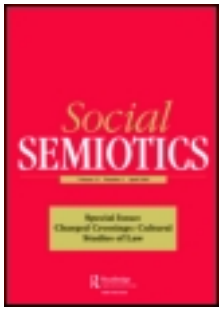

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The labor of surveillance and bureaucratized killing: new subjectivities of military drone operators

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As the military's armed surveillance drones have become the iconic weapon of the early twenty-first century, they have also introduced radical transformations in the traditional labor of those who operate them – the pilots, crew, analysts, and commanders. In so doing, these transformations have engendered new kinds of subjectivity, with new ways of experiencing the work of surveillance and killing. This paper investigates the nature of these new subjectivities, how they are constructed through new technologies that combine surveillance with remote agency, the bureaucratization of killing, and the psychological implications for operators. It examines how scientific management strategies from Taylorism to business process re-engineering have contributed to reconstituting the subjectivity of drone pilots and sensor operators through decomposing their labor practices and reconstituting them within professionalized careers and technological systems of supervision and management. It also looks at how the decisions to use lethal force are themselves decomposed and distributed among individuals designated as responsible agents within the chain-of-command. In light of the creation of these new subjectivities, the paper examines the psychological stress experienced by those who occupy these new subject positions through an examination of several recent military studies, journalistic accounts, and a recent short film based upon an interview with a drone pilot, Omer Fast's *5,000 Feet is the Best* (2011).

Keywords: drone; PTSD; UAV; post-traumatic stress; unmanned vehicle; remote-piloted; surveillance

I. Introduction

There has been a massive increase in the number of drone aircraft used by the US military over the past decade (Singer 2009; Sifton 2012). Along with this, there has been an expansion of the capabilities of drone technologies, and an increase in the sophistication and types of missions and tasks for which drones are used. Since 2001, the number of unmanned aerial vehicles (UAVs) in the US military grew from 70 to 7000. They were also armed for the first time with weapons, creating the new aircraft role of "hunter-killer" combining remote surveillance and lethal capabilities. This new role has largely been described as an economical and effective military tool for US operations in the Iraq and Afghanistan wars (DoD 2011), as well as the Libyan civil war, and as a politically expedient tool for the targeted killing of suspected terrorists in Pakistan, Yemen, and Somalia (Mayer 2009; Sifton 2012). The New America Foundation estimates that as many as 2600 people have been killed by drone

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strikes in Pakistan alone from their first use in 2004–2012 (New America Foundation 2012). Following a more rigorous methodology, the Bureau of Investigative Journalism estimates the total number of people killed by the 344 drone strikes so far in Pakistan as between 2562 and 3325, with as many as 881 of these being confirmed civilian deaths (Bureau of Investigative Journalism 2012). Casualties from drones strikes in Iraq and Afghanistan have not been tracked or analyzed by journalists, nor does the military release their own estimates, but it is likely to be significantly higher given the greater number of missions flown in those war zones.

The US military has strongly embraced the use of drones for a complicated set of reasons, alignments of interests, perceived military advantages, and internal policy and budgeting priorities. They are keenly interested in optimizing the effective use of drone technologies, which includes comprehensive reviews of missions, accidents, training programs, support infrastructure, operator performance and health, and other factors including public perceptions of the use of drones (DoD 2011). Because the operators of these drones are an essential element of the complex sociotechnical system that constitutes military drone operations, drone operators have been singled out as the subjects of a variety of research studies, especially studies of their psychophysical performances and visual-motor skills. This particular focus is due in part to perceived differences in the nature of "remote piloting" from "being in the plane" and the technological challenges of designing interfaces for such remote operations. Little, however, is known or discussed outside the military about the experiences of drone operators.

In this paper, I will be investigating the people who operate these drones as workers involved in the labor of surveillance and killing. In viewing drones as mobile platforms for surveillance, we can look to the operators of these systems, and the organization and management of their work, as constituting a particular form of the labor of surveillance. And insofar as these drones are armed with lethal weapons, we can also consider the relationships between this labor of surveillance and a unique form of the labor of killing. Of course there are many jobs in contemporary society that involve surveillance (in prisons, hospitals, offices, factories, shopping centers, and numerous other places). Yet the kind of surveillance offered by remote-controlled flying robotic cameras is new and rapidly growing (for concerns about domestic uses see Stanley and Crump 2011). There are also many jobs that involve killing (in slaughterhouses, medical research labs, the military, and others; Pachirat 2011). What makes drone operators particularly interesting as subjects is not only that their work combines surveillance and killing, but also that it sits at an intersection of multiple networks of power and technology and visibility and invisibility, and their work is a focal point for debates about the ethics of killing, the effectiveness of military strategies for achieving political goals, the cultural and political significance of lethal robotics, and public concerns over the further automation of surveillance and killing.

While the work of killing performed by drone operators bears a certain resemblance to other forms of killing labor, and shares with it certain cultural meanings, social stigmas, and psychological burdens, it is in many ways unique. Its uniqueness becomes most obvious when it is compared to other military jobs that also involve killing. Some of these involve killing at a great distance, such as the work of snipers, artillery gunners, aerial bombardiers, or ballistic missile operators. Among these, only snipers share the long and persistent voyeurism of drone operators, as

they peer through their rifle scopes at potential targets. Yet snipers differ in that they are typically a mile or less from their target; terrestrially bound; and in danger of being found out, tracked down, and killed. The sniper also feels the weather, smells the smells, and interacts with the local people in a way that a drone operator does not. The work of drone operators resembles in some ways the work of drawing up lists of aerial bombing targets. Since its invention in World War I, this work has been done in command posts by teams of workers who make their decisions based on maps and photos, intelligence reports of varying accuracy, consultations with lawyers and superior officers, collaborative decision processes, and often under intense time pressures. Yet these bombing planners neither ride along in the plane, nor are they called on to make judgments about events in real time and to change their targeting decisions based on live high-resolution video streams of potential targets.

In this paper, I will refer to "bureaucratized killing" as the particular form of labor that killing takes in the work of drone operators, and which is constituted by the kind of bureaucratic labor organization developed within the military to do things like generate lists of bombing targets, in combination with the more "hands-on" work of deciding when and where to pull the trigger that more closely resembles the killing work of the sniper. Because this form of killing involves self-conscious processes and efforts at rationalization (at both the individual and organizational levels to make the processes more efficient, more accurate, and more manageable) it is most appropriate to approach this subject as a form of killing that has an elaborate and intentional bureaucratized structure as well as a psychological dimension (Weber 1922). Consequent with the historical emergence of this rational bureaucratization has been an intense computerization and technocratic management of the human labor involved in this complex system of remote surveillance and killing. And thus, there are certain parallels to be drawn between the regimes of scientific expertise applied to understanding and managing workers and the technologies they use in factories and offices, and the kinds of scientific knowledge produced to understand the work of drone operators and the design of the technologies that they use.

At this point, I should also clarify what I mean by the term "subjectivity" and why the subjectivity of drone operators is an interesting topic for study. Within the sociological literature there has been a rich discussion of the ways in which social "subjects" are constructed by the social structures in which they find themselves (Weber 1922). More recent theories have identified the formation of subjectivities in the day-to-day activities and habits of individuals (Bourdieu 1977, 1984), and still others have shown how "subjects" have been constructed through systems of knowledge by experts, systems of data collection, and modes of discourse (Thompson 1966; Foucault 1975; Rose 1989, 1996; Taylor 1992; Miller 1993; Scott 1999). In terms of the subjectivities of workers and labor, there is a long historical evolution of systems of expertise that have been deployed to construct and manage the subjectivity of workers, and to respond to the emergent resistance to industrial and post-industrial modes of labor (Miller and Rose 1995; Asaro 2000). From Taylorism to mental hygiene, the quality of working life, business process re-engineering, and the worker-as-entrepreneur, these attempts to actively construct and shape the subjectivities of individual workers in particular ways have had real consequences on large-scale social formations of labor, and the subjective experience of workers, as well as the ways in which we conceive of and discuss their labor. This paper will extend this notion of "subjectivity" to drone operators, in order to better

understand how systematic knowledge has been deployed to constitute their subjectivity, as well as how it falls short yet still grasps for greater control over the labor of bureaucratized killing.

From the Taylorist vision of observing and decomposing the movements of workers to ethnographies of the workplace, much of the science of labor organization and management seeks to make the practices, skills, and knowledge of workers more visible. Running against, or at least across this trend, are cultural imperatives to render invisible certain distasteful forms of work. From the "dirty" work around sanitation or sex work, to dealing with the materiality of human illness and mortality, to the low prestige and wages assigned to various forms of undesirable work, there are both explicit and implicit means within every society to render some forms of work "visible" and others "invisible" (Star and Strauss 1999). These practices are tied up with cultural ideals and values, and are often a source of political tension among groups of people who are systematically excluded from desirable forms of work, or whose work is systematically hidden, unrecognized, undervalued, or underpaid. Killing work in particular has been traditionally set apart from other forms of work in many societies (Pachirat 2011). Indeed the formation of a separate social class of "warriors" to grapple with the ambivalent nature of socially sanctioned killing can be seen as a cultural expression and enforcement of the difference between killing work and other forms of work. From the execution chamber to the slaughterhouse to the battlefield, there are complicated politics surrounding the visibility and concealment of socially sanctioned forms of killing. As we will see below, even while the work of drone operators has become increasingly important to the military, and to national and international politics, the actual work of drone operators has remained largely hidden from public view and has been increasingly protected from the prying eyes of journalists and social scientists. And even within the military, drone warriors are subject to powerful social pressures not to reveal or discuss their work, or its psychological and emotional stresses.

Perhaps unsurprisingly for a technology that is often referred to as "unmanned," there has been relatively little public discussion about the people who operate these drone aircraft or the character of their work. What little public discussion there has been tends to be highly politically charged–not only because it deals with military service personnel, but because it is also perceived as expressing implicit judgments on the US policies that are being pursued using these technologies. While it may be both practically and theoretically impossible to completely understand what it is like to operate these drones in military missions with lethal consequences, I believe it is worthwhile to examine the social semiotics – the signs, social relations, and systems of knowledge that constitute them – that have emerged in various attempts to describe this work. That is, as drone technologies have taken on increasing military and political significance, a range of discourses have emerged which attempt, in various ways, to describe the operators of these drones. These discourses range from the subjective, seeking "what-it-is-like" to be a drone operator, to objective techniques seeking scientific understanding of the labor performed by drone operators and the means of improving or optimizing it. From a semiotic perspective, each of these discourses is trying, in its own way, to represent drone operators and their labor, and through these representations to influence how the technology is developed, and how it will be used to achieve military and political goals. This essay aims to provide a fresh perspective on the technological and political debates through

a more careful analysis of the ways in which these discourses are framing and constructing the subjectivities of drone operators.

To say that the discussion of drone technologies and their appropriate uses is politically charged would be an understatement. There is, in fact, a powerful and highly developed rhetoric within military and foreign policy circles concerning the use of remote-piloted aircraft and UAVs. This predominantly positive rhetoric touts the capabilities of the systems, primarily in the areas of intelligence, surveillance, and reconnaissance as well as their emerging role as weapons in close air support of ground forces, support of manned air missions, and their use by special forces in targeted killings (Singer 2009; DoD 2011).[1] This rhetoric often focuses on the ability of military robotics, among which drones are the most prominent, to perform work that is "dull, dirty, and dangerous" in ways that protect the operators and thus reduce the risk of conducting such operations. This is coupled with a positive economic cost–benefit analysis according to which these missions can be conducted at a greatly reduced cost when compared to manned aircraft and other technological alternatives, such as satellite imagery or special forces operations. More importantly, drone technologies are praised for their ability to protect their operators from the traditional threats of combat aviation by allowing them to conduct their work at a very great physical distance. I call these purported advantages collectively the "heroic myth" of drones, as it is a rhetorical framing that grants the technology itself agency in reducing costs and risks while increasing military capabilities. According to this myth, the technology serves to enhance the virtues of the pilots and operators and their ability to wage war ethically (see for example Strawser 2010).

There is also a critical rhetoric that expresses various concerns about the use of drone technologies, especially their use in delivering lethal weapons. One such criticism focuses on the distance between operators and the combat zones where their actions take place, arguing that this creates emotional distance, ethical detachment, and psychological dissociation from the consequences of those actions. Another criticism concerns the videogame-like nature of the interfaces these operators use and implies that they will increasingly treat real-world missions like videogames, blurring the distinctions between reality and fantasy, again raising the specters of distance, detachment and dissociation, or even worse a "trigger-happy" excitement like that experienced in fast-paced videogames. Closely related to this is the notion that by making the use of lethal force so easy, like the so-called "push-button" war, it will increase killing overall, and civilian casualties and accidents as well (Plotnik 2012). There is also a criticism that by failing to take any risk in face-to-face combat, or even being in an aircraft high above a combat zone, this form of military practice exhibits fear and cowardice or lacks the honor or justice of combat in which the soldiers from each side can both kill and be killed. Collectively, I call these purported dangers the "antiheroic myth" of drones, as it frames the technology as turning brave and virtuous warriors into unethical killers or even cowards.

Both mythologies, the heroic and the antiheroic, fail to capture the complexity of the reality presented by the use of drone technologies. In large part, this is because they both consider only the agency of the technology, and fail to consider how human subjectivity and agency is transformed in using the technology in ways that are more than mere reactions to the technology. Yet they both capture relevant concerns about the use of lethal military force and the development and acquisition of these technologies. By examining the kinds of subjectivities these technologies are

creating, this essay will illuminate the transformations in how drone operators understand themselves, as members of the warrior class in modern society and as laborers in a bureaucratized system of killing.

This essay will be largely concerned with the labor and psychological demands placed on those who are doing the surveillance, analyzing the images, piloting the drones, and making decisions to kill. There are numerous implications of these technologies for those who are observed as well, both obvious and subtle – from the constant fear of an imminent strike from the buzzing aircraft that circle overhead to the finger-pointing, rumors of tracking devices and killing of suspected informants in the aftermath of a strike (Wilson 2011). And while these implications are important to my larger research project, they will not be the focus of this essay. I will, however, consider the implications of the new subject positions of drone operators to the larger discourse about using weaponized drones and their role in risk management.

II. Methods

The obvious challenge to studying the subjectivity of drone operators is that of access. Not only is their work systematically hidden from public view, much of it is also protected by official security policies that prohibit drone operators from discussing the details of their work with anyone who does not have the proper security clearances. Informally, they are also strongly discouraged from discussing their work with journalists and academics, even in its general structure or outline. The only scientific researchers allowed access to these operators are either employed by the military or employed by the private contractors developing and evaluating the technologies. The few instances in which journalists or academics have been allowed to interview drone operators or visit their workplace have been limited to training centers or noncritical operations, and the names and identities of operators have been withheld or obscured. While this is claimed to be for the protection of the drone operators, it is curious that these sorts of restrictions do not apply to soldiers or pilots serving in Iraq and Afghanistan, many of whom are interviewed in the press, and who presumably have much more exposure to threats and harm. Regardless of the motives behind this policy, it presents a serious methodological challenge to gaining access to observe the work of drone operators. In the absence of such access, I will seek to elaborate this subjectivity through a variety of diverse and partial sources, each with its own limitations. The idea is to create a fuller picture of "what it is like" to be a drone operator by piecing together a mosaic from different sources and perspectives, each of which in its own way seeks to get at a particular dimension of drone subjectivity. More specifically, I will merge my analysis of a series of military medical reports, with a journalistic account of a military inquiry into a friendly-fire drone strike and a critical analysis of a short film that combines an interview with an actual drone operator with scripted scenes of an actor portraying a drone operator.

In considering the psychological and labor practices of drone operators, I will begin by critically examining a series of unclassified medical studies produced for the US Air Force and NATO between 2006 and 2011. There are limitations to any analysis of the labor practices of drone operators that rely solely on the investigations of military-sponsored researchers. In part the limitation lies in the methods used in these studies, but perhaps more importantly, it lies in the intentions that motivate the

research and frame its questions. Methodologically, these medical studies rely almost exclusively on the self-reporting of drone operators in confidential interviews. These reports are only confirmed and corroborated by comparison to the self-reports of other operators, and as such may contain systematic biases that must be taken into consideration. Foremost among these is the pressure on drone operators to hide any combat-related stress that they experience and avoid saying anything that might lead to a diagnosis of post-traumatic stress disorder (PTSD; Kime 2011), while military clinicians also report pressure not to diagnose PTSD (de Yoanna and Benjamin 2009). These issues will be considered and addressed in more depth below. A study based in direct observations of drone operators performing their jobs and applying ethnographic techniques in addition to self-reports and clinical measures of stress, would provide a much more detailed and informed analysis of the kinds of labor and the nature of the psychological stresses experienced by drone operators. Given that such observations or studies are not feasible, I will instead consider the available materials in greater depth, especially as to how they construct their representations of drone operators and the nature of the assumptions that they make.

I believe that these studies are best understood as examples of the continuation of various threads from the history of scientific labor management. The overarching intention of these military studies is to identify and remedy aspects of the involved labor practices that contribute to reducing or limiting the operational performance of drone operators. In their language and assumptions, they also bear the marks of earlier forms of scientific labor management. These studies, and many others like them, are in this sense a contemporary form of Taylorism, which seeks to identify inefficiencies in the labor production of drone operators and potentially to reconfigure their work practices to reduce or eliminate these inefficiencies. But current forms of scientific management, even in the military, go well beyond traditional Taylorism. The practices of labor management within the US military have been informed and shaped by the long history of the "humanization of work," such as the Mental Hygiene and Quality of Working Life movements (Miller and Rose 1995) according to which it became imperative to take into account the psychological health and well-being of workers in their jobs. This requires accounting for the stress induced directly by the day-to-day tasks of their jobs, but also accounting for how larger sociocultural contexts shape their long-term mental health and job satisfaction – everything from how interesting their work is to perceptions of autonomy, opportunities for promotion and advancement of career, and the indirect rewards of work apart from wages, such as social status and prestige. Thus these military studies also reveal aspects of the subjectivity that the military intends to impose upon drone operators in order to more efficiently manage their labor, including how workers manage the stresses of domestic life, families, and their careers beyond the cockpit of the drone and how these factors might influence their job performance.

To better understand "what it is like" to be a drone operator, I will augment my analysis of these military medical studies with a journalistic account of a classified report of a friendly-fire incident in which a drone fired a missile at two Americans in a case of mistaken identity. Because of its tragic results, an official inquiry was conducted and in the discussion of its details we can find more insights into the kind of work that drone operators do, the kinds of decisions they face, and the technologies and information resources they draw upon.

I will further augment my examination of these military-sponsored studies and journalistic accounts with a critical discussion of a recent short film, *5,000 Feet is the Best* (2011) by Omer Fast, which combines documentary interviews of a drone operator with scripted interviews of an actor portraying a drone operator and simulated representations of remote drone operations. I conclude with a reconsideration of how these new subjectivities relate to the heroic and antiheroic mythologies surrounding the use of drones for bureaucratized killing.

III. But, you are not a real pilot

The artist and film-maker Omer Fast's submission to the 2011 Venice Biennale was a 30 minute film, which played in the main gallery as a repeating loop. It can be viewed in a linear form on the Internet (http://www.gbagency.fr/#/en/42/Omer_Fast/). The film consists of a series of vignettes that repeat with variations. This includes a series of scripted scenes involving an actor, intercut with a documentary audio interview with a real drone operator (a sensor operator, judging from his descriptions of his work), accompanied by aerial footages of suburban Las Vegas, the Las Vegas Strip at night, a small New England town, and at one point the blurred face of the drone operator. The combined effect, and the juxtaposition of the scripted and documentary segments, serves to heighten the anxiety of the viewer and reinforce the narrative. Both the scripted and documentary segments offer insights and reflections on the new subjectivities of drone operators. For the purposes of this paper, I will accept the documentary portion of the film as being an actual and reliable report of at least one individual operator's description of his own experiences. But I wish to turn first to the scripted sequences, which I believe characterize some of the semiotic issues raised by remote warfare and drone operations.

In the scripted portion of the film we see two actors, one playing an interviewer, and the other playing a drone pilot, conducting an interview in a hotel room. The interview repeats three different times, beginning in nearly the same way, with the same opening questions each time, before each iteration takes a different direction.

(Repeated portion):

> Interviewer: "What's the difference between you and someone who sits in an airplane?"
> Pilot: "There's no difference between us, we do the same job."
> Interviewer: "But, you are not a real pilot."
> Pilot: "But so what, you are not a real journalist."
> Interviewer: "No, I mean . . ."
> Pilot: "I know what you mean."

From this point, the pilot gives a different response each time:
First iteration:

> Pilot: "You are talking about bodies and places, Euclidian shit. Like train drivers in the 1880s or something."

Second iteration:

> Pilot: "You are thinking about bodies and trenches, rats running around, mustard gas, World War One, right?"

Third iteration:

> Pilot: "You're thinking about Orville and Wilbur, Kitty Hawk, Top Gun, Red Baron, whatever."

Following each response, the pilot then tells a different fable-like story, which emphasizes a moral regarding the exchange and the nature of the subjectivity of drone pilots as it is alienated and parceled out into separate concepts and roles. What is interesting about this structure is that it unfolds multiple layers of the traditional conceptions of the subjectivity of pilots and three distinct dimensions along which it is problematized and challenged by the new subjectivity of drone pilots. In each case, the interviewer asks what difference there is between him and someone who sits in an airplane. The pilot insists there is no difference. They are the same, at least they are the same insofar as they "do the same job." In functional terms, viewed from the higher levels of command, or as functional "black-boxes" within a larger system, they get the same job done. Yet the medical studies we will review below indicate that this is not strictly true, and there are significant differences in the psychological stresses experienced by drone operators from that of traditional pilots. So what, then, is different in the subjective experience of doing that job? Each of the vignettes examines a different dimension of that subjectivity: physical location, personal safety, and social prestige.

The most obvious difference between a traditional pilot and a remote pilot is the physical location – "Euclidean shit" – about the physical presence, or absence, of the pilot's body in the airplane. In the first iteration, the pilot goes into a fable about someone fascinated with toy trains, who fills in for a train conductor who missed work and runs a real train for a day, flawlessly, before getting arrested. The implicit moral of the fable is that running a toy train is not so different from a real train and being "on board" is not so essential for developing the same set of skills and knowledge. Similarly, flying the drone is not so different from flying a manned aircraft. And thus, physical presence is nonessential to the job of piloting and can be alienated from it accordingly.

Another dimension is the subjective experience of battle and the threats it poses to one's personal safety, evoked by the images of World War One trenches, full of rats and mustard gas. In the second iteration, the pilot goes into a fable about a con-artist couple in Las Vegas in which the woman lures victims into their hotel room and removes their pants, then the male accomplice shows up in a jealous rage and throws the victim out and steals their wallet from their pants. The implied moral being even in a con, a simulation of jealousy and adultery, the embarrassment of being stuck in a hotel hallway without any pants is the same as if it is not a simulation. In other words, the psychological trauma is the same, even if the threat of direct bodily harm is missing. Virtual stress is still stress.

The third dimension is the romantic image of pilots and the social status and prestige associated with being a pilot, which is evoked by the aviation pioneers Orville and Wilbur Wright, the Hollywood heroes of the *Top Gun* movie, and the legendary Red Baron. For these pilots the embodied experience of flight, with all its risks, thrills, and romance, is integral to their heroic status. In the third iteration, the pilot describes a fable that recounts a family trip in an occupied territory, where the family is accidentally killed as collateral damage by a missile targeting some men who

are apparently planting a roadside bomb. The power of the fable is enhanced by the family being depicted as a typical suburban family in California that is occupied by what appears to be a Chinese occupational force. The implicit moral of this fable is to undermine the heroic conception of combat pilots. These pilots may seem romantic from afar, but their job is ultimately that of war: the labor of killing. Heroicism, bravery, and bravado have little to do with the day-to-day labor of bureaucratized killing. And indeed, there is much bravery in simply carrying on daily domestic life in a war zone. We will also see below how the perceived lack of prestige associated with being a drone operator, compared to a traditional pilot, led the US Air Force to give pilot wings to drone pilots.

In essence we see through these three vignettes the conceptual Taylorization of the traditional subjectivity of the pilot. Like Taylor carefully watching factory workers, breaking down their motions, and eliminating inessential movements, the drone technology allows us to strip away the properties of the drone operator and discover which are essential and which are not. According to this interpretation, having a physical presence in the airplane, or being subjected to threats of harm and the hardships of war, or having the prestige and glamour associated with the heroic myth of pilots, is not essential to the labor of surveillance and killing by drone, and can thus be alienated from it. We will see these themes return as issues of concern in the medical analysis of the psychological stress experienced by drone pilots.

IV. Stress and the cognitive demands on drone operators

There are various dimensions in which we might consider the "subjectivity" or "subject position" of drone operators as well as various discursive attempts to frame and articulate the subjectivity of drone operators. This is interesting insofar as it becomes relevant to social and political debates about the military effectiveness of drones, as well as the political, social, and moral implications of this form of warfare. One key area of interest and debate has focused on the psychological stress experienced by drone operators. With the increasing use of military drone aircraft, there have been numerous anecdotal reports of the increasing stress levels of their operators (Singer 2009). This additional stress has been attributed primarily to two factors. One factor is purported to be the psychological complexity of moving back and forth, on a daily basis, between remote combat operations in a foreign land and domestic and family life in the suburbs. The other factor was purported to be the intimate nature of the video surveillance that these operators conduct. That is, they could be surveying a potential target, such as a house or car, or tracking an individual, for more than eight hours a day, using high-resolution cameras that allow operators to see and recognize the personal details and daily activities of their potential targets. They are also required to continue to survey the target after attacking it and to confirm the deaths of the targets and any civilians nearby. This intimacy, it has been suggested (Singer 2009), puts greater emotional stress on drone operators than on individuals in other types of combat roles.

Recently, there have been several medical and occupational psychology studies commissioned by the Pentagon and NATO to investigate how and why the people who inhabit the new subject positions of drone operators are experiencing higher levels of stress than other combat duty assignments (Tvaryanas 2006; Chapelle et al. 2010; Ouma et al. 2011). Collectively, these scientific studies confirm some aspects of the

anecdotal reports and disconfirm others. For the most part they do find much higher levels of stress among drone operators than other civilian and military jobs. However, this stress was reported as primarily due to the massive increases in the use of these drones, placing greater labor demands on the relatively small number of pilots and analysts who must meet these demands. In this sense, the stress is perceived to be the predictable result of overwork, rather than the peculiarities of the subject position. Yet there are other significant and interesting details within these studies which warrant more careful scrutiny and analysis, and which point to the particular nature of the subject positions created by remote-controlled killing as being both unique and stressful. This essay will thus seek to contextualize these studies into a larger framework for understanding the changing nature of the professional and psychological subjectivity of combatants placed in the roles of remote-controlled killing using drones.

The increased use of drones and its incumbent psychological impact on operators and implications for military strategy and foreign policy together raise a complex series of questions about the ethics and values of warriors, the value and nature of military interventions in contemporary international relations, the use of lethal force by states, and the labor of killing as performed by combatants. In many ways, the ascendancy of the drone as the weapon of choice in the early twenty-first century is the result of its perceived ability to reduce the costs and risks, both political and economic, of collecting intelligence and using lethal force against remote and sparse enemies. As such it has come to be seen as the politically ideal military weapon for the "global war on terror." Much like precision-guided munitions (PGMs) a decade earlier, which greatly lowered the cost-per-target of bombing, drones greatly reduce the costs of aerial surveillance, close air support, and other high-demand military missions. And also like PGMs, they raise a moral question of the practical implications of reducing the costs of using lethal force – by reducing collateral damage and its political costs – as well as the economic cost of any given strike mission. The worry is that they enable increased use of lethal force in the form of more missions and longer targeting lists, ultimately leading to a greater overall lethal impact on both combatants and civilians, and may also influence the choice of strategies, or continued use of strategies, such as targeted killings. Drones lower the political costs of losing US personnel in two powerful ways. Primarily this lies in their ability to reduce the number of casualties, or the risk of such casualties, among pilots and sensor operators, thus reducing the political damage that such US casualties might cause. They also reduce the severity of any international crises stemming from the loss of the aircraft or capture of US forces. This was demonstrated clearly with Iran's recent capturing of a stealth US drone flying over its territory (Peterson and Faramarzi 2011), which might have been a much more severe crisis for the US had a pilot also been captured (as Francis Gary Powers was when his U2 spy plane crashed in the Soviet Union in 1960).

While drones are often referred to as "unmanned vehicles," this term obscures the reality of the human labor involved in operating these remotely piloted aircraft. The reality is that, like traditional manned aircraft, drones require extensive maintenance and a significant number of technical specialists to keep them in the air and flight ready, as well as to arm them with munitions or remove unused munitions after a mission. Often these ground crews are also responsible for launching and landing the aircraft from airfields close to the area of operation, passing control back and forth to the remote pilots in Nevada and other locations, mostly in the Continental US.

The military demands round-the-clock combat air patrols (CAPs), and there is always a demand for more. Often a single CAP will involve more than one crew change of drone operators (i.e., multiple labor shifts), as the Predator drone can fly for up to 18 hours. As soon as the drone lands, it is serviced, re-fueled, and re-armed by ground crews and then launched again. A single Predator drone requires 80 service personnel to keep it operational.

What the military considers the "operators" is a relatively small group of individuals who typically work in a ground control station (GCS) at a great distance from the drone's area of flight operation, and often great distance from the drone's launch and recovery airbase. These operator crews vary depending upon the particular type of drone and sometimes even by the mission. This essay is concerned primarily with the "large and lethal" drones (the MQ-1 Predator and MQ-9 Reaper). For these drones, the operator crews consist of three people, with separate roles but often with overlapping tasks and responsibilities. The "pilot" is an officer and is in command of the crew and in control of the aircraft, though much of the aircraft's actual maneuvering is done by automated systems. The "sensor operator" is not an officer, but rather is an enlisted service member, and is primarily in charge of the various cameras, radars, and sensors on board the aircraft, also with targeting the weapons and guiding missiles in-flight. The final member of the crew is the "mission intelligence coordinator," whose main duty is to communicate with intelligence analysts and various databases, to manage the communications of the other crew members, and to verify information and assist in understanding and interpreting the intelligence being gathered by the drone (Chapelle et al. 2010).

The tighter coupling of surveillance and the decisions to kill, as is found in weaponized drones, places new and unique cognitive demands upon drone operators. In traditional air operations, which largely separated the gathering of intelligence from the use of lethal force, operators were able to focus on specialized tasks and avoid the distractions and demands of related tasks. A target was a target, and a pilot's job was to correctly identify it and destroy it. Selecting the target was usually someone else's job. A drone pilot, in consultation with the sensor operator and mission intelligence coordinator, must now consider whether a potential target is in fact a correct and valid target. The drone operators are much more aware of the complexities of making that judgment and the uncertainties inherent in it, and they ultimately share in the responsibility for any mistakes made. An operator will usually need to get permission to use lethal force from a superior officer, but depending on the "rules of engagement," there may be circumstances in which they are authorized to make that determination themselves. Similarly, sensor operators are much more aware of the consequences of their intelligence estimations and judgments, as well as the operational pressures of the mission which, in traditional air operations, would have been much more remote. And while the role of the mission intelligence coordinator has not changed much in its description, the reality of its practice has gone from pre-flight briefings and occasional interactions during a combat mission to a real-time interaction with the pilot and sensor operator in a fast-paced multimedia and social media environment of intelligence gathering and killing.

As a result of this transformation, the traditional compartmentalization and separation of intelligence analysis and interpretation and target designation and killing has been broken down and reconfigured. This places greater psychological demands on all three roles because it becomes more difficult to shift responsibility to

others or to ignore the consequences of one's own decisions and actions. Surprisingly perhaps, the military studies found that this was not the largest source of stress among drone operators. Indeed, combat as a source of stress was not found to be significantly different for drone operators than for other combat-related military jobs, thus dispelling one of the speculated causes of anecdotal reports of high stress among drone operators. Yet, this is perhaps only a result of the assumptions made by these studies and bias in the self-reporting, within which operators find it easier and more acceptable to discuss the stresses of their careers, than to discuss the stresses of combat and killing. To better understand the new forms of labor experienced by drone operators, I turn now to an analysis of each role in turn.

A. Pilots

The demands of remote operating these drones have transformed each of the three crew roles relative to comparable roles in traditional manned aircraft. In a traditional crew, the aircraft itself would typically contain only a pilot, whose primary duty would be the constant hands-on control of the aircraft, along with operating and interpreting multiple radar and electronic warning systems, and visual identification tasks with the unassisted eye. They are also responsible for maintaining communication with a flight operations center and commanding officers who give authorization for the use of lethal force in strike missions, the sensor operator, and the mission intelligence coordinator. While the pilot in such traditional missions is in control of the aircraft and the release of the weapons, they rarely see their target for any length of time prior to releasing their weapons because they travel at high speeds and for relatively short periods of time. In most manned combat missions, the target is simply a set of geographic coordinates that were obtained from another source, such as soldiers on the ground, an aircraft or satellite up above, or the outcome of the analysis of multiple intelligence sources. They also rarely remain close to a target to observe the consequences of their attack, a task called "battle damage assessment" that is often given to unarmed surveillance aircraft or soldiers on the ground. This is very different from what ground-based drone pilots experience.

A recent study on drone operator burnout and stress lists 11 duties for drone pilots, covering a broad range of piloting, surveillance, targeting, and battle damage assessment tasks.[2] The study also notes that these tasks must be conducted in a very complex environment of mediating technologies:

> An additional challenge related to piloting the aircraft is the demand to attend to and interpret visual and auditory data from several sources to sustain situational and spatial awareness. Specifically, pilots are required to multitask and sustain vigilance to multiple forms of input from the aircraft, other aircrew, and military personnel (*e.g.*, ground forces). These multiple tasks include translating two-dimensional imagery into mental representations while performing numerical calculations for maneuvering the aircraft. It is important to note that despite the automated nature of the MQ-1 Predator and MQ-9 Reaper during certain phases of flight, the pilot must manually maneuver the aircraft for deployment of weapons, battle damage assessment, strategic positioning for surveillance and reconnaissance, avoiding bad weather, and controlling the aircraft during equipment or system failures. For effective and efficient operations, the pilot also works closely with the [sensor operator], mission intelligence coordinator, and other military personnel on the ground and in the air for identification and discrimination of

> targets and deployment of weapons. As can be surmised from above, the pilot must draw from an inherent set of cognitive aptitudes and personality traits to successfully master a wide knowledge and skill set. (Ouma et al. 2011)

While many of these tasks are similar to those of traditional pilots, much of the new complexity lies in working "closely with the sensor operator, mission intelligence coordinator, and other military personnel." This kind of interpersonal communication and coordination involves a variety of tasks that require the pilot to become a very sophisticated information processor. They must interpret a variety of pieces of information from various sources that are in turn mediated by various technologies and interfaces and must both issue and receive commands and conduct analyses and make complex decisions in consultation with a variety of other people. In short, the pilot must multitask to an extraordinary degree. This complexity will be explored in greater detail below, in discussing the role of the mission intelligence coordinator whose job is to coordinate the communications with personnel outside the drone crew.

In addition to the information and communication complexity of pilots, they also have significant visual-motor skill demands. These were examined in some detail in a 2006 study that assessed the medical review requirements on drone pilots.[3] On the basis of the complexity of the tasks they are required to do, they recommended that there should be a specialized set of medical standards for evaluating potential drone pilots. From a medical perspective, drone pilots fall somewhere between traditional pilots and traditional ground operations staff. This is not so surprising considering that "sudden incapacitation" of a drone pilot may not have the severe consequences that it might for a traditional pilot due to the many automatic flight controls, though it may still be more severe than the incapacitation of someone not in direct control of a massive piece of flying military hardware. But a closer reading of this medical study reveals that the "new demands" placed on pilots are primarily the number of distractions they are subject to, in the form of information and communication media. In particular, the study recommends a test that combines the traditional visual-motor skill task with a difficult cognitive task requiring shifts in attention and memory recall (simulating the complex and dynamic information environment of the drone cockpit). That is to say, while the overall visual-motor skills of drone pilots are less demanding than those of traditional pilots, there are significantly more cognitive information-processing demands placed on drone pilots, and the study recommends testing these skills in potential drone pilots.

It is also important to note that the stress studies found that one of the most significant sources of stress for pilots stemmed from their frustration and difficulty with the computer interfaces and the design of the GCS, or drone cockpit (Ouma et al. 2011). The poor design of user interfaces was also cited as a key factor contributing to "human errors" by an earlier comprehensive study of all the reported "mishaps" involving drones up to 2005 (Thompson et al. 2005). Mishaps are any accidents resulting in property damage in excess of $20,000 or human casualties. It is worth noting that this study found that approximately 80% of the mishaps attributed to human error were actually the result of poorly designed interfaces, insufficient training in the GCS systems, or both. There is a long tradition of ascribing the responsibility from the failures of poorly designed interfaces to the humans rather than the interfaces (Hutchins 1995; Woods and Shattuck 2000). We should similarly

recognize that when human errors are attributed to stress, a significant amount of that stress is in fact coming from the design of technology.

B. Sensor operators

Sensor operators are essentially sophisticated camera operators, though instead of a tripod, dolly, or crane, their cameras are mounted in articulated pods in the nose and belly of a drone. Their cameras provide very high-resolution video streams from the visible spectrum as well as thermal infrared imagery and sophisticated radio frequency imaging such as synthetic aperture radar. While the first generation of Predator drones carried a single cluster of instruments that could point in a single direction, newer models carry the Gorgon Stare system which can follow 12 independent ground locations each with its own video feed (from one of the sensors), and will soon carry the ARGUS system giving them the capability of following 30 independently controlled video streams from a single drone (Deptula 2009). In addition to controlling the sensors collecting these video streams, sensor operators are also involved in monitoring the content of those streams, interpreting them, and offering opinions to the pilot and mission intelligence officer as to their meaning.

According to the burnout and stress study, while the sensor operator need not fly the drone, they still require a set of sophisticated visual-motor and cognitive skills in order to accomplish their 11 duties.[4] These are primarily the cognitively demanding tasks of visual analysis and its contextualization with mission objectives and dynamic events:

> As can be surmised from [the list of sensor operator duties], this enlisted aircrew position requires a person to visually discriminate and synthesize various images and complex data on several electronic screens while maintaining heightened vigilance to numerous sources of visual and auditory information necessary for sustaining situational and spatial awareness. For example, the sensor operator must effectively attend to the electronic video to calibrate instruments and distances of specific ground objects while maintaining vigilance to visual and auditory input from aircrew and command. The sensor operator must also effectively communicate with aircrew to report the identification and discrimination of targets and to assist in the deployment of weapons. The sensor operator must also sustain visual targeting during and following the employment of weapons to ensure accuracy and damage assessment. This task includes visually observing the destruction of fixed and moving objects (such as buildings and cars), as well as the wounding and death of human combatants. Morever, the sensor operator must be attentive to several procedural checklists and processes with advanced computer systems while simultaneously translating two-dimensional information from video screens into four-dimensional mental imagery and spatial analyses. As mentioned above, sensor operators must carry out their duties in a confined environment with specific rules of engagement, tactics, and techniques. (Ouma et al. 2011)

It is clear from this that the job of the sensor operator is far more demanding and complicated than that of a traditional image analyst whose main responsibility is mostly limited to just one of these duties: "detecting, analyzing, and discriminating between valid and invalid targets using synthetic aperture radar, electro-optical, low-light, and infrared full-motion video imagery, and other active or passive tracking systems." The study also elaborates on the career trajectory of these sensor operators. Many of them began as imagery analysts who were primarily trained in interpreting

images. Needless to say, they find the new responsibilities involved in the direct control of the sensors, as well as the targeting decision processes and weapons guidance, much more demanding than their more traditional role in simply analyzing visual imagery, a task that they continue to perform as drone sensor operators.

C. Mission intelligence coordinators

While the researchers in the medical studies of burnout among drone operators conducted interviews with a significant number of mission intelligence coordinators, they do not describe the role or stresses of this crew member as explicitly as they do for pilots and sensor operators. It is thus more difficult to analyze just how their subjectivities have been shaped by the weaponization of drones and the bureaucratization of remote killing. However, it seems reasonable that they would experience most of the same forms of stress as other members of the drone crew, along with some forms specific to their specialized role. While their tasks often intersect and overlap with those of the pilot and sensor operator, the mission intelligence coordinator is the human interface between computer databases of intelligence information containing archived data and analyses, as well as coordinating with human intelligence analysts at remote locations in real-time through audio communications and text messaging.

Perhaps the best way to develop an understanding of what mission intelligence coordinators do and their subject position is to examine a journalistic account of a friendly-fire incident reported in the *Los Angeles Times* (Cloud 2011; Zucchino and Cloud 2011). Because this incident resulted in the accidental deaths of Marine Staff Sgt. Jeremy Smith and Navy Hospitalman Benjamin D. Rast, it was subject to significantly more scrutiny than most drone missions, including an official inquiry conducted by the Pentagon:

> The 381-page report, which has not been released, concludes that the Marine officers on the scene and the Air Force crew controlling the drone from half a world away were unaware that analysts watching the firefight unfold via live video at a third location had doubts about the targets' identity. The incident closely resembles another deadly mistake involving a Predator in early 2009. In that attack, at least 15 Afghan civilians were killed after a Predator crew mistook them for a group of Taliban preparing to attack a U.S. special forces unit. In that case, analysts located at Air Force Special Operations Command in Florida who were watching live battlefield video from the aircraft's high-altitude cameras also had doubts about the target. Their warnings that children were present were disregarded by the drone operator and by an Army captain, who authorized the airstrike. (Zucchino and Cloud 2011)

Within the team of drone operators, it is the role and responsibility of the mission intelligence coordinator to manage the complex streams of communications between the drone pilot, the sensor operator, superior officers, troops on the ground, and the host of analysts at other locations. In this friendly-fire case, these communications broke down with tragic consequences:

> Smith, Rast and another Marine had separated from the others and had taken cover behind a hedgerow, where they were firing on insurgents in a cluster of nearby buildings. Infrared cameras on the Predator overhead had picked up heat signatures of the three men and detected muzzle flashes as they fired their weapons at insurgents. Air Force

> analysts who were watching the live video in Terre Haute, Indiana, noted that the gunfire appeared aimed away from the other Marines, who were behind the three. The analysts reported that gunshots were "oriented to the west, away from friendly forces," the Pentagon report says. But the Predator pilot in Nevada and the Marine commanders on the ground "were never made aware" of the analysts' assessment. The analysts, who communicated with the Predator pilot via a written chat system, were never certain who Smith and Rast were. At one point, the analysts described the pair as "friendlies," but withdrew that characterization a few seconds later. They later wrote, "Unable to discern who personnel were." (Zucchino and Cloud 2011)

Unfortunately, in this case the communications were taking place directly between the pilot and the remote analysts, via a text-based chat application. In other words, the mission intelligence coordinator was failing to coordinate their communications. Contributing to this failure was the fact that the mission intelligence coordinator was a trainee, not yet fully skilled in performing the responsibilities of that role:

> Even a written assessment that the gunfire was aimed in the wrong direction was not passed along to the pilot by the Mission Intelligence Coordinator, a crew member responsible for relaying information to the pilot, the report says. The coordinator was a trainee supervised by a trainer. The report blames the attack on a fatal mix of poor communications, faulty assumptions and "a lack of overall common situational awareness." It recommends that a Marine lieutenant and two sergeants in Smith's platoon be "formally counseled" and suggests detailed reviews of battlefield procedures, but it said no one involved in the attack was "culpably negligent or derelict in their duties." "The chain of events . . . was initiated by the on-scene ground force commander's lack of overall situational awareness and inability to accurately communicate his friendly force disposition in relation to the enemy," the report said. The report, which was originally classified secret and written by a Marine colonel, criticizes the analysts for failing to make sure the pilot understood that the gunfire was aimed away from the Marines. The analysts "should have been more assertive," it says, and "should have persisted with their assessment until the crew either accepted or refuted the assessment." (Zucchino and Cloud 2011)

What becomes apparent in this breakdown of the system of people and technologies that constitute drone operations is the constructed nature of "situational awareness." This concept is often assumed to be something that simply exists, until it is missing or mistaken. Rather, situational awareness – the overall awareness of what is happening in a given situation – is the result of deliberate efforts, labor, and communications of a complex team. Moreover, the fact that the members of this team all have access to high-resolution imagery of the same situation does not mean that they all "see" the same thing. The visual content and interpretation of the visual scene is the product of analysis and negotiation among the team, as well as the context given by the situational awareness, which is itself constructed. And while the team may often come to different interpretations of the same situation, in most cases of failure such as this one, they mistakenly believed that they had come to the same conclusions or failed to communicate their alternate interpretations.

Through the absence of an effective mission intelligence coordinator in this case, we can begin to piece together the unique subject position that they are meant to occupy. As the only crew member not directly involved in controlling the drone or its surveillance sensors, their job is to operate the complex network of databases and communications with remotely located intelligence analysts who are viewing the same video streams as the drone crew. However, because they are physically located

within the GCS, they are in a superior position to assess the "situational awareness" of the drone crew, as well as to second guess and correct their interpretations and judgments. This is not the case for those remotely located analysts:

> The analysts in Indiana told investigators that they did not believe they should intervene to block an airstrike if U.S. troops were possibly in danger, even if they had doubts about the targets. When U.S. troops were under fire, the analysts told investigators, "they were to adopt a non-interference role, unless they observed an imminent violation" of the laws of war or women and children were present, the report said. The email chat system also contributed to the breakdown in communications, investigators said. After the Afghan civilians were mistakenly targeted in early 2009, the Air Force began installing equipment so drone video analysts could talk directly with drone pilots. The new equipment was not in place at the Indiana base in April, however. (Zucchino and Cloud 2011)

So we can see again that the technologies that deliver information and mediate communications are clearly also a source of "stress" for mission intelligence coordinators. Indeed, we can see more clearly how the "frustrations" with a technology can lead directly to systems failures that result in friendly and civilian deaths.

While the responsibilities of coordinating communication and information are not new, the kind of subjectivity engendered by new communication technologies certainly is. As mentioned in the discussion of pilots, a major source of stress for drone operators is the poor design of their interfaces. Here we see a Pentagon report explicitly blaming the design of the email chat system for contributing to the breakdown in communication that led to these mistaken deaths. Moreover, it is precisely the physical presence of the crew members, which is acknowledged to be so important to situational awareness that has been radically transformed here. That is to say, by removing the drone operators from the combat theater, they are now completely dependent upon the information provided by their mediating technologies in order to reach their decisions. So too are the analysts in Indiana, and this introduces yet another layer of remote mediation. In the context of such mediation, the interpretation and meaning of the images, the actions of soldiers, civilians and suspected insurgents, and indeed the very identification of a figure in the image as being in one of those categories is an active process that is shaped, influenced, and constituted by these mediated practices. What we find is a pilot in Nevada having an email chat with an imagery analyst in Indiana in order to select a target in Afghanistan on which they will fire a deadly laser-guided missile. Within such mediation, shared understanding can be difficult to achieve and misunderstandings and misinterpretations are likely to occur. The real work of the mission intelligence coordinator can thus be seen as coordinating these communications, keeping miscommunications in check, and correcting misunderstandings in real time.

Now that we have a clearer sense of the kinds of labor that drone operators perform, we now turn to a consideration of how their new subjectivities are related to their experience of stress and burnout.

V. Stress, burnout, and PTSD

It is important to note that the two latest military research reports into drone operator stress focus on what they call "burnout" (Chappelle et al. 2010; Ouma et al.

2011). The sub-clinical diagnosis of burnout has emerged as a psychological condition which lies between the normal "stress" of day-to-day military work and the clinical diagnosis of PTSD, which entails possible medical interventions, loss of duty assignment, discharge from the military, and the lifelong impacts of a mental health disorder including strained social relations, medical treatments and expenses, and limited employment opportunities in civilian life. As a medico-bureaucratic compromise, burnout can be severe enough to warrant managerial interventions, such as a temporary relief of duties (some time off to rest), without the grave professional and medical interventions that follow from PTSD (permanent loss of duty assignment or discharge from the military). That is, burnout is considered a normal reaction to high levels of stress, rather than a clinical or pathological reaction to such stress. It is perceived as being alleviated through a contextual change (removing the stress), rather than as a psychological condition that requires treatment of the patient (reforming their mental life). The escalation of stress from an occupation issue to a medical issue also carries many implications including dismissal from duty:

> According to USAF aeromedical policy, performing and operating in a high-demand, high-operational, and high-precision aviation-related position requires an optimal level of physical and psychological functioning. Although operators may be perceived to be generally healthy, if they suffer from a physical or psychological condition that has the potential to lead to degradation in the performance of their duties, then they are disqualified from such aviation-related operations. A general reason for holding operators to such high aeromedical standards is due to the perceived risk that subtle decrements in health can have on elevating the risk for an aviation mishap in which the threat to human life, national security, foreign relations, military operations, and loss of a multimillion dollar aircraft is often high. Although occupational burnout is not a categorical psychiatric diagnosis, it stands to reason that such a condition leads to performance degradation and, if untreated, may lead to significant emotional difficulties (e.g., anxiety and depression). (Ouma et al. 2011)

By framing burnout as an occupational category instead of a medical category, it allows superior officers and support staff to try to manage the severe stress of drone operators without losing their skilled labor, which is in such high demand.

It is here where we begin to see Taylorist aims of these studies most clearly. The concern of the studies is only indirectly about the stress and psychological health of drone operators. It is primarily concerned with attaining the "optimal level of physical and psychological functioning" of the drone operators as a means of maximizing their labor productivity and minimizing the risk of costly mishaps. In this sense, the health of the drone operators is not an end, but a means to an end. There is also a clear distinction being made between psychological stress that interferes with job performance (burnout) and psychological stress that interferes with daily life or mental health (PTSD).

In their study, the researchers found that much of the reported stress was due to operator's long work hours and the stresses of late-night shift work:

> Consistent with the results of the study by Chappelle et al. (2011), the most commonly cited stressors accentuating occupational stress for remote piloted aircraft operators included long hours (50+ hours a week), shift work, human-machine interface difficulties (ergonomic design of equipment and GCS), inefficiencies in computer-based

> input and command procedures, and difficulty juggling the demands of personal and domestic life with military operations. (Ouma et al. 2011)

Right after long hours, which might reasonably apply to any demanding form of labor, we find difficulties with the technology itself as the leading source of stress. This includes the human-machine interface and its effects on cognition, its ergonomic design and effects on the body, and frustration with the inefficiency of the rules and procedures governing the bureaucratized labor they perform, both those imposed by machines and those imposed by command procedures, protocols, and regulations. Earlier studies of medical review standards mentioned above noted that one of the most difficult aspects of drone operators' jobs was the coordination of precise hand-eye tasks along with complex verbal tasks (Biggerstaff et al. 1998). This may cause one to wonder which side of the human-machine interface is failing, or to blame one side (the human or the machine) as inadequate, as in the report on the friendly-fire incident above which blames the analysts for not speaking up while merely noting that their communications technologies were making that difficult.

After these issues, the reports focus in on the stresses that have long been the focus of post-Taylorist scientific labor management, such as the Quality of Working Life movement's focus on ideals of job satisfaction, home life, and career prospects (Miller and Rose 1995). In its latest incarnations, productivity is sought by treating each individual in an organization as an "entrepreneur" who is constantly striving to increase his own productivity and advance the goals for the organization, along with his own career. In this sense, these pilots have adopted the subjectivity of an entrepreneur within the military hierarchy. While military personnel have always sought promotions and better duty assignments, it is rather startling that these medical studies found one of the largest sources of occupational stress among drone operators coming not from combat, or even from the technical challenges of flying an aircraft and conducting operations halfway around the world, but from concerns over the future of their careers after this duty assignment. This was closely followed by the stresses of managing a family life alongside a military career. A possible reason for this focus is that the uncertainties of the "pilot as career entrepreneur" can be rectified through organizational change, while the relief of other stresses requires far more complex technological interventions and social changes.

The career stress issue is an important one for understanding the subjectivity of drone operators in the broader context of military service. The first generations of drone pilots were chosen from pilots already flying manned aircraft. These early pilots trained specifically for drones were initially trained in manned aircraft, but never given a manned flight duty. With the heavy demand for drone pilots, the US military is now training more of them than they are training pilots for all types of manned aircraft combined. They are also seeking to reduce the cost of that training by eliminating all manned aircraft flight training for future drone pilots. Thus, current trainees work primarily on simulators, and eventually real remote operated aircraft, but no longer fly a manned plane in the course of their training.

Within the military hierarchy, and especially within the US Air Force, being a pilot carries a special, prestigious status and identity. It is expensive to train pilots, and it is physically and mentally demanding to fly. Pilots are accordingly seen as a distinct and privileged class within the military. Indeed, only they are allowed to wear "flight wings" insignia on their uniform to designate them to all as pilots. They are

only allowed to wear these wings for as long as they are certified to fly. Within the Air Force, only officers can be pilots, whereas the other branches permit enlisted service members to fly some types of aircraft. Initially, the Air Force did not grant pilot status and wings insignia to drone pilots, at least not for their drone training and duties alone, because some drone pilots had wings before becoming drone operators, those who did not feel left out and perceived themselves as having a significantly lower status. In this way, the lack of wings and full pilot status for drone pilots led directly to one form of the "career stress" Ouma et al. discuss. That is to say for those who were manned aircraft pilots, moving to drones was seen as less prestigious than flying manned aircraft, and thus such an assignment meant a lowering of both current status and of future career prospects. It also made it more difficult for them to acquire the flight time needed to keep their wings and, with no clear career route to return to flying manned aircraft, it could mean the eventual loss of their status as pilots. For those who came in without pilot's wings, there was little or no hope of ever getting them, or the prestige and status associated with wearing them.

In 2009, the US Air Force recognized this problem and addressed it with two major changes. First, it moved to recognize the hidden labor of drone operators by changing the official term for drones, which at the time was UAVs, because "unmanned" seemed to imply that the systems were autonomous, or that they did not have a crew or pilot. Rather, they had a "remote" crew, and so the official term within the US Air Force is now "remote-piloted aircraft". It is interesting to note that the other service branches, in which pilot status is significant but not nearly as much so, have retained the term UAV. The US Air Force also moved to designate drone pilots with the status of full-fledged pilots by giving them wing insignia for their uniforms, though they issued them special wings that distinguish drone pilots from the pilots of manned aircraft. Whether these moves ultimately served to alleviate the career stress of drone pilots is uncertain, but it was certainly a powerful symbolic gesture towards trying to instill prestige status to their work.

The career stress of sensor operators was similar to that of drone pilots. Many of them were initially trained as imagery analysts. Because the job of drone sensor operator involves rather unique and demanding skills, it is both much more stressful than most imagery analysis jobs, but also lacks a clear career path toward advancement and promotion afterwards. That is, while most image analysts could move up into more specialized fields of analysis, or to more sophisticated image platforms like satellite imagery, drone sensor operators are not likely candidates for such assignments. And due to the high demand for people to do the drone work, and their enlisted status, they are unlikely to ever be promoted out of that duty assignment.

The other interesting feature of the studies is that they cite family and geographic location demands as additional sources of stress among drone operators. This is interesting because these are direct consequences of the remote operation of drones and also because this supports the popular perceptions that remote warfare is stressful because of the shift between war zone and home life. If drone operators were "in theater" or in the aircraft, they would be based in Iraq, Kuwait, or Afghanistan, and flying their missions from there. One of the perceived advantages of drones is that they do not require this, which is a huge cost savings. But this appears to come at a psychological price. While those who serve overseas often report being homesick and missing their families, and families report the stress of being without the service member, there are also psychological advantages to being physically present in the

war zone. First, one is much more aware of what it is like to live in that place, and its culture and society, both as a soldier and a civilian, which is difficult to understand from merely watching video streams. Moreover, there is a shared sense of hardship and camaraderie amongst soldiers serving together. This allows them to connect to one another emotionally, and relate to a common shared experience, which offers a form of psychic relief that does not require the intervention of medical professionals.

Drone operators, on the other hand, must return to their family lives each day. This can mean killing insurgents remotely at night, and taking the kids to school the next morning. On the one hand this means that all of the usual stresses of home life are added to the stresses of work and combat. On the other hand it means constantly moving back and forth between ordinary civilian life and military combat on a daily basis. For those who do experience combat stress, there is little chance that they would find comfort and shared understanding among the civilian population, and there are many powerful cultural forces within the military that would prevent them from discussing it with military colleagues (Kime 2011).

While it might be surprising that the demands of family and career should turn out to be more stressful than combat, we should take a moment to consider the biases inherent in the methodology of these studies. One must keep in mind that within military cultures there is an imperative to show strength and hide weakness, especially emotional weakness. There is also a taboo against acknowledging the stress of combat. A clinical diagnosis of PTSD, or even anxiety or depression, can result in the end of one's military duty assignment or career, a discharge, and the stigma can even follow one to the civilian world, with a lifelong medical condition and bills and limited civilian employability. As such, it is difficult for drone operators to discuss or admit to experiencing combat-related stress. Even under the conditions of these studies, which provided anonymity to the operators, they are not likely to discuss such experiences with a medical professional. In some cases, they may have even been in denial of the existence of these kinds of stresses in order to protect their military careers. The researchers admit as much in their study:

> Combat-related stressors were not rated as within the top sources of stress among participants. Such a finding is helpful for line commanders and medical personnel in understanding occupational stress. However, Chappelle et al. (2011) proposed that such a finding should also be interpreted cautiously when considering individual operators. It is likely that there are Predator/Reaper operators who perceive the deployment of weapons and exposure to live video feed of combat (*i.e.*, destruction/death of enemy combatants and ground forces) as highly stressful even though it is not reported as the main source of occupational stress. (Ouma et al. 2011)

The medical studies also claim that drone operators suffer from PTSD at similar rates as other combatants. This would mean that drone operators experience PTSD at a rate of about 4% to 17%, which is the estimated rate for units deployed to combat zones in the Iraq War (Richardson et al. 2010). Given that they interviewed over 400 drone operators, it is statistically highly unlikely that none of the subjects were actually experiencing, or would soon be diagnosed with, PTSD. It seems more likely that they were simply failing to report it to the researchers. It is likely that all forms of combat stress were significantly avoided or under-reported in the course of these studies, as they are more generally. To get a better understanding of the subjectivity of combat stress as experienced by drone operators, we must turn to other sources.

VI. *5,000 Feet is the Best*

I now want to return to Omer Fast's film, and particularly the sections that present a documentary-style interview with an actual drone operator. While the medical studies we have reviewed conducted such interviews, the reports did not reveal the content or texts of those interviews, but merely summarized them. The film thus offers a more detailed insight, if only into the experiences of a single operator. Based on his description of his work, the documentary interview in the film is with a sensor operator who describes what he has seen during his five years operating a Predator drone from an airbase in Nevada. In the course of the interview, he acknowledges that he currently suffers from PTSD and left his assignment and the military as a result of it. While his psychological condition may only be shared with a percentage of drone operators, his subjective experience of his work is certainly shared with most if not all drone operators, or at least with Predator sensor operators operating in Iraq and Afghanistan.

One aspect of that subjectivity is that of the voyeurism of surveillance from high above. The drone operator tells us:

> 5,000 feet is the best. We love it when we are sitting at 5,000 feet. You get more description, plus at 5,000 feet I can, I mean, I can tell you what kind of shoes you are wearing, from a mile away. I can tell what type of clothes they are wearing, if they have a beard, their hair color. We have very clear cameras on board. We have the IR infrared which we can switch to automatically. That will give us any heat signatures, or cold signatures. (Fast 2011)

He goes on to describe the strange world revealed by infrared thermal imaging, from the white blossoms where people sat down and then left, to the glowing beacons of lit cigarettes, to the disturbed soil around roadside bombs. In another vignette, the drone operator describes the stress of remote killing:

> Usually after you get done with work and getting back home you have about two hours before you have to get to sleep for work the next night. Usually I wouldn't get home until about 10 o'clock in morning, jump in the shower, get some breakfast, play some videogames for a few hours then try to sleep. A lot of guys over there, believe it or not, play videogames in their free time. I guess that's their way of unwinding. Mine were a lot of role-playing games, flight simulators. I guess Predator is similar to playing a videogame, but playing the same videogame 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 11 hours, everyday, for a month. But then you have your moments where there is a real emergency going on. And that is just where stress comes into play. How do I hit that truck? And in what way do I hit that truck? How far away should I put the missile to get the truck? So that way I don't have any damage to the surrounding buildings, or to the people or hurt anybody else's life that is around there. And sometimes I make mistakes. (Fast 2011)

In this account, we see some of the elements of the stresses of domestic life and also the cognitive and interpretative challenges that make the job stressful according to the medical studies. It also addresses a popular idea that drone operators are "playstation warriors" and treat their work like a videogame. While there are some similarities in terms of the interfaces and activities, drone operations are usually much more boring and tedious, with brief moments of incredible pressure and stress. And even for these operators, videogames can be a form of relaxation, a way of decompressing from their

work. Together this should make it clear that there is not a real danger that drone operators are confusing reality for a game or treating the work of killing lightly.

It is also clear that they take the responsibility of using lethal force seriously and fear making mistakes. Though in fact they do make mistakes and the killing of innocents is often cited as a source of PTSD more generally. The drone operator in the film goes on to describe some of the combat stress he experienced, and which is missing from the military medical studies:

> I mean, there are horror sides to working Predator. You see a lot of death. You know you see it all, as I said, I can tell you what kind of shoes you are wearing from a mile away, it is pretty clear about everything else that is happening. I mean there came a point after five years of doing this, that I just had to think about all this loss of life, that was a direct result of me. I mean, there was a lot of personal stuff, I had to go through, and a lot of chaplains I had to talk to just because of that. And the one factor that we talked about that helped me was that if it wasn't me who was doing it, then some new kid would be doing it, but worse. I was 26 at the time. A lot of people look at me like, how can you have PTSD if you weren't active in a war zone? Well, technically speaking every single day I was active in a war zone. I mean, I may not have been personally harmed but I was directly effecting people's lives over there every single day. There is stress that comes with that, with having to fire, with seeing some of the death, with seeing what is going on, having anxiety, looking back at a certain situation or incident over and over and over, you know, bad dreams, loss of sleep. You know, it's not like a videogame, I can't switch it off. It's always there. There was a lot of stress with that. They call it virtual stress. (Fast 2011)

The operator goes on to describe the first time he killed someone as a drone operator. He says that it did not impact him immediately the first time he targeted a Hellfire missile at some insurgents who had planted a roadside bomb, but soon after that the bad dreams started. We can see in this testimonial a hint of how combat stress is also being managed in the boundaries between medical psychological interventions and other forms of intervention. While the experiences described by the drone operator clearly constitute combat stress, and he is eventually diagnosed with PTSD, for many years his stress is managed in a variety of ways other than medical intervention or psychological treatment. For instance, rather than discuss his stress with a psychologist, which might lead to a diagnosis and stigma along with therapy, he gets most of his emotional and psychological counseling through a chaplain. While the military clergy are trained in dealing with combat stress, the methods and options are much more limited than what medical treatment can offer. While the chaplain provides the drone operator with a degree of counseling, he is able to do so without threatening the operator's job or military status. In the long run, however, this counseling is not sufficient to prevent the PTSD which later afflicts the operator.

VII. Conclusions

The work of remote surveillance and killing that drone operators perform is difficult, stressful, and exhausting. Even the US Air Force has recognized that this work deserves more respect than it often receives. Yet the military's strategy in studying this labor is primarily targeted at optimizing its efficiency. Towards this end, the US military has incorporated elements of the quality of working life movement, and its concerns about quality-of-life issues that effect job stress and performance, such as home life and satisfaction with geographic location, along with a conception of

self-directed entrepreneurialism within military careers as a motivational strategy within a professional, post-conscription military. The military is thus conscientious to develop career paths for striving drone operators, to avoid these jobs becoming stigmatized as a "dead-end," and to thereby reduce the career stress of the operators who perform them. Yet the remoteness of the work and the contextual shifts between combat zone and domestic life continue to present problems.

There are many complicated ethical issues raised by the management of combat stress. While there is a strong interest in managing the stress experienced by combatants, as well as PTSD, the technological means for doing this may impose a greater moral distance between those making combat decisions and further alienation from the lives of those directly affected by those decisions. Further analysis may be able to determine the extent to which many of the stresses of combat, and the bureaucratization of killing enacted through the use of drones, are in fact being redirected, projected, or simply denied by most drone operators. Until then, it is clear that drone technologies, and the integration of surveillance with remote killing, have created new and complex forms of human-machine subjectivity.

The mythologies surrounding the use of lethal drones, both the heroic and antiheroic, seem to fall short of the complexities of the new subjectivities of drone operators. The heroic myth that the technology enables more precise use of lethal force and thus engenders a more ethical form of warfare is only partly true. What is true is that the technology is capable of more deliberate and precise use of force than some other military technologies. But what is also true is that the technology presents far more potential targets and shapes the interpretations and determinations of targets in unpredictable ways. It also puts far greater cognitive, moral, and emotional burdens upon drone operators, who must engage with increasingly complicated information and communication systems in order to make these determinations. These burdens result in greater degrees of stress, burnout, and PTSD than other military and combat operations. In other words, the work of surveillance and killing, once compartmentalized, isolated, and hidden, is now becoming formalized, collaborative, and visible within the GCSs of lethal drones. Within this process of the bureaucratization of surveillance and killing, we find the mediating technologies as both enablers of these new bureaucratic forms of labor, and as themselves sources of stress and breakdown. This is in part because of poor design and misguided assumptions about how these systems will be used and the psychological needs of their users, but it is also because these technologies have exposed the hidden labor by failing to support it.

Some, but not all, aspects of the antiheroic myth are also borne out by these studies of drone operators. On the one hand, drone operators do not treat their job in the cavalier manner of a video game, but they do recognize the strong resemblance between the two. Many drone operators are often also videogame players in their free time, and readily acknowledge certain similarities in the technological interfaces of each. Yet the drone operators are very much aware of the reality of their actions, and the consequences it has on the lives and deaths of the people they watch via video streams from half a world away, as they bear witness to the violence of their own lethal decisions. What they are less aware of, but which is revealed by a careful analysis of the various accounts of their work surveyed in this paper, is that their work involves the active construction of interpretations. The bodies and actions in the video streams are not simply "given" as soldiers, civilians, and possible insurgents – they are actively constructed as such. And in the process of this

construction the technology plays both an enabling and mediating role. I use the term "mediating" here to indicate that it is a role of translation, not of truth or falsity directly, but of transformation and filtering. On the one hand there is the thermal imaging that provides a view into a mysterious and hidden world of relative temperatures. And thus these drone technologies offer a vision that contains more than the human alone could ever see. On the other hand we can see that the lived world of human experience, material practices, social interactions, and cultural meanings that they are observing are difficult to properly interpret and fully understand, and that even the highest resolution camera cannot resolve the uncertainties and misinterpretations. There is a limit to the fidelity that mediation itself can provide, insofar as it cannot provide genuine social participation and direct engagement. This applies not only to both surveillance and visuality, which is necessarily incomplete, but also to the limited forms of action and engagement that mediating technologies permit. While a soldier on the ground can use his or her hands to administer medical aid, or push a stalled car, as easily as they can hold a weapon, the drone operator can only observe and choose to kill or not to kill. Within this limited range of action, meaningful social interaction is fundamentally reduced to sorting the world into friends, enemies, and potential enemies, as no other categories can be meaningfully acted upon.

Notes

1. They are also being used extensively by the Central Intelligence Agency for targeted killings, but since these operations are almost completely opaque to public scrutiny and academic study, and outside the view of even the military studies upon which my research draws, I will have little to say about these admittedly significant operations.
2. According to Ouma et al. 2011:

> [T]he duties of the predator and reaper pilots include, but are not limited to: (1) performing preflight and in-flight mission planning activities in accordance with unified combatant command and theater rules of engagement; (2) understanding tactics, techniques, and procedures for friendly and enemy air order of battle assets; (3) receiving, interpreting, extracting, and disseminating relevant air tasking orders, airspace control orders, and special instructions information; (4) ensuring airframe and supporting GCS systems for controlling the aircraft are operating efficiently and effectively; (5) performing checklists and monitoring system controls during aircraft launch/recovery; (6) flying the aircraft en route to airspace of national interest while coordinating with air traffic control, ground forces, and other aircrew; (7) strategically maneuvering the aircraft to gather surveillance and reconnaissance data over targets and areas of interest; (8) maneuvering the aircraft into strategic positions for the deployment of weapons; (9) assisting in air navigation, [battle] integration, fire control planning, and determining effective weapons control and delivery tactics to achieve mission objectives; (10) receiving target briefs for weapons delivery and conducting battle damage assessments; as well as (11) assembling target information, locating forces, and determining hostile intentions and possible tactics. (Ouma et al. 2011)

3. According to Tvaryanas 2006:

> Issues considered by the panel in recommending medical standards included:
> (1) Physical demands of the present GCS task environment as well as consideration of how near term technological advances may modify that task environment (e.g., 3D synthetic vision, etc.).

> (2) Likelihood of a medical condition to predispose to sudden incapacitation.
> (3) Likelihood of a medical condition to cause undue distraction, potentially degrade performance, or both.
> The resulting recommended standards differed significantly from current medical standards for ground-based controller duty (e.g., AF148-123V3 Attachment 2) and for flying duty (AF148-123V3 Attachment 4). In particular, ground-based controller duty standards lacked sufficient rigor to address many of concerns associated with current Unmanned Aerial System (UAS) operations while flying duty standards were unnecessarily restrictive. Therefore, it is recommended a separate set of medical standards be created for career UAS pilots flying large or weaponized UASs. (Tvaryanas 2006)

4. According to Ouma et al. 2011:

> (1) conducting reconnaissance and surveillance of potential targets and areas of interest; (2) detecting, analyzing and discriminating between valid and invalid targets using SAR, electro-optical, low-light, and infrared full-motion video imagery, and other active or passive tracking systems; (3) assisting in air navigation, [battle] integration, fire control planning, and determining effective weapons control and delivery tactics to achieve overall mission objectives; (4) receiving target briefs (9-liners) for weapons delivery and conducting immediate first phase battle damage assessments for up-channel coordination and potential re-attack; (5) utilizing laser target marking systems to provide target identification and illumination for onboard weapons delivery and being responsible for terminal weapons guidance; (6) performing preflight and in-flight mission planning activities in accordance with unified combatant command and theater rules of engagement; (7) understanding [protocols] for friendly and enemy [battle] assets; (8) operating mission planning ancillary equipment to initialize information for download to airborne mission systems; (9) receiving, interpreting, extracting, and disseminating relevant [mission] information; (10) researching and studying target imagery, friendly and enemy orders of battle, and offensive and defensive capabilities from various sources; and, lastly (11) assembling target information, locating forces, and determining hostile intentions and possible tactics. (Ouma et al. 2011)

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