[167] experiences of UAV operators are more significantly compressed in time, and the readjustment recurs daily:[168]

> Each day was the same. Wake up, complete the morning routine, and start the long, forty-five-minute drive to work. En route, I changed my mental state to that of someone capable of killing another human being without thought, hesitation, or remorse. The return trip home was worse. I had to remove myself from the war. The easiest days were the ones when nothing happened.[169]

> Having our folks make that mental shift every day, driving into the gate and thinking, "All right, I've got my war face on, and I'm going to the fight."[170]

Thus, what had seemed to be a benefit of the job—fighting war from the safety of one's home state—has led to a new type of stress, including that of "perpetual deployment."[171] At times, juxtaposition with the banalities of day-to-day family life could not be greater:

> I am a parent governor for my local school and every year I volunteer to go away with the teaching staff and help the kids enjoy the great outdoors. It's only 3 days away but the kids get to abseil, canoe, pot-hole and do many other fun things. One year, I had a great time and thoroughly enjoyed the company of the children and the staff. Eighteen hours after I got back I was in work, watching a prisoner having his head cut off and being powerless to do anything about it. Oh how my life had changed—and not for the better—in such a short period of time![172]

The day-to-day disjuncture between home and work is, however, only one aspect of the multifaceted experience of transition. Lee, for example, concludes in his most-recent research that the mental transition between war and peace happens at the beginning and end of *every stint* in the GCS during the course of single shift.[173] Finally, there is also a constant transition between "hours and days of boredom" and "moments of stark terror," particularly when an order is issued to locate and engage a target:[174]

> Other times you might be supporting a convoy and the speed at which things can go from deadly boring to hair on fire is the blink of an eye. You can spend six or seven hours bored out of your mind sometimes, just flying round in circles looking at stuff: "Nothing to see here. Nothing to see here. Nothing to see here." And then something goes down and you have to react very quickly. And no I don't mean dive in start firing stuff off.[175]

While one should not underestimate the difficulties associated with waging war in shifts, reactions to the nature of perpetual deployment differ. For some, it

is a source of stress. In contrast, Major Callahan asserts that operators are sufficiently "good at compartmentalizing," being taught this skill early on and often. "You need to tuck those things away and put them where they belong. We're pretty good at it."[176]

Making Sense of Conflicting Claims

UAV technology has developed significantly since 7 October 2001, when the first-ever MQ-1 Predator combat sortie resulted in a successful strike on a vehicle belonging to personal guards of Mullah Omar—the Taliban leader in Afghanistan.[177] That sortie stands in marked contrast to the MQ-9 Reaper sorties of today. Unlike the Predator of 2001, which spent its operative years supporting land and special operations forces in pursuit of mission objectives, its successor, the MQ-9 Reaper, has now demonstrated its ability to achieve mission objectives as a true theater asset, executing strikes, close air support, and surveillance in a single mission.[178]

As argued by one of the present authors elsewhere, military personnel are likely to rely on and tolerate increasingly more sophisticated weapons systems only for so long as, and up to such point that, said technology allows it to exert influence on the concrete operating environment.[179] This finding is strongly supported by the firsthand testimonies of aircrew members. One can hardly find a first-person account that would not have emphasized or at least indicated the fact that it has been important for the UAV operators to evidence that their work makes impact on the battlefield.[180] Many of the accounts reveal a distinct sense of pride experienced by the operators and coming from the realization of contributing to the overall war effort.[181]

Conclusion

This article has sought to demonstrate that many of the frequently expressed criticisms about UAVs and their operators do not hold up well under more detailed scrutiny. While the caricature of video-game-minded operators void of emotion or understanding of their work certainly does not accurately portray UAV aircrew, the discussion above shows how widely perceptions of their role as UAV operators and the nature of engagement in professional duties may vary among aircrew members.

The first-person testimonies also suggest that the extent to which technology is likely to stimulate engagement with professional duties is open to question and much is likely to depend on the personality of each individual operator. Peter Lee, having spent an extended time with Reaper personnel, whose responses to

conducting remote operations ranged from apparently unaffected to significantly affected—with the majority somewhere in between—raises the question as to why some operators are able to fly missions for more than five years consecutively, compartmentalize, and focus on performing their duties, while others seem exhausted and experience mental health issues after two years or less on the job.[182] To summarize, while some of the prevailing narratives appear easier to challenge (PlayStation mentality and cowardly button pushers, for example), other aspects of the debate on the human dimension of remote warfare require further rigorous investigation and analysis.

It has been noted that UAVs are commonly perceived of as the beginning of a slippery slope to a machine takeover of warfare; as autonomous aircraft and (un) manned aircraft are likely to remain tools of air warfare for decades to come, it is important to focus the debate on how the machines will interact with and affect their operators.[183] Developing a better understanding of the nature and implications of interaction between currently used systems and their operators is essential to ensure that technology is developed in ways that will serve rather than negatively impact society.

While, at present, cognitive computing is not sufficiently robust to field truly autonomous weapons systems, militaries of the future will have even more sophisticated technology at their disposal. Success in the robotics revolution will not necessarily be won by the state that has the best technology or succeeds in developing such technology first. The true opportunity afforded by robotics and automation is how it can be best partnered with service members.[184] Now the core issues are known, the challenge will be designing the right human-machine balance to maximize the relative advantages of both service member and machine in a future fighting system.[185] JIPA

Notes

1. What in popular language is known as 'drones' has various designations throughout State governments, industry and academia, including remotely-piloted aircraft (RPA) or systems (RPS), unmanned aerial systems (UAS), unmanned aerial vehicles (UAVs), unmanned combat aerial vehicles (UCAVs), Intelligence, Surveillance and Reconnaissance (ISR) systems or simply unmanned aircraft. The preferred term in this paper is 'UAV'. However, where the context so requires, it is used interchangeably with other terms.

2. A UAV is not a 'weapon' in the technical sense, but a platform that carries weapons (e.g., AGM-114 Hellfire missiles).

3. George Nacouzi et al, *Assessment of the Proliferation of Certain Remotely Piloted Aircraft Systems: Response to Section 1276 of the National Defense Authorization Act for the Fiscal Year 2017* (Santa Monica: RAND Corporation, 2018) xiv.

4. Comprising both military and commercial UAV systems.

5. Nacouzi, *Assessment of the Proliferation*, 12.

6. Ibid., xii and 1.

7. By the end of 2017, a total of nine states had been documented as using armed UAVs for kinetic strike operations. *See* UN, Office for Disarmament Affairs, *The United Nations Disarmament Yearbook*, Volume 42 (Part II): 2017, 177; *see also* Peter Bergen, David Sterman, et al, "Who Has What: Countries with Armed Drones," *NewAmerica*, https://www.newamerica.org/in-depth/world-of-drones/3-who-has-what-countries-armed-drones/; and Austin Wyatt and Jai Galliott, "Closing the Capability Gap: ASEAN Military Modernization during the Dawn of Autonomous Weapon Systems," *Asian Security*, 2018, https://www.tandfonline.com/doi/full/10.1080/14799855.2018.1516639.

8. *See also* Peter Asaro, "The Labor of Surveillance and Bureaucratized Killing," in *Life in the Age of Drone Warfare,* ed. Lisa Parks and Caren Kaplan (Durham, NC: Duke University Press, 2017), 282, 288–89.

9. Matthew Power, "Confessions of a Drone Warrior," *GQ*, 23 October 2013, https://www.gq.com/story/drone-uav-pilot-assassination.

10. Brett Velicovich and Christopher S. Stewart, *Drone Warrior: An Elite Soldier's Inside Account of the Hunt for America's Most Dangerous Enemies* (New York: Harper Collins Publishers, 2017), ix.

11. *See*, for example, Chris Cole, Mary Dobbing, and Amy Hailwood, *Convenient Killing: Armed Drones and the "Playstation" Mentality* (Fellowship of Reconciliation: Oxford, 2010), https://dronewarsuk.files.wordpress.com/2010/10/conv-killing-final.pdf.

12. Laurie Calhoun, "The End of Military Virtue," *Peace Review: A Journal of Social Justice* 23, no. 3 (2013): 377, 382.

13. Alex Edney-Browne, "Embodiment and Affect in a Digital Age: Understanding Mental Illness among Military Drone Personnel," *Krisis: Journal for Contemporary Philosophy* 1 (2017): 18, 23.

14. Joe Chapa, "'Drone Ethics' and the Civil-Military Gap,'" *War on the Rocks*, 28 June 2017, https://warontherocks.com/2017/06/drone-ethics-and-the-civil-military-gap/.

15. Joe Chapa, "Remotely Piloted Aircraft and War in the Public Relations Domain," *Air & Space Power Journal* 31, no. 5 (September–October 2014): 29, 41.

16. Michelle Bentley, "Fetishised Data: Counterterrorism, Drone Warfare and Pilot Testimony," *Critical Studies on Terrorism* 11, no. 1 (2018): 88, 90.

17. Ibid.

18. October 2001, see Joe Chapa, "The Sunset of the Predator: Reflections on the End of an Era," *War on the Rocks,* 9 March 2018, https://warontherocks.com/2018/03/the-sunset-of-the-predator-reflections-on-the-end-of-an-era/.

19. Notably, the UAV community in the US Air Force has more pilot billets than any other aircraft in the service, see Oriana Pawlyk, "Drone Milestone: More RPA Jobs Than Any Other Pilot Position," *Military.com*, 8 March 2017, https://www.military.com/daily-news/2017/03/08/drone-milestone-more-rpa-jobs-any-other-pilot-position.html. The world's largest UAV training facility run by the U.S. Army at Fort Huachuca, has about 700 soldiers and marines training at a time, and some 3,000 drone operators and technicians graduate every year, *see* Hillary Mushkin,

"The Disposition of Drones," *Places Journal*, February 2018, https://placesjournal.org/article/the-disposition-of-drones/.

20. Matt J. Martin and Charles W. Sasser, *Predator: The Remote-Control Air War over Iraq and Afghanistan: A Pilot's Story* (Minneapolis: Zenith Press: 2010).

21. T. Mark McCurley and Kevin Maurer, *Hunter Killer: Inside America's Unmanned Air War* (New York: Dutton, 2015).

22. Velicovich and Stewart, *Drone Warrior*.

23. Joseph L. Campo, *From a Distance: The Psychology of Killing with Remotely Piloted Aircraft* (dissertation, Air University, 2015), https://apps.dtic.mil/dtic/tr/fulltext/u2/1031892.pdf.

24. United Nations General Assembly, "Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, Philip Alston," UN Doc. A/HRC/14/24/Add.6 (28 May 2010), para. 84.

25. Philip Alston and Hina Shamsi, "A Killer Above the Law," *The Guardian*, 8 February 2010, https://www.theguardian.com/commentisfree/2010/feb/08/afghanistan-drones-defence-killing.

26. John Yoo, quoted in Mark Bowden, "The Killing Machines: How to Think about Drones," *Atlantic*, September 2013, https://www.theatlantic.com/magazine/archive/2013/09/the-killing-machines-how-to-think-about-drones/309434. *See also* Michael Brooks, "Eyes in the Sky: Can You Play a Video Game? Then You Can Fly a Drone," *New Statesman* 141, no. 5110 (18 June 2012): 27–29.

27. See Edney-Browne, "Embodiment and Affect in a Digital Age," 18, 20.

28. "From Console to Trigger: How Pentagon 'Exploits' Video Game Culture to Wire Youth for War," *Democracy Now!*, 20 November 2015, https://www.democracynow.org/2015/11/20/from_console_to_trigger_how_pentagon. See also Joe Mellor, "Gamers Make Best Drone Pilots," *TLE*, 22 August 2017, https://www.thelondoneconomic.com/tech-auto/gamers-make-best-drone-pilots-says-new-research/22/08/. See also Tim Wright, "Do Gamers Make Better Drone Operators Than Pilots? Video Gamers' Psychology Might Be Better-Suited to Flying Drones," *Air&Space Magazine*, 29 August 2017, https://www.airspacemag.com/daily-planet/could-video-gamers-make-better-drone-pilots-180964653/.

29. Joseph L Campo, "Distance in War: The experience of MQ-1 and MQ-9 Aircrew," *Air & Space Power Journal* 27, no. 3 (2015): 4, 9.

30. Asaro, "The Labor of Surveillance", 282, 308.

31. Campo, *From a Distance*, vi.

32. Alan D. Castel, Jay Pratt, and Emily Drummond, "The Effects of Action Video Game Experience on the Time Course of Inhibition of Return and the Efficiency of Visual Search," *Acta Psychologica* 119 (2015): 217–230.

33. Jerry Griffith, Patricia Voloschin, et al, "Differences in Eye-Hand Motor Coordination of Video-Game Users and Non-Users", *Perceptual and Motor Skills* 57, no.1 (1983): 155-158.

34. Hiroki Yuji, "Computer Games and Information-Processing Skills," *Perceptual and Motor Skills* 83, no. 2 (1996): 643-647.

35. Michel Dorval and Michel Pepin, "Effect of Playing a Video Game on a Measure of Spatial Visualization," *Perceptual and Motor Skills* 62, no. 1 (1986): 159-162.

36. Jacqueline M Wheatcroft, et al., "Unmanned Aerial Systems (UAS) Operators' Accuracy and Confidence of Decisions: Professional Pilots or Video Game Players?" *Cogent Psychology* 4 (2017): 1, 6.

37. Ibid., 19.

38. Ibid.

39. Michael Haas, in "*Drone Wars: The Gamers Recruited to Kill*," *Guardian,* 2 February 2015, https://www.theguardian.com/news/video/2015/feb/02/drone-wars-gamers-recruited-kill-pakistan-video: "I thought it was the coolest damn thing in the world… play video games all day. . . . You never know who you are killing, because you never actually see a face."

40. Brandon Bryant, as reported by Power, "Confessions of a Drone Warrior".

41. "Taylor" is a 10-year veteran drone sensor operator and trainer interviewed under condition of anonymity, *see* David Somerstein, "Drone Operator Made Long-Distance War from Close to Home," *North Country Public Radio*, 9 December 2014, https://www.northcountrypublicradio.org/news/story/26852/20141209/drone-operator-made-long-distance-war-from-close-to-home-for-10-years.

42. Peter Lee, *Reaper Force: Inside Britain's Drone Wars* (London: John Blake, 2018), 65–66.

43. Campo, *From a Distance*, vi.

44. Campo, "Distance in War," 4, 6.

45. Ibid., 7. Campo's study offers a sample of responses:

"Watching this through a video is not equal to a video game. I'm not a child, this is not fiction.";

"Somebody is dead due to our actions. It's not a video game. People's lives are on the line.";

"It's nothing like a video game. Nobody gets hurt in video games. I hate that comparison.";

"It's not a video game. It's stressful, serious, complicated. Calling it a video game detracts from what we are doing.";

"People outside our community are not even worth my time in having this discussion.";

"I know it's not a video game. Civilians just don't understand. If I was playing a video game I could hit reset.";

"It's not a **** video game. Nothing in a video game is like this. There are real people on the ground."

46. Rob Blackhurst, "The Air Force Men Who Fly Drones in Afghanistan by Remote Control," *Telegraph*, 24 September 2012, https://www.telegraph.co.uk/news/uknews/defence/9552547/The-air-force-men-who-fly-drones-in-Afghanistan-by-remote-control.html.

47. Drone Pilot, "It Is War at a Very Intimate Level," interview by Daniel Rothenberg, Nellis Air Force Base, Nevada, in *Drone Wars: Transforming Conflict, Law, and Policy*, ed. Peter L. Bergen and Daniel Rothenberg (Cambridge, UK: Cambridge University Press, 2014), 114.

48. Marc Pitzke, "Interview with a Drone Pilot: 'It Is Not a Video Game'," *SpiegelOnline*, 12 March 2010, https://www.spiegel.de/international/world/interview-with-a-drone-pilot-it-is-not-a-video-game-a-682842.html.

49. Omer Fast, 4 June 2011, *5000 Feet is the Best* (Commonwealth Projects).

50. Martin and Sasser, *Predator,* 78 and 84.

51. Campo, "Distance in War," 10, also notes that "RPA aircrew . . . are so astounded by the absurdity of the topic that most choose to avoid it altogether."

52. *See* Chapa, "Remotely Piloted Aircraft and War in the Public Relations Domain," 37.

53. Ibid., 37–38.

54. Hillary Mushkin, "The Disposition of Drones".

55. See Asaro, "The Labor of Surveillance," 282, 284.

56. Ibid.

57. Lamber Royakkers and Rinie van Est, "The Cubicle Warrior: The Marionette of Digitalised Warfare," *Ethics and Information Technology* 12, n. 3 (2010): 289–96; Christian Enemark, "Drones, Risk, and Perpetual Force," *Ethics and International Affairs* 28, n. 3 (2014): 365, 375; Roger Clarke, "Understanding the Drone Epidemic," *Computer Law and Security Review* 30 no. 3 (2014): 230, 242; Kathleen E. Powers, *Killing at A Distance: A Construal Level Approach to the Psychology of Drone Operation* (San Francisco: American Political Science Association, 2015); and Medea Benjamin, *Drone Warfare: Killing by Remote Control* (New York: OR Books, 2012). Peter Singer, similarly, argued that drone crews are "disconnected" from the wars in which they conduct air operations, Peter W. Singer, *Wired for War* (New York: Penguin, 2009), 332.

58. Benjamin, *Drone Warfare*, 160.

59. Dave Grossman, *On Killing: The Psychological Cost of Learning to Kill in War and Society* (Boston: Back Bay Books, 1995), 97.

60. Ibid., 108.

61. Ibid., 108.

62. Ibid., 101.

63. Ibid., 102–03.

64. Ibid., 108.

65. *See also* Campo, *From a Distance,* v. Campo interviewed 111 MQ1/9 aircrew members from thirteen different squadrons across the United States who have employed weapons and killed via remote-combat operations. It concludes that MQ-1/9 aircrew are mentally engaged in combat despite the distances involved and are psychologically impacted by killing.

66. Elijah Solomon Hurwitz, "Drone Pilots: 'Overpaid, Underworked, and Bored'," *Mother Jones*, 13 June 2018, https://www.motherjones.com/politics/2013/06/drone-pilots-reaper-photo-essay/.

67. Elisabeth Bumiller, "A Day Job Waiting for a Kill Shot a World Away," *New York Times*, 29 July 2012, https://www.nytimes.com/2012/07/30/us/drone-pilots-waiting-for-a-kill-shot-7000-miles-away.html.

68. See Campo, "Distance in War," 9.

69. Denise Chow, "Drone Wars: Pilots Reveal Debilitating Stress Beyond Virtual Battlefield," *Live Science*, 5 November 2013, https://www.livescience.com/40959-military-drone-war-psychology.html; see also Campo, *From a Distance*, 117.

70. Edney-Browne, "Embodiment and Affect in a Digital Age," 18, 20; and Lee, *Reaper Force*.

71. Slim (operator), see Chow, "Drone Wars".

72. Drone Pilot, "It Is War at a Very Intimate Level," 114–16.

73. Martin and Sasser, *Predator*, 213.

74. For example, Steven, an UAV operator, comments:

"'[i]t's still weird taking another life … [d]istance [does] not lessen this feeling. 'Distance brings it through a screen'," *see* Eyal Press, "The Wounds of the Drone Warrior," *New York Times Magazine*, 13 June 2018, https://www.nytimes.com/2018/06/13/magazine/veterans-ptsd-drone-warrior-wounds.html. *See also* interview of former RAF Reaper pilot "Justin Thompson" (a pseudonym) by Chris Cole, *Drone Wars UK*, May 2017, https://dronewarsuk.files.wordpress.com/2017/05/justin-thompson-interview-transcript.pdf:

I don't recognise the notion of detachment that some people claim about UAV pilots. The idea that 'you are not there so you are not in the action'. I just don't recognise that from my experience. My mind-set was very much one of being there, and I was able to see so much of what I was

looking at, in so much detail that you develop an intimate and in-depth knowledge of what is going on around you'.

75. McCurley and Maurer, *Hunter Killer*, 135.

76. Bumiller, "A Day Job Waiting for a Kill Shot a World Away."

77. Nacouzi, *Assessment of the Proliferation*, 25.

78. Brandon Bryant, in in "*Drone Wars: The Gamers Recruited to Kill*," *Guardian,* 2 February 2015, https://www.theguardian.com/news/video/2015/feb/02/drone-wars-gamers-recruited-kill-pakistan-video.

79. Press, "The Wounds of the Drone Warrior."

80. A pilot interviewed by Daniel Rothenberg concurs: "Targeting with RPAs is more intimate. It is war at a very intimate level," see Drone Pilot, "It Is War at a Very Intimate Level," 115. *See also* Dave Blair and Karen House, "Avengers in Wrath: Moral Agency and Trauma Prevention for Remote Warriors," *Lawfare*, 12 November 2017, https://www.lawfareblog.com/avengers-wrath-moral-agency-and-trauma-prevention-remote-warriors.

81. See Press, "The Wounds of the Drone Warrior."

82. See, for example, Lee, *Reaper Force*, 170:

[W]e may watch 'Target A' for weeks, building up a pattern of life for the individual: know exactly what time he eats his meals; drives to the Mosque; or uses the ablutions – outdoors of course! This is all-important for the guys on the ground. However, what we also see is the individual interacting with his family – playing with his kids and helping his wife around the compound. When a strike goes in, we stay on station and see the reactions of the wife and kids when the body is brought to them. You see someone fall to the floor and sob so hard their body is convulsing. A conventional aircraft often doesn't have the endurance [in the air] to witness this.

Colonel William Tart: "We watch people for months. We see them playing with their dogs or doing their laundry. We know their patterns like we know our neighbors' patterns. We even go to their funerals," *see* Nicola Abe, "'Dreams in Infrared'," *Spiegel Online*, 14 December 2012, (Translated from the German by Christopher Sultan), https://www.spiegel.de/international/world/pain-continues-after-war-for-american-drone-pilot-a-872726-2.html.

McCurley and Maurer, *Hunter Killer*, 116: "There was an intimacy about following someone for months. We spent so much time with the family that I knew what the Captain's [target's] kids looked like and what roads they took to school."

Likewise, Elisabeth Bumillier reported in 2012 that a dozen pilots, sensor operators, and supporting intelligence analysts interviewed from three American military bases and flying missions in Afghanistan spoke of experiencing a certain level of intimacy they felt with Afghan family life that neither conventional pilots nor ground troops experience, *see* Bumiller, "A Day Job Waiting for a Kill Shot a World Away," *New York Time*, 29 July 2012.

83. Peter L. Bergen and Daniel Rothenberg, eds., *Drone Wars: Transforming Conflict, Law, and Policy* (New York: Cambridge University Press, 2015), 115; *see also* Lee, *Reaper Force*, 170.

84. Mark Coeckelberg, "Drones, Information Technology, and Distance: Mapping the Moral Epistemology of Remote Killing," *Ethics and Information Technology* 15 (2013): 87–98. *See also* Tyler Wall and Torin Monahan, "Surveillance and Violence from Afar: The Politics of Drones and Liminal Security-Scapes," *Theoretical Criminology* 15, no. 3 (2011): 239–54.

85. Cian Westmoreland, *see* Norma Costello, "Confessions of a Former US Air Force Drone Technician," *AlJazeera*, 13 April 2016, https://www.aljazeera.com/indepth/features/2016/04/confessions-air-force-drone-technician-afghanistan-160406114636155.html.

86. Abe, "Dreams in Infrared."
87. Ibid.
88. Edney-Browne, "Embodiment and Affect in a Digital Age," 18, 29.
89. Heather Linebaugh, "I Worked on the US Drone Program. The Public Should Know What Really Goes On," *Guardian*, 29 December 2013, https://www.theguardian.com/commentisfree/2013/dec/29/drones-us-military. *See also* Heather sharing her experience in the documentary *National Bird*; and Ed Pilkington, "Life as a Drone Operator: 'Ever Step on
Ants and Never Give It Another Thought?'," *Guardian*, 19 November 2015, https://www.theguardian.com/world/2015/nov/18/life-as-a-drone-pilot-creech-air-force-base-nevada.
90. *See* Gregoire Chamayou, *Drone Theory* (London: Penguin Books, 2015), at 109.
91. McCurley also speaks of "intimacy" in killing, *see* McCurley and Maurer, *Hunter Killer*, 134.
92. Martin and Sasser, *Predator*, 42.
93. Ibid., 43.
94. Ibid., 46.
95. Hurwitz, "Drone Pilots."
96. Bumiller, "A Day Job Waiting for a Kill Shot a World Away".
97. Using a pseudonym.
98. Abe, "Dreams in Infrared." *See also* Martin, *Predator*, 43–44: "The man was not *really* a human being. He was so far away and only a high-tech image on a computer screen. The moral aspects of it—that I was about to assassinate a fellow human being from ambush—didn't factor in. Not at the moment. Not yet."
99. Martin and Sasser, *Predator*, 299–300.
100. *See also* Blair and House, "Avengers in Wrath."
101. Quantitative and qualitative data collected by Campo show that 96 percent of the more than 100 RPA operators interviewed for the purposes of the study report psychological response in the emotional, cognitive or social domain, Campo, *From a Distance*, 295.
102. Chapa, "Drone Ethics"; and Campo, "Distance in War," 4.
103. Campo, *From a Distance*, 131.
104. Ibid.
105. Ibid., 132.
106. Ibid., 266.
107. Ibid., 131.
108. Ibid., 132.
109. Ibid., 133.
110. Coeckelberg, "Drones, Information Technology, and Distance," 97; and Campo, "Distance in War," 9–10.
111. Campo, "Distance in War," 8.
112. Abe, "Dreams in Infrared."
113. Paul W. Kahn, for example, an early proponent of this view, argues that remote warfare is "riskless", *see* Paul Kahn, "The Paradox of Riskless Warfare" *Yale Law School Legal Scholarship Repository* 1 no. 1 (2002): 1–8.
114. Robert J Sparrow, "War Without Virtue?," in *Killing by Remote Control: The Ethics of Unmanned Military,* ed. Bradley Strawser (New York: Oxford University Press, 2013), 88.

115. Peter W. Singer, "A Military Medal for Drone Strikes? Makes Sense," *Washington Post*, 15 February 2013, https://www.washingtonpost.com/opinions/a-military-medal-for-drone-strikes-makes-sense/2013/02/15/e90c0638-76e4-11e2-8f84-3e4b513b1a13_story.html?utm_term=.6f9c1b9d063b.

116. See Asaro, "The Labor of Surveillance," 282, 286.

117. *See*, for example, Sparrow, "War Without Virtue?," 88–89.

118. Ibid.

119. Robert Sparrow, "Martial and Moral Courage in Teleoperated Warfare: A Commentary on Kirkpatrick," *Journal of Military Ethics* 14 no. 3–4 (2015), 221.

120. *See* McCurley and Maurer, *Hunter Killer*, 186: "This was my first trip to Iraq. For most of the war, I watched from a GCS thousands of miles away. But now, I was actually in harm's way. I was on the ground and vulnerable to attack. It thrilled me." *See also* Jesse Kirkpatrick, "Reply to Sparrow: Martial Courage—or Merely Courage?," *Journal of Military Ethics* 14, no. 3–4 (2015), 228.

121. Jesse Kirkpatrick, "Drones and the Martial Virtue Courage," *Journal of Military Ethics* 14, no. 3–4 (2015), 209.

122. Ibid., 213.

123. *See*, for example, Wayne Chappellea, et al., "Combat and Operational Risk Factors for Post-Traumatic Stress Disorder Symptom Criteria among United States Air Force Remotely Piloted Aircraft 'Drone' Warfighters," *Journal of Anxiety Disorders* 62 (2019): 86–93; Wayne Chappelle, et al., "An Analysis of Post-Traumatic Stress Symptoms in United States Air Force Drone Operators," *Journal of Anxiety Disorders* 28, no. 5 (2014): 480–87; Cherie Armour and Jana Ross, "The Health and Well-Being of Military Drone Operators and Intelligence Analysts: A Systematic Review," *Military Psychology* 29, n. 2 (2017): 83–98; and Craig Bryan, et al., "Occupational Stressors, Burnout, and Predictors of Suicide Ideation among U.S. Air Force Remote Warriors," *Military Behavioral Health* 6, no.1 (2018): 3–12.

124. *See* Sparrow, "Martial and Moral Courage," 222, concluding that "now that these risks [of psychological trauma] are known, operating drones arguably requires significant courage."

125. Sparrow, "War Without Virtue?," 223.

126. Campo, "Distance in War," 6.

127. Lee, *Reaper Force*, 282–83.

128. Chapa, "The Sunset of the Predator."

129. *See* David Whetham, "Killer Drones: The Moral Ups and Downs," *RUSI Journal* 158, n. 3: (2013), 23: "drones are cold, calculating emotionless machines dispatched to eliminate all identified threats."

130. For example, Martin and Sasser, *Predator*, 218–19.

131. *See*, for example, Human Rights Watch, *Loosing Humanity: The Case Against Killer Robots* (The International Human Rights Clinic (IHRC), Harvard Law School, November 2012). *See also* summary of the study solicited by the US Army, "Automatic Target Recognition of Personnel and Vehicles from an Unmanned Aerial System Using Learning Algorithms," https://www.sbir.gov/sbirsearch/detail/1413823.

132. McCurley and Maurer, *Hunter Killer*, 340; and Martin and Sasser, *Predator*, 218–19.

133. Martin and Sasser, *Predator*, 218–19.

134. Lt Col Bruce H. Black in: James Fenton, "Retired Military Drone Operator Shares Experience of Remote Piloting," *Daily Times*, 25 September 2015, https://www.daily-times.com/

story/archives/2013/11/25/retired-military-drone-operator-shares-experience-remote-piloting/75984370/.

135. McCurley and Maurer, *Hunter Killer*, 213. *See also* study that found that one of the most commonly cited sources of stress for pilots stemmed from their frustration with human-machine interfaces of equipment and the design of the GCS, Joseph Ouma, Wayne Chappelle, and Amber Salinas "Facets of Occupational Burnout among U.S. Air Force Active Duty and National Guard/Reserve Mq-1 Predator and Mq-9 Reaper Operators," AFRL-SA-WP-TR-2011-0003, June 2011, file:///E:/Airmen%20and%20Autonomy_Sources/74.%20Ouma_2011_Operational%20Burnout.pdf, at 11. See also Asaro, "The Labor of Surveillance", 282, 295.

136. McCurley and Maurer, *Hunter Killer*, 213.

137. Ibid., 30.

138. *See* Martin and Sasser, *Predator*, 62–64 describing the risk of losing an aircraft to a cloud bank at high altitudes.

139. McCurley and Maurer, *Hunter Killer*, 30.

140. See Martin and Sasser, *Predator*, 43–44, 106–07, 209.

141. "Predator RQ-1/MQ-1/MQ-9 Reaper UAV," *Air Force Technology*, https://www.airforce-technology.com/projects/predator-uav/.

142. Martin and Sasser, *Predator*, 209. *See also* Marcel LaFlamme, "A Sky Full of Signal: Aviation Media in the Age of the Drone," *Media, Culture & Society* 40, n. 5 (2017), 697–99.

143. Martin and Sasser, *Predator*, 51.

144. McCurley and Maurer, *Hunter Killer*, 88.

145. Martin and Sasser, *Predator*, 53.

146. La Flamme, "A Sky Full of Signal," 692.

147. Asaro, "The Labor of Surveillance," 282, 303.

148. McCurley and Maurer, *Hunter Killer*, 95.

149. Ibid., 26–27.

150. Ibid., 27.

151. *See* Loren DeJonge Schulman, "Precision and Civilian Casualties: Policymakers Believe Drones Can Be Precise. That May Not Be Enough," *Just Security*, 2 August 2018, https://www.justsecurity.org/59909/precision-civilian-casualties-policymakers-drones-precise-enough/. *See also* Richard A. Muller, "Weapons of Precise Destruction," *MIT Technology Review*, 10 May 2002, https://www.technologyreview.com/s/401448/weapons-of-precise-destruction./

152. The most common anti-UAV argument is that UAVs kill a disproportionate number of innocent civilians. *See*, for example, Vivek Sehrawat, "Legal Status of Drones under LOAC and International Law," *Penn State Journal of Law & International Affairs* 5, no. 1 (2017), 164; and Rosa Brooks, "The Constitutional and Counterterrorism Implications of Targeted Killing. Testimony before the Senate Judiciary Subcommittee on the Constitution, Civil Rights, and Human Rights," 23 April 2013, https://scholarship.law.georgetown.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1114&context=cong). Available evidence also suggests, however, that UAV operations conducted by US forces cause fewer civilian casualties than most other common means of warfare, *see*, for example, Kenneth Anderson and Benjamin Wittes, "Three Deep Flaws in Two New Human-Rights Reports on U.S. Drone Strikes," *New Republic*, 25 October 2013, https://newrepublic.com/article/115329/amnesty-international-human-rights-watch-drone-reports-are-flawed.

153. Since operators are not concerned for their own safety, the possibility that the combined effects of tension, an unexpected occurrence, and a concern for personal life would lead to munition being fired when it should not, is significantly eliminated.

154. Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), opened for signature 8 June 1977, 1125 UNTS 3 (entered into force 7 December 1978) ('AP I'), Arts 48, 51 (4)(b), 51(4)(c) and 51(5)(b).

155. Asaro, "The Labor of Surveillance," 282, 299. Elements of this process will also be automated in the future, as per Jai Galliott and Jason Scholz J, 2019, "Artificial Intelligence in Weapons: The Moral Imperative for Minimally-Just Autonomy," *Air Force Journal of Indo-Pacific Affairs* 1, no. 2 (Winter 2018): 57–67, https://www.airuniversity.af.edu/Portals/10/JIPA/journals/Volume-01_Issue-2/04-Galliott-Scholz.pdf.

156. Alan W. Dowd, "Drone Wars: Risks and Warning," *Parametres* 42, no. 4 / 43, no. 1 (Winter-Spring 2013), 7.

157. *See* David Szondy, "MIT Investigating Ways to Combat Boredom in Drone Pilots," *New Atlas*, 19 November 2012, https://newatlas.com/uav-pilot-boredom-mit/25014/.

158. McCurley and Maurer, *Hunter Killer*, 124.

159. Hurwitz, 'Drone Pilots."

160. Martin and Sasser, *Predator*, 33.

161. McCurley and Maurer, *Hunter Killer*, 112–15.

162. Ibid., 109.

163. Ibid.

164. Power, "Confessions of a Drone Warrior."

165. Ibid.

166. Martin and Sasser, *Predator*, 29.

167. C. S Milliken, J. L. Auchterloine, and C. W. Hoge, "Longitudinal Assessment of Mental Health Problems among Active and Reserve Component Soldiers Returning from the Iraq War," *Jama* 298, no. 18 (2007): 2141–48.

168. *See* also Bentley, ""Fetishised Data," 88, 95.

169. McCurley and Maurer, *Hunter Killer*, 133–34.

170. Interview with Col James Cluff, *see* Christopher Drew and Dave Philipps, "As Stress Drives Off Drone Operators, Air Force Must Cut Flights," *New York Times*, 16 June 2015, https://www.nytimes.com/2015/06/17/us/as-stress-drives-off-drone-operators-air-force-must-cut-flights.html.

171. Ibid.

172. Simmo (Sensor Operator), in Lee, *Reaper Force*, at 266–67. *See also* Martin and Sasser, *Predator*, at 85: "it is like living in two places at the same time. Parallel universes."

173. Lee, *Reaper Force,* 39.

174. Interview with Lt Col Bruce H. Black, *see* Drew and Philipps, "As Stress Drives Off Drone Operators, Air Force Must Cut Flights."

175. Justin Thomson, see Chris Cole, *Drone Wars UK*, May 2017.

176. Pitzke, "Interview with a Drone Pilot."

177. Chapa, "The Sunset of the Predator."

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179. Jai Galliott, "The Soldier's Tolerance for Autonomous Systems," *Paladyn, Journal of Behavioral Robotics* 9, no. 1 (2018): 124–36; and Jai Galliott, "The Limits of Robotic Solutions to Human Challenges in the Land Domain," *Defence Studies* 17, no. 4 (2017): 327–45.

180. For example, Francis, Air Surveillance Operator, Air Force, https://airforce.defencejobs.gov.au/jobs/air-surveillance-operator: "Knowing I'm making an impact on the safety of the country is very rewarding."

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