NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

PSYCHOLOGICAL EFFECTS ON UAV OPERATORS AND PROPOSED MITIGATION STRATEGIES TO COMBAT PTSD

by

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June 2021

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REPORT DOCUMENTATION PAGE	*Form Approved OMB No. 0704-0188*

1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** June 2021	**3. REPORT TYPE AND DATES COVERED** Master's thesis

4. TITLE AND SUBTITLE PSYCHOLOGICAL EFFECTS ON UAV OPERATORS AND PROPOSED MITIGATION STRATEGIES TO COMBAT PTSD	**5. FUNDING NUMBERS**
6. AUTHOR(S) Jamal M. Campbell	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000	**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A	**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.	**12b. DISTRIBUTION CODE** A

13. ABSTRACT (maximum 200 words)

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14. SUBJECT TERMS drone pilots, posttraumatic stress disorder, PTSD, psychological effects, unmanned aerial vehicle, UAV, remote aircraft pilot, RPA, UAV operator, psychology	**15. NUMBER OF PAGES** 81
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	**18. SECURITY CLASSIFICATION OF THIS PAGE**	**19. SECURITY CLASSIFICATION OF ABSTRACT**	**20. LIMITATION OF ABSTRACT**
Unclassified	Unclassified	Unclassified	UU

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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PSYCHOLOGICAL EFFECTS ON UAV OPERATORS AND PROPOSED MITIGATION STRATEGIES TO COMBAT PTSD

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

Although unmanned aerial vehicle (UAV) operators avoid exposure to many physical risks, they may be susceptible to the same psychological threats as conventional aircraft pilots in the field. This thesis analyzes case studies involving experiences of UAV operators suffering from posttraumatic stress disorder (PTSD) with the intent to increase understanding of the psychological threats associated with piloting unmanned systems. Mitigation strategies found to combat PTSD include workload restructure, strategic counseling, and cortisol testing and therapy. Psychological distress that leads to PTSD can be prevented when conditions are structured with containment, intervention, and prevention in mind. Following the Government Accountability Office recommendations and applying scientific treatments and therapies, the U.S. Armed Forces has a chance to gain traction against its operator shortages without causing psychological distress to its personnel.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACC	Air Combat Command
AFSOC	Air Force Special Operations Command
AIV	artificial intelligence vehicle
APA	American Psychiatric Association
CAP	combat air patrol
CISD	critical incident stress debriefing
CISM	critical incident stress management
DOD	Department of Defense
DSM	Diagnostic and Statistical Manual of Mental Disorders
GAO	Government Accountability Office
HPA	hypothalamic pituitary adrenal
ISR	intelligence, surveillance, and reconnaissance
MIC	mission intelligence coordinator
PAF	Project Air Force
PTSD	posttraumatic stress disorder
RPA	remotely pilot aircraft
SED	serious emotional disturbance
SO	sensors operator
SUD	substance abuse disorder
UAS	unmanned aerial system
UAV	unmanned aerial vehicle
WHO	World Health Organization

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ACKNOWLEDGMENTS

I want to give a shoutout to my advisors, Mr. Edward Fisher and Mr. Steve Iatrou, for believing in me along this process. Without their faith, patience, and understanding, none of this would not have been possible during the COVID-19 pandemic.

Thank you to all of the Information Sciences professors and lecturers who inspired me to pursue excellence during my time at the Naval Postgraduate School.

Lastly, I want to thank my dear friends, Ian, Sonya, and Tyshawnna, for motivating my writing and always keeping my spirits up.

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I. INTRODUCTION

The Department of Defense (DOD) has continued to pursue technological innovations in order to meet mission objectives and remain ready to respond to its enemies. As the U.S. military continues its development in technological warfare, conflicts across the world will see an increase in unmanned systems. In particular, drone warfare gives the advantage of flying lethal missions without endangering an airman's life inside the cockpit of the aircraft or a soldier on the ground. Unmanned aerial vehicle (UAV) and remotely pilot aircraft (RPA) pilots and operators control the drones from a station separate from the actual event. The benefits include fewer human casualties, low-risk training, cost-savings for training, and safer working conditions (Rosa et al., 2016).

Although the use of drones provides valuable benefits, there is a chance that UAV operators can suffer psychological effects as a result of their unmanned combat flights. Posttraumatic Stress Disorder (PTSD) is a common mental disorder military members who have experienced battle hardships in the field develop. The use of unmanned aerial vehicles may seem to decrease this possibility, but research reveals that UAV operators are not invulnerable to these psychological effects. While the operators are physically safe miles away, they are subjected to witnessing horrific events that unfold on their screens and the moral conflicts that result from this. They are also subjected to overwhelming workloads due to staffing shortages, which elevates the stress they already feel.

This thesis will discuss the psychological consequences of using unmanned systems and possible solutions and resolutions by evaluating the cause and effect that make UAV operators vulnerable to psychological distress that can lead to PTSD. This thesis will discuss PTSD, review case studies for understanding the need for research and intervention, and propose mitigation strategies to combat psychological disorders in UAV operators.

A. PROBLEM STATEMENT

The utilization of unmanned systems is essential to maintaining the strength and flexibility of the Department of Defense, especially concerning the use of unmanned aerial

vehicles (UAV). Although UAV operators avoid many risks conventional aircraft pilots are susceptible to, they can suffer the same psychological effects as the pilots in the field. The DOD seems to focus more on the physical benefits of piloting unmanned systems than the psychological after-effects experienced by UAV operators. This is a problem because the increase in the use of unmanned systems could also increase military members suffering from psychological disorders. To address this problem, this thesis will study the psychological consequences of using unmanned systems by looking at PTSD experienced by UAV operators, case studies, and proposed mitigation strategies to combat psychological disorders in UAV operators.

B. PURPOSE STATEMENT

This thesis aims to inform the psychological threat of piloting unmanned systems and propose mitigation strategies to combat PTSD as the DOD increases its use of unmanned systems. Failure to acknowledge and develop proactive strategies could increase psychological disorders among military members as the U.S. military expands its use of unmanned systems. This would have an effect on military members during and after their time in service. The motivation behind this study is to develop a greater understanding of the causes of psychological effects upon operators of unmanned systems and discover avenues that might help minimize those effects and develop better mitigation strategies.

C. RESEARCH DESIGN

This thesis will address the issue of PTSD among military UAV operators, which causes early retirement or discharge, and thus a shortage of operators to meet military demands. This thesis will address the research question of how the U.S. military can intervene with UAV/RPA operators to thwart PTSD by reviewing and evaluating PTSD attributes, case studies, and mitigation possibilities. Medical research concerning predisposition to and development of PTSD will be used to navigate possible resolutions, and historical methods of PTSD mitigation will be explored, analyzing the strengths, weaknesses, and overall effectiveness.

II. LITERATURE REVIEW

The literature review is divided in two sections. The first part reviews the definition, history, and attributes of posttraumatic stress disorder to gain insight as to its evolution and current cognizance. The second reviews the qualifications of Army and Air Force drone operators, what they do, the misconceptions they face, and the stress they experience and how it can lead to PTSD.

A. POSTTRAUMATIC STRESS DISORDER

1. Defining PTSD

Posttraumatic stress disorder (PTSD) is not a new phenomenon. PTSD is, in essence, a psychiatric disorder that results from a traumatic experience or witnessing a traumatic or life-threatening event from violent abuse, natural disasters, or military combat (Miao et al., 2018). PTSD is characterized by sufferers reliving traumatic events, avoiding people, places, or things that remind them of those traumatic events, and negative cognition and arousal changes (Miao et al., 2018). "It is reported that 44–72% of veterans suffer high levels of stress after returning to civilian life. Many returned veterans with PTSD show emotion regulation problems, including emotion identification, expression troubles and self-control issues" (Miao et al., 2018, p. 3).

a. Two Hundred Years of PTSD

While having a blanket definition for PTSD is useful, it is essential that researchers understand the history of the how this disorder has been perceived and what led to its modern term and diagnoses. It is important that clinicians understand the history of PTSD and that the relationship between tasks or incidents related to war can cause PTSD. Symptoms by soldiers, including those held in captivity, were not properly understood or classified (Chekroud et al., 2018). Terms such as nostalgia, soldier's heart, battle fatigue, and Vietnam syndrome all lead to the present-day term of PTSD (Chekroud et al., 2018). It is vital that clinicians acknowledge the past awareness of the disorder and collect the accumulated findings that led to modern research for treating PTSD (Chekroud et al.,

2018). It is possible that because of name changes, the research of PTSD is disjointed since approaches changed over time (Chekroud et al., 2018). “This pause in neurobiological research had clear consequences: placebo-controlled clinical trials of pharmacological PTSD treatments lagged behind other mental illnesses such as depression and schizophrenia” (Chekroud et al., 2018, p. 4).

In the 18th century, Austrian physician Josef Leopold described soldiers’ melancholy after a military trauma “nostalgia” because soldiers became homesick, depressed, could not sleep, and experienced anxiety (Friedman, 2019). In the 19th century, during the Civil War, Jacob Mendez Da Costa termed the symptoms of rapid pulse, anxiety, and trouble breathing by soldiers as “Soldier’s Heart” (Friedman, 2019). At the end of World War I, the term “shell shocked” described the behavior because of artillery explosions, although doctors discovered patients who never experienced artillery explosions also suffered from the disorder (Friedman, 2019). In World War II, the term changed to “battle fatigued” because doctors assumed the soldiers were merely exhausted; they assumed that soldiers could return to duty after a small rest (Friedman, 2019). By 1952, the American Psychiatric Association (APA) recorded “gross stress reaction” as the term for the afflictions of people who experienced traumatic events such as war or a natural disaster in the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*) (Friedman, 2019).

It was not until 1980 that the APA settled on the term posttraumatic stress disorder (PTSD) and listed it in the third edition of the *DSM*, and the World Health Organization listed it in the 10th version of the *International Statistical Classification of Diseases and Related Health Problems* (Skinner & Kaplick, 2017). At this time, the term began to cover the civilian population as research extended to include traumatic civilian events (Skinner & Kaplick, 2017). As evident in the historical track, PTSD can have various symptoms, some not as grave as others, but the description of each historical term relates to many modern PTSD symptoms. Not all veterans have the same symptoms, but many would easily fit into the category of nostalgia, soldier’s heart, battle fatigue, and Vietnam syndrome. It is important to understand that this is not something recent or new and should not be ignored or minimized.

2. Symptoms of PTSD

The fifth edition of the *DSM* lists up to 20 symptoms of PTSD within the four categories of "intrusion, active avoidance, negative alterations in cognitions and mood, and marked alterations in arousal and reactivity" (Miao et al., 2018, p. 1). However, WHO's International Classification of Diseases "simplified the symptoms into six under three clusters, including constant re-experiencing of the traumatic event, avoidance of traumatic reminders and a sense of threat" (Miao et al., 2018, p. 2). Veterans must have had symptoms for at least one month for a PTSD diagnosis, although symptoms can emerge at a later time (The National Institute of Mental Health [NIMH], 2020). A veteran must have at least "one re-experiencing symptom, one avoidance symptom, at least two arousal and reactivity symptoms, and at least two cognition and mood symptoms" (NIMH, 2020, p. 3).

With re-experiencing symptoms, words, objects, or situations can trigger flashbacks or reoccurring memories or dreams, causing the veterans to relive the trauma they experienced, including the physical symptoms (NIMH, 2020). Re-experiencing trauma can cause veterans to have distressing thoughts, such as suicide, and begin to display physical signs of stress (NIMH, 2020). Avoidance symptoms include avoiding places, events, or objects that remind the veteran of the traumatic event and refusing to think about it or talk about it. Arousal and reactivity symptoms can include easily startled, anxiety, difficulty concentrating, hardships with sleeping, irritability and outbursts, and performing destructive behavior (NIMH, 2020). Cognition and mood symptoms include difficulty remembering aspects of the traumatic event, thinking negative thoughts about themselves, or having feelings of blame (NIMH, 2020).

a. Secondary Symptoms

PTSD symptoms can create issues for veterans when discharged from the military. For example, veterans who have PTSD might be more prone to use drugs to diminish anxieties, sleeplessness or nightmares, experience flashbacks or fight-or-flight episodes, or become incarcerated from acting out of aggression. Government studies showed that veterans presenting with PTSD symptoms exhibited aggression and violent or criminal behavior after returning home from overseas deployments (Traynham et al., 2019).

Government statistics for 2011–2012 showed that 8% of local, state, and federal prison inmates consisted of veterans returning from overseas deployment (Traynham et al., 2019). Some veterans returning home after traumatic experiences feel like they are in a state of limbo or feel out of place because they were actively in combat, in dangerous zones, or dealing with dangerous people, and then are sent back to their civilian environment without a buffer period. Once back in a civilian environment, veterans who express aggressive behavior tends to externalize their feelings and lash out, leading to breaking the law. "Research has repeatedly shown links between psychopathy and a proclivity toward criminal behavior" (Traynham et al., 2019, p. 87).

A veteran suffering from even a mild case of PTSD might suffer from fight-or-flight, which is a natural response for people when they believe they are in danger. However, "people who have PTSD may feel stressed or frightened, even when they are not in danger" (NIMH, 2020, p. 2). Many veterans seek relief through self-aid and, subsequently, develop a substance use disorder (SUD). A study based on Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans showed that 82–93% of veterans who presented with PTSD also battled with a SUD (Teeters et al., 2017). SUD includes drinking, which is the more prevalent SUD, but prescription drugs such as opioids are rising (Teeters et al., 2017). SUD does not necessarily start with military exposure, especially since drinking is a social norm practiced by the general public, but traumatic military episodes increase the likelihood of it (Teeters et al., 2017).

Other stressors among PTSD sufferers with deep moral, ethical, or religious beliefs included shame and guilt from moral conflict because of actions during a war (Miao et al., 2018). These feelings could initiate suicidal thoughts or tendencies. Suicide rates are higher for people with PTSD than the general population, citing that depression and anger increase the severity of cognitive-emotional factors McKinney et al., (2017). That includes veteran suicide. "Approximately 17 U.S. veterans die by suicide every day—a rate that is about 1.5 times that of nonveterans after adjusting for differences in age and sex, according to the Department of Veterans Affairs (VA) 2019 National Veteran Suicide Prevention Annual Report" (Novotney, 2020, p. 32). Since 2013, over 45,000 veterans and active-duty service members committed suicide, which equates to more military deaths than in Afghanistan

and Iraq (Giacomo, 2019). The military personnel most at risk are under the age of 30 (Giacomo, 2019).

Historically, veteran suicide was not recorded unless it occurred at a barracks. The *Statistical Report on the Sickness and Mortality in the Army of the United States* addressed active-duty personnel suicide from 1819 to 1828, but did not necessarily use the term suicide (Smith et al., 2019). However, medical returns uncovered 11 recorded Army suicides from 1928 to 1839 (Smith et al., 2019). Although the Surgeon General's Office did not investigate Army-wide trends at that time, research into the matter continued and "[b]y 1843, the U.S. Army began tracking suicide among service members with enough confidence to include annual totals in their published statistical reports" (Smith et al., 2019, p. 3). The *Statistical Report on the Sickness and Mortality in the Army of the United States* of 1840 reported over 15 military deaths across U.S. military forts from suicide but these reports were based on climate and sickness/death so percentages are based on total deaths per fort or post (Lawson, 1840). Smith et al. (2019) estimate the suicides at approximately 1 in 10,000, or 10.38 per 100,000. The National Library of Medicine digital collections of the *Statistical Report on the Sickness and Mortality in the Army of the United States 1839–1860* report lists one suicide in 1852 (n.d.a), and the 1855 to 1860 report lists one suicide (n.d.b). Interestingly, Army historical research and data focused on only active-duty suicide and concluded that since military records dating back to the Civil War did not express suicide because of battle fatigue or trauma, the soldiers suffered other afflictions (Shane, 2019). Lande (2011) explains that during the Civil War, suicide statistics were a compilation of state and military records and news reports, but that Army surgeon records showed an average of 5.25 suicides per month from 1861 to 1865. Suicide rates increased dramatically across states after the Civil War with the 1870 Census reporting 1,080 suicides by men (100 suicides per million), and states reported increasing suicide rates within the same five-year window after the Civil War (Lande, 2011).

By 1883, the military suicide rate had risen to 118.3 per 100,000 (Smith et al., 2019). Although Smith et al. (2019) state that suicide rates among the military decreased during World War I (WWI) and World War II (WWII), the Veteran's Administration cited WWI veteran suicide from 1926 to 1930 at 23 suicides per 100,000 (Inwood et al., 2016).

Military suicides during WWII were 10 per 100,000, but WWII veteran suicides from 1945 - 1968 were higher and broke into four categories: long-serving vets 1946 - 1975 (18 per 100,000), TX vets 1960 (21 per 100,000), vets with psychoneurotic separation 1944 - 1968 (34 per 100,000), and vets without psychoneurosis roughly averaged 11 per 100,000 (Briggs, 2013; Inwood et al., 2016). During the Korean War, active duty suicides were 11 per 100,000 while Korean War veteran suicides from 1954 - 1975 were at 50 per 100,000 (Briggs, 2013; Inwood et al., 2016).

Suicide rates for the Vietnam War veterans continue to vary between studies. For example, a 2004 report for NATO RTO HFM Symposium by Meijer and Weerts disclosed that studies conducted from 1990 to 2001 concerning suicide rates among Vietnam veterans did not attempt to pinpoint an exact number of suicides by Vietnam veterans as much as cause. The overall causes of suicide by Vietnam veterans included survivor's guilt, psychological distress from guilt from killing defenseless people (e.g., children, women, elderly, prisoners of war), PTSD, wounded, societal factors, and those subjected to Agent Orange (Meijer & Weerts, 2004). The more applicable rate of reported Vietnam veteran suicides comes from a combination of data from the Centers for Disease Control and Prevention and the Veterans Administration, which places the suicide rate at 1.2 percent of 305,000 from 1967 to 1996 at 3,660 suicide deaths, or 126 suicides per year (Kelley, 1999).

The estimated suicide rate for the Persian Gulf War (1990-1991) is 1.8 suicides per 10,000 (Barth et al., 2016). Veteran suicide rate for the Iraq and Afghanistan wars are as follows: Kang et al. (2015) showed that out of 9,353 deaths of deployed and non-deployed veterans from discharge to 2009, 20% were by suicide; the U.S. Department of Veterans Affairs (n.d.) study from 2001 - 2007 show that the suicide rate is the highest the first three years after discharge at 33.1% for non-deployed veterans and 29.7% for deployed veterans; the Veterans Administration reports 72.9 veteran suicides per 100,000 in 2005 to 66.4 per 100,000 in 2018, which the 2018 statistics equate to 17.6 veteran suicides per day (Kime, 2020).

The pattern is that suicide among veterans is higher than active duty personnel, which implies lingering psychological trauma. The pattern also implies that as combat became more unconventional, psychological distress became more complicated. The

Iraq/Afghanistan wars expand that complication showing a higher rate of suicide among non-deployed veterans, which correlates to weaponization of drones. In 2001, the Predator was equipped with Hellfire missiles and designated MQ-1L and engaged in combat in Afghanistan (Bowden, 2013). President Obama, Congress, human rights lawyers, and counterterrorism officials contemplated targeting decisions, international law, and public opinion (Bowden, 2013). However, no one considered the mental and emotional effects of non-deployed drone operators; this became a new variable for the development of veteran psychological distress. UAV/RPA operators are not exempt from suicidal thoughts or actions because of their participation in traumatic events or witnessing traumatic events. A 2008 report by the Naval Postgraduate School found that psychological distress and suicide ideation was caused by long hours and combat compartmentalization—switching from remote combat to civilian life in a short period of time (Korody, 2019). Pilots described watching targets interact with their family, especially playing with their kids and then a hellfire missile takes them all out. The pilots then go home and interact with their family and play with their kids (Korody, 2019). "'Sometimes it's hard to keep switching on and off. Back and forth. It's like living in two places at the same time. Parallel universes,' said one pilot. 'It was enough to make a Predator pilot schizophrenic'" (Korody, 2019, p. 1). In a 2014 Air Force report, pilots cited this as a major stressor, even stating they would rather be deployed-in-theater (Korody, 2019).

3. Vulnerability

PTSD is a psychological phenomenon resulting in physiological changes to the sufferer's brain. "Stress results in acute and chronic changes in neurochemical systems and specific brain regions, which result in long term changes in brain "circuits," involved in the stress response" (Bremner, 2006, p. 446). The key brain regions affected by PTSD are the amygdala, prefrontal cortex, and hippocampus (Bremner, 2006; Greenberg, 2018). The amygdala region detects threats and triggers fight-or-flight, activates the sympathetic nerve system that aids in handling a situation, and stores new emotional and threat-related memories (Greenberg, 2018). The Prefrontal Cortex region is responsible for regulating emotions, dysfunctional reactions, attention, awareness, responsible decision making, and determining the meaning and emotional significance of events (Greenberg, 2018). When

the brain detects a threat, the amygdala releases adrenaline, norepinephrine, and glucose to initiate fight-or-flight. However, the prefrontal cortex assesses the threat and either allows it or attempts to shut it down. If the threat is allowed, "the amygdala communicates with the hypothalamus and pituitary gland to release cortisol" (Greenberg, 2018, p. 1).

When a person becomes stressed, the hypothalamic-pituitary-adrenal (HPA) axis system releases cortisol, thus elevating the person's cortisol level. "However, prolonged activation of the HPA response can result in aggregated physiological and psychological wear and tear" (Dekel et al., 2017, p. 2). Veterans with PTSD tend to have lower levels of cortisol (Dekel et al., 2017). One theory of depleted cortisol levels is constant exposure to trauma, thus creating a permanent change (Hill et al., 2017). Constant exposure to trauma causes the HPA to release cortisol continually, and that constant release of cortisol causes permanent changes in the brain and gene expression (Substance Abuse and Mental Health Services Administration [SAMHSA], 2020).

Another potentiality is that some people are born with adrenal insufficiency. According to the Pediatric Endocrine Society (PES), 2018:

> There are 2 kinds of adrenal insufficiency. One form is primary adrenal insufficiency, in which the adrenal gland cannot produce enough cortisol or aldosterone. This form is also called Addison disease. The other form is secondary or central adrenal insufficiency, in which ACTH or CRH fails to signal to the adrenal gland, leading to decreased cortisol levels.

Children can inherit genetic disorders that cause adrenal insufficiency or have abnormalities of the brain or pituitary gland (PES, 2018). Children can also develop acquired adrenal insufficiency after treatment of high doses of steroids, autoimmune disorders, or adrenal gland infections or removal (PES, 2018). Children born with or who later develop adrenal insufficiency will become adults with a predisposed risk for PTSD.

a. Other Risks

While it is true that not all veterans who experience or witness combat or other traumatic events during their military career will develop PTSD, it is vital to understand information that could make a soldier a candidate for PTSD. NIMH (2020) states that veterans who have a higher risk of developing PTSD include those who had traumatic or

dangerous childhoods, such as familial substance abuse or physical abuse, or lived in dangerous areas (e.g., witnessed or lived through various forms of violence outside the home). SAMSHA (2020) stated that high-risk conditions create dysregulated HPA axis; thus, children, and then the adults they become, are more apt to develop PTSD. NIMH (2020) also states that the risk is higher for veterans who participated in drinking and drug use or who have struggled with mental disorders or issues, and that delayed symptoms of PTSD might develop because of personal issues once veterans return home (e.g., job loss, home life issues, death of a friend or family). Alcohol, marijuana, opioids, and nicotine stimulates the HPA axis, thus stimulates a rise in cortisol (Wimm & Sinha, 2019). However, daily or habitual use of opioids, marijuana, and alcohol will cause the user to develop dysregulation of cortisol or a decrease in cortisol levels (Wimm & Sinha, 2019). Users of opioids, marijuana, or alcohol would then be more prone to PTSD than non-users or lesser users.

4. Accurate Diagnosis

According to Bremner (2006), people who experience a traumatic event must be treated soon after the trauma to avoid traumatic memories becoming indelible and resistant to treatment. For example, some Vietnam veterans continue to suffer from PTSD symptoms 50 years later, prompting Congress to request a follow-up study by the U.S. Department of Veterans Affairs of its 1983 National Vietnam Veterans Readjustment Study (NVVRS), which focused on prevalence. The new study, the National Vietnam Veterans Longitudinal Study (NVVLS), would measure the long-term health and mental health of Vietnam veterans (U.S. Department of Veterans Affairs, n.d.). The NVVLS was completed in 2013 and studied both deployed and non-deployed veterans, but only the results for deployed were reported (U.S. Department of Veterans Affairs, n.d.). The study found that 18% of Vietnam veterans, both male and female, continue to suffer from PTSD, and 37% of those who no longer suffer from PTSD do suffer from major depression (U.S. Department of Veterans Affairs, n.d.). The results of the NVVLS raise questions, such as how some veterans recover from PTSD and some do not, and why do some recovered veterans suffer from major depression. The answer could be as simple as false PTSD diagnosis.

The evolution of psychological distress among active duty military and veterans has not come full circle yet. Studies continue to discover better treatments and better tools for accurate diagnosis. “The National Comorbidity Survey demonstrated that although 61 percent of men and 51 percent of women were exposed to a traumatic experience at some point in their lives, the lifetime prevalence of PTSD was 8 percent and 20 percent, respectively” (Matto et al., 2017, p. 325). Falsifying PTSD symptoms or claims of having PTSD is not unheard of either; for example, people might use trauma as a means for disability, civil suits, or to reduce sentencing for criminal actions (Matto et al., 2017). In fact, Brendan O’Byrne, a sergeant with the 173rd Airborne Brigade who served a 15-month tour in the remote Korengal valley of eastern Afghanistan made an allegation against the VA concerning its push to diagnose him at 100% disabled when he was diagnosed at 70% for the past four years (Sisk, 2017). It is vital that the medical profession and the VA take advantage of current and advancing testing protocols to ensure that veterans receive the correct treatment they need, and that they use transparency to ensure that veterans who are suffering from PTSD get the help they need.

5. Resilience Factors

Resiliency is “the ability of an individual to recover from a traumatic event or to remain psychologically robust when faced with an adverse event … the process of negotiation, management, and adaptation to significant sources of stress or trauma” (Shatté et al., 2017, p. 135). Some people can naturally bounce back after an ordeal, but others can feel devastated or depleted. Those who struggle to bounce back need help, especially veterans who have PTSD. NIMH (2020) suggests having a coping strategy for when traumatic events occur, which a resilience training program could help the veterans accomplish. As of December 2020, the U.S. Navy expanded their resilience program to the Expanded Operational Stress Control Program stating, “Research has shown the need for stress management and optimization is more pronounced following deployment as Sailors return home and reintegrate into their families and life ashore” (Faram, 2020, p. 1). NIMH (2020) also suggests reaching out to friends and family and maybe joining a support group.

Ways to control PTSD severity includes being proactive and resilient. Proactive measures mean not doing things that make it worse; this does not mean to shut oneself off from the world, but not do things that would lower cortisol levels. By living a healthy lifestyle, (e.g., keep drinking to a minimum, try to quit smoking, and avoid using recreational drugs), a person who has PTSD can take control over it. If cortisol levels are low, it is harder to overcome symptoms.

6. Conclusion

Posttraumatic Stress Disorder has been an evolving disorder in terms of name and definition that has eluded the medical community in its relevance, prevention, and treatment for over two-hundred years. The symptoms slowly found its credence for research, which expands the discussion for root causes and treatment. Evidence shows that there are psychological and physiological pre-conditions that might result in a PTSD diagnosis for individuals who experience certain traumatic events, and that their environments can compound the onset of PTSD symptoms. Studying the correlation between individuals and their environments could lead to better understanding of the disorder and opportunities to mitigate the onset of PTSD. One environment that has been specifically identified is that of military UAV operators.

B. UAV OPERATORS ARE COMBAT PILOTS

Some people do not consider UAV operators as combat pilots. Many narratives equate them to that of a glorified video gamer using a joystick to shoot at targets from the safety of an air-conditioned building miles away from the actual destination of its target. However, UAV operators work under intense scrutiny and stress. While they might not be in the physical battle, they are very much engaged in combat. This chapter will discuss the qualifications of Army and Air Force drone operators, what they do, the misconceptions they face, and the stress they experience and how it can lead to PTSD.

1. What UAV Operators Do

Unmanned aerial vehicle (UAV) operators are the military personnel who pilot drones into areas that are out of reach for humans to reach or are extremely dangerous.

These areas are typically enemy territory where physical presence might result in combat. UAV operators discreetly guide UAVs to surveillance and track dangerous enemies or suspected dangerous enemies. They can hover in place for days gathering information that UAV operators would need for mission strategies. The UAV and RPA operators essentially are responsible for:

- Operates mission sensor/payload for target detection
- Plans and analyzes flight missions
- Deploys and redeploys the TUAV ground and air system
- Operates and performs operator level maintenance on communications equipment, power sources, light and heavy wheel vehicle and some crane operations
- Launches and recovers the air vehicle performs pre-flight, in flight and post-flight checks and procedures
- Directs emplacement of ground control station, directs emplacement of launch and recovery systems
- Supervises and assists in air frame repair and coordinates evacuation and replacement of parts and end items
- Conduct reconnaissance and surveillance of potential targets and areas of interest
- Discriminate between valid and invalid targets using radar, electro-optical, low-light, infrared video imagery and other tracking systems
- Assist RPA pilots through all phases of mission (Air Force Reserve, n.d., p. 1)

The list of tasks UAVs can accomplish grows by the demand, and the demand for UAV operators grows with it. The more tasks UAVs can accomplish, the fewer military personnel are put in harm's way. The enemy is never consistent, but drones and operators help give the military an advantage.

a. What the Future Holds

Unmanned vehicles have existed for over a century. Most likely, people do not realize that a vehicle is merely a form of getting an object, person, or idea from point A to point B. At the Electrical Exhibition, Nikola Tesla built and revealed a radio-controlled boat in 1898, and during WWI and WWII, the U.S., Germany, and Russia were experimenting with and using unmanned boats, submarines, guided torpedoes, and winged aerial bombs (Blazeski, 2016; Military History Now, 2012). Remote cars that children (and

adults) have enjoyed playing with have been around since the 1960s, and the first robotic bomb deposal vehicle came from the UK in the 1970s (Lisle, 2019; Venki, 2017). The military has used many types of unmanned vehicles such as unmanned aerial vehicles (UAV), unmanned ground vehicles (UGV), and unmanned underwater vehicles (UUV) over the decades (Walimbe, 2020).

Artificial intelligence vehicles (AIV) are expanding autonomous drone technology that "function with the help of environmental sensors and AI with little to no human intervention" (Walimbe, 2020, p. 1). Originally created for transportation of heavy equipment, they are now capable of surveillance, rescue, and IED search-and-destroy mission and can be reprogrammed as needed (Walimbe, 2020). The U.S. Navy is expanding its Boeing AIV family by upgrading carriers for Boeing's MQ-25 Stingray unmanned aerial tanker with plans to have eight carrier-based MQ-25 Stingrays by 2024 (Strauss, 2020). "The flying fuel depots effectively extend the "combat radius" of F/A-18s and F-35Cs, while allowing the carrier to remain out of range of increasingly sophisticated missiles" (Strauss, 2020, p. 1). The new trend in AIV is also going to be smaller scale, which make them more practical for remote areas and less obtrusive. They are capable of delivering supplies and medications, as well as performing more high-pressure tasks such as firefighting and public safety (Walimbe, 2020).

b. Misconceptions of UAV Operators

Even with training and skill, a misconception about UAV operators is that they are glorified video gamers instead of highly trained and skilled soldiers. "John Yoo, the Emanuel Heller Professor of Law at the University of California, Berkley, concurs, stating, 'It is like a video game; it's like Call of Duty'" (Jevglevskaja & Galliott, 2020, p. 1). Laurie Calhoun, an out-spoken critic against the government and military, believes "operators are trained 'to kill in the manner of sociopaths with no feelings whatsoever for their victims [who] are but icons on computer screens'" (Jevglevskaja & Galliott, 2020, p. 1). All branches, levels, and members of the military have had similar comments made about them throughout the decades by anti-military factions as well, but to degrade a member of the military to the ranks of someone playing a game where he or she gets a limitless number

of chances and lives to win a level is beyond insulting. These types of comments could make UAV operators feel they should keep their profession a secret or that their job is not taken seriously, so they too are not taken seriously.

Another concern by critics is the non-threat factor's influence on the psyche of UAV operators. Skeptics think operators are "projecting power without projecting vulnerability" (Jackman, 2020, p. 95). Critics question if UAV operators fail to connect to the targets as airmen, sailors, or boots on the ground soldiers. They question if sitting safely on base creates emotional detachment (Jackman, 2020). Granted, there are people in all branches of the military who will do or say things that are cruel, racist, or criminal, and UAV operators have their fair share of insubordinates, but to assume that all UAV operators are immoral or have a psychological disconnection is a fallacy in reasoning. "Such interpretations collectively thus tie physical distance to emotion and ethics, positing that remote operations can equate to and breed forms of detachment" (Jackman, 2020, p. 95). The misguided critical interpretation adds to the stress UAV operators already feel with their jobs, and it adds to false information concerning the UAV programs, thus discouraging candidates to join the UAV divisions.

2. Requirements of UAV Operators

UAV operators operate unmanned aerial vehicles (UAV), and military branches set their standards as to education level and training. "The U.S. Armed Forces use various designations for their UAS [unmanned aerial systems] pilots. Some military UAS pilots … graduated from a military manned aircraft pilot training program and an unmanned pilot training program" (Federal Aviation Administration, 2017, p. 2). For example, Predator and Reaper drone operators must meet strenuous mission requirements for the Air Force. On average, drone operators fly 900 hours a year, compared to 250 hours a year for fighter pilots (Hardison et al., 2017).

a. Army / Air Force

While several branches of the armed forces are facing drone operator shortages, the U.S. Air Force is leading the pack. The Air Force requirements for drone operators are

more stringent than most other branches of the military. According to the U.S. Air Force (n.d.), requirements are:

- Minimum bachelor's degree
- Knowledge of theory of flight, air navigation, meteorology, flying directives, aircraft operating procedures and mission tactics
- Completion of Air Force Undergraduate Remotely Piloted Aircraft Pilot Training
- Completion of a Single Scope Background Investigation (SSBI)
- Additional requirements specific to specialty
- Completion of Officer Training School (OTS), Air Force Academy (AFA) or Air Force
- Reserve Officer Training Corps (AFROTC)
- Must have begun pilot training between the ages of 18 and 40 (Waiverable) (U.S. Air Force, n.d.)

Granted, the U.S. government does not want expensive machinery operated by anyone who is not completely trained and competent. However, the Air Force requirements mean fewer active RPA operators to meet an increasing demand. This lack of personnel puts a strain on the existing pilots creating a dangerous working condition for those pilots leaving them susceptible to burnout and leaving the Air Force susceptible to turnover.

The U.S. Army program is open to enlisted, active duty, National Guard, and Entry Level. The pilots do not have to be officers or have a college degree. According to the U.S. Army (n.d.), requirements are:

- 10 weeks of Basic Training
- More than 23 weeks of Advanced Individual Training
- 102 ASVAB Score: Surveillance & Communications (SC)
- 22 Nationally Recognized Certifications Available (U.S. Army, n.d.)

The Army's approach means more drone operators to help meet demand. The two-year training requirement, Armed Services Vocational Aptitude Battery (ASVAB) score requirement, and certification are more accomplishable than the double-digit years required by the Air Force.

(1) GAO 2015

Training and education requirements are all well and good if they are actually followed. In 2015, the U.S. Government Accountability Office (GAO) released a report concerning both the Army and Air Force training of unmanned aerial systems (UAS) pilots (GAO, 2015). It discovered through discussions with pilots and questionnaires in 2014 that most Army units had not completed fundamental training tasks (GAO, 2015). Since the Army does not require UAS pilot training information on the status reports, it does not know if the pilots are trained enough to be deployed (GAO, 2015). The Air Force also failed in training UAS pilots. Only 35% from seven units of UAS pilots completed training for required missions in 2015 (GAO, 2015). UAS Pilots stated they could not conduct training of new recruits because of UAS shortage; this issue was a continuation from 2014 and the Air Force still had not corrected its shortage (GAO, 2015). The GAO made recommendations for the Air Force to update its crew ratio, and the Air Force stated that they completed a study on crew ratio, but still had not implemented any of the GAO recommendations (GAO, 2015).

(2) GAO 2017

Senate Report 114–49 requires the GAO to review the Air Force and Army UAS personnel strategies and compared their previous strategies with their actions (GAO, 2017). Both the Air Force and the Army struggle with meeting demand. The Air Force has not met crew ratio since 2008, but it quadrupled its requirements (GAO, 2017). That is cutting its nose off to spite its face. The Army, since 2015, has a higher mishap rate for UAS than any other aircraft and blames training shortfalls for the mishaps (GAO, 2017).

> GAO's 11 recommendations include that the Air Force tailor its strategy to address UAS pilot shortages; the Army revise its strategy to address UAS training shortfalls; and that both services evaluate their workforce mix for UAS pilot positions and conduct analysis to ensure cost effectiveness of workforce decisions (GAO, 2017).

The DOD had not fully agreed with the recommendations, stating it would consider or accept part of them (GAO, 2017). The Air Force and Army UAS programs are only as good as the funding and support they receive from the DOD, but the DOD does not seem

to understand the importance of the stress the pilots are placed under and how the shortages mean that not all UAS missions are accomplished.

(3) GAO 2020

The GAO continues to review the Air Force RPA challenges as stated by *Senate Report 115–262* (GAO, 2020). "GAO analyzed selected Air Force accession, retention, and instructor staffing data; held non-generalizable focus groups at three RPA military bases; and interviewed officials at various levels of the RPA enterprise" (GAO, 2020, p. 1). The Air Force continues to lag behind in implementing recommendations by the GAO. To this date, it does not know how many RPA pilot and sensor instructors are needed, thus it has not been able to fill the staffing and pilot gap (GAO, 2020). The Air Force has increased its number of RPA operators, but its staff level remains at a 2009 level (GAO, 2020). The Air Force lowered the number of days for training to accommodate the staff shortage and implemented combat-to-dwell, but will not be fully implemented until 2024 (GAO, 2020).

b. Air Force Shortages

While it is a grand concept that UAV operators are the best they can be, the Air Force seems to insist on "Top Gun" pilots to operate the drones. Granted, UAV operators must be at a higher skill level than a video gamer, but the stringent requirements of the Air Force have left them in a quandary. In 2017, the Air Force reported shortages of UAV operators and had assigned airmen as temporary UAV operators (Maucione, 2017). The GAO stated in 2017 that both the Air Force and Army "are impeding their own progress by halfheartedly using proper human capital planning" (Maucione, 2017, p. 1). The GAO suggested that both military branches should incorporate federal civilians to work with military personnel for drone activities, which would be cheaper than hiring contractors, thus more money to put toward training more UAV operators (Maucione, 2017). Even with the report, results, and suggestions from the GAO, the Air Force did not produce any long-term solutions for their drone pilot shortage, and the Army's shortage stems from poor management. Not only is it lacking in facilities for UAV operators to work from, but also access to airspace (Maucione, 2017). Additionally, when considering solutions to issues,

"the study found the Army's planning had even more holes when it did not even take into account drone pilot's input when developing a strategy to address training shortfalls" (Maucione, 2017, p. 1).

Even though the Air Force began allowing enlisted airmen to become official RPA operators instead of temporary RPA operators, the Air Force continues to find itself facing a shortage (Pawlyk, 2020). It even started promoting RPA operators at a faster pace than they had before, which was a complaint among the drone pilots, yet they still face a drone pilot shortage (Vandiver, 2019). The GAO has made suggestions for the Air Force that would help it build its staff and maintain a supply of RPA operators to meet the demands of the congressional approved levels, but the Air Force seems to make subtle changes instead of addressing the issue head on (Pawlyk, 2020). The gaps in manning drones resulted in overworked and overstressed RPA operators working consecutive missions (Pawlyk, 2020). "For a majority of the time in fiscal years 2016 through 2019, the Air Force's number of assigned RPA pilots and sensor operators were less than both of their respective authorizations and requirements" (Pawlyk, 2020, p. 1). Furthermore, the Air Force makes little effort at helping the airmen who suffer with serious emotional disturbances (SED) or PTSD. One Air Force Staff Sergeant who assists with supporting drone crews expressed her anger and frustration with the Air Force not having a systematic process to care for troops with PTSD (Singer, 2009).

c. Air Force Manned Pilot Shortage

The turnover of Air Force pilots costs the armed forces money and time. "A recent RAND study found the cost of training a basic qualified fighter pilot ranges from $5.6 million for an F-16 pilot to $10.9 million for an F-22 pilot" (Maucione, 2019, p. 1). Although the Air Force increased its yearly incentive to $100,000 per year, it continues to lose pilots at an alarming rate (Maucione, 2019). Since the Air Force tends to use manned aircraft pilots to fill the gap in RPA operators, it is creating more havoc within its personnel numbers. Two complaints by pilots are dissatisfaction with the job and poor quality of life (Maucione, 2019). Since these are two of the same complaints coming from the RPA sector, pushing manned pilots into RPA slots is increasing the intensity of the complaints,

thus inadvertently encouraging more pilots to leave to commercial industry (Maucione, 2019). It is important to understand the connection between the two, and that, perhaps, if the DOD had gotten on board with past study recommendations, the pilot shortage, thus RPA pilot shortage would not be as profound as it is today.

d. Army Shortage

The GAO (2017) report showed the Army continues to lag in training UAS pilots. Out of 73 UAS units, 61 flew less than 50% of the "340-flight-hour per unit annual minimum training goal in fiscal year 2015" (GAO, 2017, p. 1). The Army, as well as the Air Force, has not evaluated the mix of military, federal civilian, and private sector contractor personnel to fly UAS (GAO, 2017). The Army is currently using private sector contractors to fly UAS but has not decided if federal civilians would be useful to fly UAS, thus increase their UAS pilot crews (GAO, 2017). Using private contractors costs the Army more than using federal civilians, something the Army did not calculate in their decision.

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III. PRELUDE TO PTSD

UAV operators are, psychologically, on the battlefield. They track, they aim, they shoot, and they witness the deaths or destruction of not only the target but also the collateral damage, which are the innocent people who get caught in the line of fire (Werner et al., 2020). "Operators are able to see or imagine the lethal consequences of their actions. As their behavior is often in conflict with their individual moral standards, a secondary trauma may follow" (Werner et al., 2020, p. 1). UAV operators are expected to return home and be glad they have that option and perhaps shrug off the tasks of the day. In combat, soldiers have the opportunity to sit and talk with those who shared the experience, but UAV operators do not; it is a misconception that only being in physical harm's way causes stress (Werner et al., 2020). While some researchers or psychologists might argue that the symptoms of UAV operators are another psychological issue, the *DSM-5 Manual* differs in its assessment. UAV operators can experience flashbacks of what they witnessed, depression from their actions, and suffer arousal and reactivity symptoms, and according to the definitions and symptoms in the *DSM-5 Manual*, the symptoms exhibited by the UAV operators fit the description of PTSD.

A. PERSONAL STRESS

UAV operators suffer from PTSD just like pilots of manned aircraft (Edney-Browne, 2017). In fact, "psychological studies reveal equal, sometimes higher, prevalence rates of PTSD in active-duty UAV operators as manned-aircraft pilots" (Edney-Browne, 2017, p. 20). Researchers believe that study findings might be off since there is a high possibility that UAV operators are not reporting symptoms of PTSD in fear that in-service counseling or a PTSD diagnosis would jeopardize their job (Edney-Browne, 2017). When questioning why UAV operators would develop PTSD being away from physical combat, the answers never come easy.

A huge misconception is that UAV operators are only firing missiles at targets; however, they also spend hours in surveillance gathering intelligence. During these hours, they witness great atrocities. "They're exposed to the most gruesome things that you can

think about that could happen on a battlefield … They find mass graves; they witness executions … Some airmen reported witnessing more than 100 incidents of rape or torture" (McCammon, 2017, p.1). One former UAV operator told of an incident where two boys were riding a bike—one pedaling and the other sitting on the handlebars. They did not know they entered into a firing line of a missile and both were killed. The pilot thought about when he was a kid riding with his sister sitting on the handlebars—he was helpless watching those children ride directly into the missile line of fire (Edney-Browne, 2017). Another operator, Heather Linebaugh, an Air Force imagery analyst (2009-2012), stated in an opinion piece for *The Guardian* in 2013:

> What the public needs to understand is that the video provided by a drone is not usually clear enough to detect someone carrying a weapon, even on a crystal-clear day with limited cloud and perfect light. This makes it incredibly difficult for the best analysts to identify if someone has weapons for sure. One example comes to mind: "The feed is so pixelated, what if it's a shovel, and not a weapon?" I felt this confusion constantly, as did my fellow UAV analysts. We always wonder if we killed the right people, if we endangered the wrong people, if we destroyed an innocent civilian's life all because of a bad image or angle (p. 1).

Testimonies such as this undermine the theory of emotional detachment. These pilots must then go home to their families and pretend all is good with the world.

B. INTERNALIZING AND EXTERNALIZING TRAUMA

In Wired for War by Peter W. Singer (2009), Colonel Michael Downs, USAF, believes that unmanned war "comes with a great psychological stress and emotional connections, perhaps more than people might think that a so-called cubicle warrior would experience" (p. 346). Downs expressed his concern for his subordinates after they observed insurgents kill U.S. forces from a Predator drone lens (Singer, 2009). He knew their military experiences differed from the past; thus, their support systems would also be different because they dealt with drone, not boots on the ground per se; they simply went home and internalized it (Singer, 2009). However, according to the American Psychological Association's *Dictionary of Psychology* (n.d.), internalization is the mental process where participants or victims simply absorb the behavior and accept those behaviors or beliefs as a norm. However, when the psychological trauma is something that

should not become normal behavior, such as witnessing people succumb to attack, internalizing takes on a new meaning. People exposed to traumatic events can develop SED (SAMHSA, 2018). When people with SED do not seek treatment, they either internalize or externalize, or both, the trauma (SAMHSA, 2018).

Internalizing trauma can cause anxiety, sleep issues, or depression, whereas externalizing trauma takes on a disruptive state, such as aggression, rage, thus fighting or breaking the law (Salavera et al., 2019). Internalizing trauma can interfere with social skills and emotional intelligence (EI). People with SED could struggle with maintaining social skills if the trauma is constantly hovering in their mind. A normally talkative person might become quiet and withdrawn—the interaction between people becomes an inner conflict (Salavera et al., 2019). People might also believe that telling someone that they are experiencing mental or emotional stress could get them in trouble, such as losing their job or demotion (Salavera et al., 2019). EI "refers to the interaction between emotion and cognition that allows individuals a functioning that adapts to their surroundings … EI consists of… (1) knowing one's own emotions, (2) handling emotions, (3) motivating oneself, (4) recognizing others' emotions, and (5) establishing relationships" (Salavera et al., 2019, p. 2). A soldier struggling with an SED could find it hard to make decisions and solve problems, which could escalate to hesitation and a failed mission.

C. FAILING CONCERNS

Considering the standard for pilots with PTSD or an SED is retirement, many pilots do not report issues as they should. In fact, many will not admit they have a problem until an accident occurs, usually costing lives. They take pride in their military careers and are determined to continue service (Pons, 2017). One pilot who did seek treatment was told "there was no way I could have experienced anything overseas I was recounting with the counselors, and I was told I should just busy myself with other things to not think about any of what I had brought up during my sessions" (Pons, 2017, p. 1). The recommendation for the pilot was to get a hobby and stay busy so he would not think about it (Pons, 2017). If a counselor would disbelieve a pilot and tell him to get a hobby and not think about it, the same advice could be given to a drone pilot.

A 2017 study by the RAND Corporation found that the Air Force was wholly lacking in concern for its remote piloted aircraft (RPA) pilots (Hardison et al., 2017). The understaffed RPA pilot program is overburdened with the demand by the Air Force to meet the government fixed levels of drone use. An RPA pilot's time is not only in manning drones, but also training, health, and wellbeing to ensure quality performance (Hardison et al., 2017). The top recommendation by RAND is to attract and retain RPA personnel (Hardison et al., 2017). Only with a properly staffed program can the Air Force limit turnover and lessen the burden on RPA pilots that cause burnout, SED, and PTSD. For the requirements set by the Air Force for personnel to qualify for combat air patrol (CAP), the timeframe creates crucial gaps leaving other military branches to fill those gaps (Hardison et al., 2017). The use of personnel from other areas creates issues within those areas. For example, if combat pilots are manning drones, then gaps develop within the pilot division (Hardison et al., 2017). A combat-to-dwell policy is also recommended. "Institute a combat-to-dwell ratio for RPA personnel to help mitigate potential cumulative negative effects of combat exposure, high [operations tempo] OPTEMPO, and shift work; to provide time for personnel to spend with their families; and to provide time for personnel to complete continuation training and other developmental activities" (Hardison et al., 2017, p. xv).

D. CONCLUSION

Posttraumatic stress disorder can develop over repeated exposure to traumatic events or with just one. It is not a disorder that can be eradicated or cured, but it can possibly be mitigated or prevented when situations are addressed and controlled. UAV operators are highly trained skilled pilots, sensors, and analysts. What causes them stress or mental anguish is as real as if they were in physical combat. Watching the horrific events that the UAV operator caused or witnessing a crime against innocent people while doing reconnaissance or surveillance can leave operators feeling shaken and having doubts about the morality of the job. Having those feelings ignored or minimized can leave the person psychologically damaged and at risk of developing PTSD. With the increase in demand for drone missions, and the shortage of drone operators, the DOD needs to put true effort into intervention and prevention for its UAV operators. The shortage the Air Force is

experiencing will continue to expand as operators have shorter careers due to psychological disorders. The time it takes to properly train operators cannot fill the gaps as quickly as they happen. Research has proven the cause and is now starting to provide answers, but the DOD and commanders need to listen and take action.

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IV. PTSD CASE STUDIES

The way that PTSD is depicted in popular culture has led to a common perception that PTSD affects those who have experienced trauma in combat directly more than UAV operators who witnessed it from UAV sensors to a video display. The belief is that deployment puts soldiers, airmen, and sailors at greater risk of PTSD because they are subjected to life threatening situations where they could be harmed or killed, or they harm or kill someone else (Schultebraucks et al., 2020). In combat, a soldier is physically at the scene—the soldier can touch the building, the ground, people passing, and the target. With virtual combat, the soldier is a UAV operator, hundreds or thousands of miles away from physical harm. UAV operators are safe and sound and cannot be touched; they cannot touch the building, ground, people passing by, or the target. UAV operators have no physical presence in the moment the target is hit, and thus are perceived as having little claim to developing PTSD.

As more news sources interview and report on UAV operators, their experiences, and PTSD issues, this perception that virtual combat has little impact on its operators is beginning to unravel. While there is a growing interest in the mental health of UAV operators, especially concerning PTSD, research of the phenomenon is not as prevalent as it should be. It is becoming more apparent that UAV operators can indeed develop PTSD, and that pertinent treatment opportunities should be available to them. However, most people afflicted by PTSD do not want to discuss it or make it public, especially to their bosses or commanders, which leave researchers short of study participants. For those in the military, depending on their job description, it could mean losing flight qualification or retirement. This section of the thesis will review case studies and discuss research for UAV operators' risk of developing PTSD and analyze research methods and findings.

A. RAND 2015

In 2015, the Air Force Special Operations Command (AFSOC) requested RAND Project Air Force (PAF) to conduct a study into RPA personnel directly involved in AFSOC combat operations and the issues relating to the lack of RPA pilots in relation to

demand in spite of increasing RPA numbers (Hardison et al., 2017). Consequently, retention of trained RPA personnel has become a significant issue (Hardison et al., 2017). Combat air patrols (CAP) fly 24/7, and RPA pilots, sensor operators (SO), and mission intelligence coordinators (MIC) crews work around the clock in three shifts, day, midnight, and swing shift (Hardison et al., 2017).

1. Methods

RAND researchers conducted 28 focused groups made up of 186 RPA operators directly involved in daily combat missions (Hardison et al., 2017). The groups included airmen assigned to RPA pilot, SO, or intelligence (MIC) positions within ACC and AFSOC (Hardison et al., 2017). The groups were given two questionnaires, one Likert and one open-ended (Hardison et al., 2017). The open-ended questionnaire asked what they liked most, least, and what they would change. It gave the participants a chance to write what they felt about their situations without anyone influencing answers (Hardison et al., 2017). The Likert scale-type questionnaire focused on specific aspects of their jobs and lifestyle (e.g., manning, shiftwork, leadership, base locations) and was given after the groups discussed the open-ended questionnaires to see if what was discussed in the open-ended questionnaire matched what was given on the Likert scale-type questionnaire (Hardison et al., 2017). RAND researchers also reviewed the DOD policies on deploy-to-dwell to use as guidance for similar policies for the RPA community (Hardison et al., 2017).

2. Results

While responses toward the positive aspects of their job included job importance, camaraderie among colleagues, being near family, good leadership, and gaining experience and knowledge, the positive aspects could not compensate for the negative. A third of the crews felt overwhelmed with their jobs due to being understaffed, shiftwork, and lack of training. Many crewmen felt shiftwork could be eliminated if crews were stationed in areas of different time zones, but leadership did not pursue the idea. The crewmen also felt unappreciated by other members of the Air Force, and that needs and duties (e.g., medical, appointments, sleep, stress) were neglected (Hardison et al., 2017).

3. Discussion

The study found that stress for RPA personnel is high while job satisfaction is low, with stressors for RPA personnel being high operations tempo (OPTEMPO) and deployed in garrison (Hardison et al., 2017). The majority of RPA personnel do not leave the U.S. border. They deploy in garrison, or deploy in place, at Air Force bases within the United States (Hardison et al., 2017). While it seems that this would be ideal for RPA personnel, it actually adds to the burden of dealing with RPA personnel shortages, added responsibilities, and long shifts while also adding family responsibilities (Hardison et al., 2017). When deployed, as much as personnel would like to be home for birthdays, special occasions, or just family dinners, the stress of juggling the job and family can be overwhelming (Hardison et al., 2017). It also creates a problem when the RPA pilot or sensor experienced a traumatic day and must go home and leave it at the door. There is no defusing or debriefing between work and home, and with the hours many work, exhaustion could compromise any positive intervention; thus, burnout becomes as significant a factor in turnover as PTSD (Hardison et al., 2017).

a. Burnout

The top negative concerns from the focus groups were manning and over tasking. Understaffed UAV departments mean there are not enough personnel to meet demand, thus UAV personnel are working well past their shift slots to complete assignments (Hardison et al., 2017). The supply and demand inequity, thus burnout, is similar to what many nurses experience. Hospitals struggle to retain nursing staff primarily due to supply and demand issues and poor management. "'Nurses are the backbone of the healthcare system,' says Gerardi. 'When they're feeling overworked, physically and mentally exhausted, and not appreciated, it diminishes staff morale and can result in resignations and instability in the workplace'" (Kaple, 2021, p. 1). The World Health Organization (WHO, 2019) added burnout in the 11th Revision of the International Classification of Diseases (ICD-11) as an occupational phenomenon. WHO (2019) recognizes burnout as a syndrome characterized by "feelings of energy depletion or exhaustion; increased mental distance from one's job, or feelings of negativism or cynicism related to one's job; and reduced professional

efficacy" (p. 1). WHO (2019) adds that burnout results from chronic workplace stress that is not properly managed, which is what is happening within the UAV/RPA divisions across all military branches.

b. Shiftwork

Deploying in place is a positive benefit for the government since it saves money from having to deploy personnel and equipment; however, the effect on personnel is not all that beneficial. While it is impossible for the military to stop working at 5:00 pm, shiftwork can have negative effects on personnel. The main grievances concerning shiftwork is tiredness and not being able to participate in family functions since they were sleeping or working evenings and weekends, thus families feeling neglected (Hardison et al., 2017).

c. Training

Interestingly, the Air Force has a tougher and stricter training program for UAV crews, yet participants complained that they received less training than the manned aircraft crews (Hardison et al., 2017). Participants felt that their limited training held them to their exact jobs instead of allowing them to be able to also offer more to support teams and eventually advance via promotions (Hardison et al., 2017). They also felt that the overwhelming schedules kept them from continuing training, and the training they did receive was during combat operations, thus the training they received was more of their exact job description instead of encompassing training that would prepare them for the full range of missions (Hardison et al., 2017).

d. Management

An aspect not touched upon much concerning military mental health issues is management. The military operates under a management system with the Department of Defense as its umbrella that all military branches fall under. If a department, division, platoon, squadron, battalion, etc., is not properly managed, the affects show in performance and retention. The results concerning management were comments such as:

- Most people want to treat RPAs same as all other planes. Just like other planes, [one commander gave us the rule that we] need to use [a] piddle pack [while flying].
- You can get phone calls from colonels and generals [chewing you out] and you still have to fly the mission.
- Leadership here put mission before people. Feedback is nonexistent from a leadership perspective.
- [Leaders] who come from other flying units arrive with an idea or mentality of how things should work. Do it my way even though it may not work (Hardison et al., 2017, p. 41).

Naturally, not all responses were negative toward management, but "some felt that management and supervision were lacking, inconsistent, or otherwise problematic, citing examples of being treated unfairly, micromanaged, or held to unrealistic standards" (Hardison et al., 2017, p. 41). If commanders are not educated on UAV equipment and operations, they cannot guide operators. If a commander does not recognize the issues operators face or understand the complexity of how PTSD works and push relentlessly trying to fill personnel gaps, then the commander is not leading but creating turnover. Army Gen. Colin Powell once stated, "Leadership is solving problems. The day soldiers stop bringing you their problems is the day you have stopped leading them. They have either lost confidence that you can help or concluded you do not care. Either case is a failure of leadership" (Falkner, 2018, p. 1).

4. Conclusion

The objective of the RAND study was to ascertain the cause for the lack of RPA operators and retention of those operators. The issues uncovered in the RAND study pertained to supply and demand inequities, shiftwork, burnout, and commanders. While the benefit of deploy in garrison enables operators to remain close to family and friends, the benefit is often undermined by harsh working conditions that leave operators overwhelmed, anxious, tired, and depressed. If operators are mentally and emotionally exhausted, they are not able to take full advantage of the benefit of deploy in garrison. In fact, deploy in garrison could make the anxiety worse when they have to work long shifts and tend to family needs. Poor management by commanders can also leave operators feeling uncertain about operations or stressed by the negative atmosphere commanders

could create. These conditions can cause mental anguish, which can lead to burnout, or worse, psychological distress such as PTSD. It is imperative that the Air Force Special Operations Command heed the results of the RAND study to try and circumvent the negative conditions that is undermining its retention rates, as well as the mental health of its operators.

B. *JOURNAL OF MILITARY AND VETERANS' HEALTH* 2017

Because of activities in the Middle East, Australia planned to increase its number of UAVs; however, it was concerned with the reports of UAV operators and their mental health issues, especially PTSD, and whether they are exposed to higher mental health risks than other military personnel (Wallace & Costello, 2017). Since most of the research concerning UAV operators and PTSD has come from the United States, the research project was based more so on U.S. data.

1. Methods

Wallace and Costello (2017) conducted a narrative literature search using PubMed and Google Scholar, using the most applicable keywords pertaining to UAV operators and PTSD (Wallace & Costello, 2017). This study is primarily based on findings from previous U.S. studies that consisted of a combination of anonymous surveys and military records of U.S. UAV operators, non-combatant airmen, and manned aircraft pilots that measured rates of clinical distress and PTSD (Wallace & Costello, 2017). The research also consisted of groups of who participated in the Malach Burnout Inventory General Survey, as well as a comparative study that utilized electronic health records of U.S. Air Force UAV operators and manned aircraft pilots (Wallace & Costello, 2017).

2. Results

The reports found that clinical distress and posttraumatic stress disorder was higher in UAV operators who were exposed to unique stressors than manned aircraft pilots (Wallace & Costello, 2017). Electronic health records of U.S. Air Force UAV operators and manned aircraft pilots showed that 8.2% of UAV operators had recorded mental health outcomes compared to 6% from manned aircraft pilots (Wallace & Costello, 2017).

"Adjustment disorder and depressive disorder were the two most common diagnoses in both groups. Incidence rates for PTSD were 0.9 per 1000 persons for UAV operators (n=3, 95% CI 0.3-2.7) compared to 0.7 (n=20, 95% CI 0.4-1.0) for manned aircraft pilots" (Wallace & Costello, 2017). An added psychological symptom is moral injury. Operators' experiences of having to bear witness to traumatic events, failing to prevent events, or perpetrating events that went against deep moral beliefs caused "feelings of guilt, betrayal, being changed by exposure to death, relationship or spiritual difficulties and social alienation" (Wallace & Costello, 2017, p. 38).

3. Discussion

While the Wallace and Costello (2017) study provides data from numerous articles and studies, it is regurgitating data and making several conclusions instead of focusing on its specific research question. For example, Wallace and Costello used prevalence rates comparing UAV operators to civilians. Saying that UAV operators was low (2–5%) compared to civilian rates (3.5%) makes it questionable as to why UAV operator rates are being compared to civilian rates. Not only do the numerical factors need to be balanced for correct percentage rates, but also military-related PTSD is a different beast than civilian-related PTSD. For example, 5% of the 1,094 UAV operators compared to 3.5% of 9,200 civilians would be 54.7 UAV operators compared to 322 civilians. To properly balance the count, the numbers need to be balanced—1,094 UAV operators (Chappelle et al., 2014) at 54.7 to 1,095 civilians (Kessler et al., 2005) at 38.2. Also, since the civilian survey was a random door-to-door survey, the odds of any of those people being ex-military are slim.

The UAV operators who participated in the Malach Burnout Inventory General Survey and various questionnaires and surveys did so anonymously out of fear for their careers. "Typical barriers to seeking mental health care reported by military personnel include being seen as weak; concern about the risk of adverse effects on career; and believing that their leadership discouraged the use of mental health services" (Wallace & Costello, 2017, p. 38). Lack of reporting is evident in that the reviewed health records that showed that both UAV operators and manned aircraft pilots had similar, low incidence rates of PTSD, especially since the anonymous surveys showed high levels of occupational

stressors (Wallace & Costello, 2017). However, research suggested that they have not reached a sub-threshold PTSD where they might have symptoms but not considered disabled enough to meet full diagnostic criteria (Wallace & Costello, 2017). Depending on when those surveys took place in an operator's career could set the findings off balance. The lack of qualifying symptoms could be because many operators might suffer from delayed-onset PTSD, which is more common in military populations (Wallace & Costello, 2017).

4. Conclusion

While Wallace and Costello seem undecided as to whether UAV operators can develop PTSD, they do have recommendations, one being that there needs to be more research into the matter, but they also recommend long-term monitoring for occupational stressors among UAV operators and psycho-education designed for their specific job descriptions and the deployed in garrison risks. They also recommend that UAV operators have the "opportunity to participate in a tailored and standardized decompression and reintegration phase from the 'deployed in garrison' operational environment" (Wallace & Costello, 2017, p. 39). The study objective leans toward intervention and monitoring in the attempt to prevent UAV operators from developing PTSD. It will take a significant amount of planning to develop effective intervention and monitoring strategies, as well as strategies for support services.

C. MILITARY MEDICINE 2020

Bryant-Lees et al. conducted this study as a comparison of stress levels between Air Force Special Operations Command (AFSOC) and Air Combat Command (ACC). They were interested to see if there was a difference between the two commands as to frequency of personnel becoming burned out, and the frequency of high psychological distress. The overall objective is to use this research to develop intervention strategies and optimize the support services across the RPA career field (Bryant-Lees et al., 2020).

1. Methods

The online, anonymous occupational stress assessment compares the cause and effect of stress of the RPA operational crew (Bryant-Lees et al., 2020). The assessment tools used were the Maslach Burnout Inventory, Outcome Questionnaire (OQ-45.2), and Embedded Care Provider Assessment. The 571 participants included 158 AFSOC and 413 ACC (Bryant-Lees et al., 2020). The link to the assessment was sent via email by leadership explaining the purpose, confidentiality, and that it was voluntary.

2. Results

The overall result assessment "revealed that high stress levels from an array of sources continue to result in increased risk of burnout and psychological distress for RPA operators" (Bryant-Lees et al., 2020, p. 1). The results of this 2020 study correlate with earlier studies tagging burnout from stress as a trend within the UAV sector that is not being properly addressed. Insufficient manning leads to overwhelming duty loads resulting in sleep issues, long hours, and organizational communication issues with AFSOC experiencing a higher stress level than ACC (Bryant-Lees et al., 2020).

3. Discussion

Air Force Special Operations Command (AFSOC) and Air Combat Command (ACC) are the two Major Commands (MAJCOMs) for RPA operators (Bryant-Lees et al., 2020). "AFSOC RPA operators engage in missions that typically involve searching for and eliminating specialized targets, while ACC RPA operators tend to engage in broader and more conventional operations such as surveillance of the battlefield and providing close air support to ground troops" (Bryant-Lees et al., 2020, p. 1). RPA operators consist of RPA pilots, sensor operators, and intelligence personnel and provide 24 hour intelligence, surveillance, and reconnaissance (ISR) support for combat and surveillance missions (Bryant-Lees et al., 2020). Together, they "provide visual intelligence support, close air support for ground troops, and on-demand precision strike capabilities" (Bryant-Lees et al., 2020, p. 1). They are essential to the Air Force, but the increase in demand for drone missions has increased workloads without sufficiently increasing RPA staff (Bryant-Lees et al., 2020).

Because RPA operator stress has been a continuous issue that more than ten years' worth of studying has not shown any true progress, the USAF has continued the occupational stress and well-being assessments every two to three years for active duty, Air National Guard, and Reserves (Bryant-Lees et al., 2020). With crews working 12-hour shifts, occupational burnout and psychological distress is a given, and if not addressed, emotional exhaustion, cynicism, and professional efficacy become prevalent (Bryant-Lees et al., 2020). Burnout is also related to psychological distress, which affects cognitive, emotional, and behavioral functioning (Bryant-Lees et al., 2020). The study showed that RPA operators who witnessed, experienced, or participated in traumatic events were more likely to experience negative emotional reactions leaving them susceptible to PTSD (Bryant-Lees et al., 2020). The occupational health assessments go beyond the typical anonymous questionnaires of other studies by including actual health questions. Since PTSD tends to have physical symptoms (internalizing or externalizing), asking about general health related behavior (e.g., when the person last saw a doctor, what for, medications taken, and substance abuse and suicide ideation) gives more of an idea of what is going on inside someone's mind (Bryant-Lees et al., 2020).

In this study, the age demographic variable was significant in that RPA operators from 18 to 25 experienced relation problems, getting less sleep from working roughly 50-hour weeks, lack of exercise per week, and experiencing a significant change in oneself as a result of combat exposure/trauma put these operators at risk for cynicism (Bryant-Lees et al., 2020). Cynicism could be a major factor in turnover if personnel suffer from burnout and simply no longer cares about the job. Emotional exhaustion and professional efficacy would also be factors for turnover. The prevalence of psychological distress in this study is approximately 15.2%, which might seem low to some people, but since there is a shortage of RPA operators, that 15.2% is massive (Bryant-Lees et al., 2020).

4. Conclusion

This 2020 study is an update of the same problems that have existed for over ten years—shortage of UAV/RPA operators result in operators working long shifts, exhaustion, traumatic experiences, lack of sleep or cannot sleep, and burnout. All these

factors result in more turnovers, thus increasing the negative aspects of the operators' job. This particular study touched on an element that is very much a red flag—the age group of operators showing signs of psychological distress. If these young men and women develop PTSD at an early age, their careers are potentially threatened before they have gotten comfortable in their uniforms. Bryant-Lees et al. (2020) recommend continuous monitoring for stressors, much as other studies have, but there needs to be more research into intervention when the symptoms show, better yet, preventing the stressors by addressing one of the main variables that cause much of the psychological stress, which is the lack of operators.

D. HEALTH AND HUMAN RIGHTS 2020

Research is beginning to shed light that people viewing traumatic events miles away via video or pictures can cause trauma-related stress reactions, which can lead to PTSD. This phenomenon is called secondary trauma since it is witnessed after an event (Baker et al., 2020). The United Nations and nongovernmental organizations conduct digital investigations into human rights abuse from across the globe. University students from various colleges around the world are trained "in open source investigation and verification methods and assist Amnesty researchers in monitoring and documenting human rights violations" (Baker et al., 2020, p. 294). Open source investigating means volunteers and employees spend hours scouring the Internet for information, and research is showing that this action can trigger secondary trauma, which the American Psychiatric Association is now recognizing as a mental health risk (Baker et al., 2020). While UAV/RPA operators are witnessing primary trauma (firsthand), this study backs the theory that witnessing an atrocity from miles away can still impact how the brain processes what it sees.

1. Methods

This is a preliminary study that will lead to a larger study on the effectiveness of mitigation techniques (Baker et al., 2020). A survey was developed specifically for this study and was sent to university students across the globe who participated in the Amnesty investigations. It examined "three categories of secondary trauma mitigation techniques:

(1) strategies for reviewing content, (2) community support techniques, and (3) self-care practices" (Baker et al., 2020, p. 296).

2. Results

Six general practices were identified and recommended for use by institutions. These six were used most by investigators to mitigate secondary trauma included: "processing graphic content, limiting exposure to graphic content, drawing boundaries between personal life and investigations, bringing positivity into investigations, learning from more experienced investigators, and employing a combination of techniques" (Baker et al., 2020, p. 293). Other recommendations included labeling graphic content (affect labeling) and self-care. Participants were more apt to use the reviewing content strategies (e.g., reduce sound, work with partner or near someone, limit graphics) instead of reaching out for support or utilizing self-care practices (Baker et al., 2020).

3. Discussion

The goal of this study was to protect the investigators health and human rights and discover if investigators implemented training on secondary trauma and whether they thought it helpful or not. The training programs taught investigators techniques to reduce the risk of secondary trauma by teaching them to recognize the signs and provide coping resources (Baker et al., 2020). Reducing sound and working with a partner were the top strategies utilized in this study. Participants stated that implementing the strategy of reducing sound seemed to reduce the emotive impact of the graphic content since sound made it seem more real, putting them at the scene (Baker et al., 2020). However, not all participants could reduce the sound since it played an important part of a situation, such as contextualizing images (Baker et al., 2020). Working with a partner, as a team, or near someone gave investigators a sense of security—that they were not alone (Baker et al., 2020). They could discuss material or work in silence, but the effect allowed them to put distance between them and the graphic nature of what they viewed (Baker et al., 2020).

The third strategy most followed was limiting exposure to graphic images (Baker et al., 2020). Granted, they must look at graphic images in order to properly investigate, but that does not mean they cannot filter what is not necessary or what does not pertain to

their investigation. “[M]inimizing windows with graphic imagery, and reducing the size of graphic images on screens … using peripheral vision to assess content” helped participants limit the impact of the graphics (Baker et al., 2020, p. 297). Limiting the amount of graphic exposure helped keep the investigators from visual overload. However, it is impossible to filter all the time since discovery requires full resolution for geolocation and other vital information (Baker et al., 2020). Participants stated that preparing themselves ahead of time for what they might see helped keep the shock value at bay (Baker et al., 2020). Another participant used graphic labeling in advance to limit surprise and shock, and another said prepping for disturbing images by clicking through individual frames helped ready her for what she was about to see (Baker et al., 2020).

4. Conclusion

Baker et al. are opening the door for more relevant study into how psychological distress can impact a person via a computer or elaborate monitor system. Even though this study was for the United Nations’ (UN) organizations and nongovernmental agencies, the theories apply across all fields and even recreational. Parents become concerned when their child stays glued to violent games or movies, and social media, for the most part, removes violent videos out of concern as to how people will react. Some videos can recruit, corrupt, and frighten. This might be a preliminary study, but it is a most important study. The Baker at al. study is further evidence that UAV/RPA operators can develop PTSD from visually witnessing and participating in atrocities via a computer monitor. The fact that the UN and nongovernmental organizations recognize this phenomenon should tell the DOD and Air Force that they are falling behind the world in understanding the seriousness of PTSD developed through exposure to real time displays of graphic content broadcast by the onboard sensors of platforms engaged in real-world yet remote combat.

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V. PTSD MITIGATION STRATEGIES

The definition for mitigation is "the process or result of making something less severe, dangerous, painful, harsh, or damaging" (Merriam-Webster, n.d.). Mitigating refers to both the results of an event as well as prevention or intervention to keep an event from having a more severe or permanent result. Mitigating a psychological impact on any military personnel is not an easy task. It requires specifics as to the person's situation and diagnosis to create treatment plans. However, setting protocols for intervention would be a start to help UAV operators get immediate support to ease emotional stress to circumvent it from becoming a permanent disorder. While PTSD is not curable, people who have high risk jobs should be equipped with coping methods and monitoring procedures for signs of an escalation in symptoms. This chapter will discuss the connection between emotional regulation and PTSD and discuss strategies for containment, intervention, and prevention.

A. EMOTION REGULATION

Emotion regulation is a brain function that detects stimulus and responds. It is the "automatic and cognitive processes that interact to influence the duration, intensity, and expression of emotions" (Inwood & Ferrari, 2018, p. 3). Emotion regulation strategies are various in which people tend to have their favorite methods, such as meditation, yoga, exercise, deep breathing, focusing on something different, listening to music, etc. However, people with emotion regulation deficits tend to do the opposite by avoiding the subject or situation, dwelling on the subject or situation, self-harm, or substance abuse (Inwood & Ferrari, 2018). Maladaptive emotion regulation is a short-term fix that causes emotions, such as increased heart rate, breathing, or feelings of panic, which results in emotion dysregulation (Inwood & Ferrari, 2018). Maladaptive emotion regulation can cause a person who experienced a traumatic event to develop a more permanent dysregulation status. It is essential that people strive for adaptive emotion regulation (Inwood & Ferrari, 2018). Practicing methods of "psychological first aid" so that they become second nature could help people in high risk or dangerous jobs cope with the extreme stimulus they might experience on their jobs (CISM International, n.d.).

1. Critical Incident Stress Debriefing

Critical Incident Stress Management (CISM) is "psychological first-aid" developed for military combat veterans and later expanded to include first responders (CISM International, n.d.). It consists of six types of interventions that address particular issues. Two of the interventions that would aid UAV operators in dealing with stress is defusing and debriefing (CISM International, n.d.). Defusing takes place, usually within 12 hours, after an event so that people can discuss the event, how they felt, and if further assistance is needed (University of Houston, n.d.). The purpose of defusing is not so much helping the person recover from the traumatic event but to stabilize the person so he or she can "return to normal routines without unusual stress" (CISM International, n.d., p. 1). Essentially, for a UAV operator, it is defusing the feelings a UAV operator might experience (e.g., shock, anger, depression) after initiating a strike on a target so it is not carried home and dwelled upon. Debriefing also goes by Critical Incident Stress Debriefing (CISD). Debriefing takes place within a 72-hour window of an event and can involve a group session "to talk about their experience, how it has affected them, identify individuals at risk, and inform the individual or group about services available to them in their community" (University of Houston, n.d., p. 1). CISD would attempt to assist UAV operators to mitigate, or lessen, the impact of the event to help them recover from the stress of the event.

CISM has had its fair share of criticism with claims that it was not helpful since it is not therapy, and that it could hinder treatment for PTSD (Swab, 2020). However, over 60% of emergency medical services (EMS) responders surveyed during clinical research disagreed (Swab, 2020). CISM offers immediate support instead of having to wait for an appointment to meet with a private psychologist or assigned agency psychologist. Responders found CISM more useful because they were with a group of their peers who understood the stress and trauma they experienced (Swab, 2020). Granted, most CISM research targets first responders, but research concerning military personnel is over 20 years old. A theory could be that a first responder witnesses trauma secondarily—the event has happened, while military personnel are witnessing it firsthand and/or causing it. It would be one thing to talk about something that a person came upon, but another for a

UAV operator to talk about watching children die from an attack that he or she initiated, or watching women being raped while doing surveillance. CISM would be a productive method of at least defusing operators' emotions until they can participate in a more in depth treatment.

2. Affect Labeling

When contemplating strategies for mitigating PTSD, it is impossible to do so without addressing the underlying mechanism, which is emotional regulation. Emotional regulation is vital to stress reduction. According to *Psychology Today* (n.d., p. 1):

> Emotion regulation is the ability to exert control over one's own emotional state. It may involve behaviors such as rethinking a challenging situation to reduce anger or anxiety, hiding visible signs of sadness or fear, or focusing on reasons to feel happy or calm.

A current trend for emotional regulation is affect labeling. Affect labeling simply means putting feelings into words (Torre & Lieberman, 2018). Although people have expressed their feelings in some form in therapy with word association or writing out their feelings with journaling, affect labeling can be a form of implicit emotion regulation. Affect regulation also falls under self-report. When people take surveys and answer questionnaires, they can put a word, term, or phrase to a feeling (Torre & Lieberman, 2018). For example, from the Likert questionnaire, "I am often overwhelmed on the job" might receive an answer of "Strongly Agree" and "Bothers Me a Lot." That simple act of picking an answer labels it—"my feeling is that I am overwhelmed and it bothers me." The same happens when looking at a picture and being asked how it makes one feel. "Labeling the emotion depicted in images has also been shown to reduce self-reported experience of negative valence and arousal from aversive images" (Torre & Lieberman, 2018, p. 117).

Some researchers believe affect labeling is more of a distraction than help—that by encouraging the person to label a feeling, it distracts, or diminishes, that person from fully feeling it, thus not fully processing and dealing with it (Torre & Lieberman, 2018). That theory would undermine basic psychology of patients talking about their troubles to help come to terms with them. Torre and Lieberman (2018) also point out that affect labeling plays an important role in stimulating the amygdale, thus emotion regulation. "Emotion

regulation relies on basal cognitive functions such as working memory, attention, self-reflection, semantic memory and language" (Morawetz et al., 2017, p. 569). The amygdale and prefrontal cortex work in unison to determine what occurrence is a threat and what action to take. The amygdale detects threats and triggers a response from the prefrontal cortex to either allow the threat or shut it down (Greenberg, 2018). Even though the prefrontal cortex controls whether threats are allowed or not, the amygdala creates and stores new memories regardless of the mental action taken (Greenberg, 2018). These memories are what can trigger PTSD symptoms. The ideal resolution would be to give a person control over bad memories, enabling that person to not reappraise them, but can access those memories without the anxiety.

3. Cortisol Testing and Therapy

Since there is a medical correlation between PTSD and cortisol levels among sufferers, cortisol testing could be a biomarker in PTSD screening (Pan et al., 2020). "Previous studies found inconsistent results on the relationship between post-traumatic stress disorder (PTSD) and concentrations of 24-hour (24-h) urinary cortisol" (Pan et al., 2020, p. 1). The easiest and fastest ways to test cortisol levels is through urine or saliva testing, although 24-h urinary cortisol testing is believed to be more trustworthy than salvia (Pan et al., 2020). While cortisol testing and treatment are slowly gaining ground in scientific research, there could be merit in basic testing of UAV operators during training and then periodic testing tri-annually. This type of mitigation is about catching signs of symptoms early, if possible, and starting UAV operators on an intervention plan to keep them active in their jobs.

Research into cortisol therapy could offer hope for treatment of patients with low cortisol levels before they develop PTSD. Pan et al. (2020) state that a single high dose of cortisol after a traumatic event, regardless of if it was witnessed, experienced, caused, might promote the restoration of homeostasis, or balance of cortisol, so that the HPA axis can better constrain the sympathetic nervous system. Pan et al. (2020) also point out that this method should only be given to someone who definitely has a low cortisol level, so a quick test is imperative. They also believe the cortisol therapy could help people who

experienced trauma in the past. Mifepristone (RU-486) is the glucocorticoid in this research study and has proven effective for decreasing traumatic memory recall, thus preventing PTSD.

B. EVALUATION QUESTIONNAIRES AND SURVEYS

While the RAND Corporation study focused on the Air Force RPA personnel, the questionnaire is easily adaptable to all military branch UAV programs. Using a Likert Scale enables researchers to make the survey specific to the industry. A Likert Scale is a unidimensional scaling method, which is an easier measuring scale since it is "more or less" (Trochim, 2020). It removes the stress of having to answer questions in sentence form. The RAND questionnaire works in conjunction with GAO reports and expands the research from one sector of RPA issues to encompassing a greater area (Hardison et al., 2017). The goal was to bring attention not only to the issues but also the concerns they create (Hardison et al., 2017). RAND's aim was to "provide a comprehensive and in-depth understanding of the sources of stress and dissatisfaction within the RPA community to inform both of AFSOC's goals for the study" (Hardison et al., 2017, p. 6).

1. Conclusion

Mitigation strategies should be developed and implemented to keep UAV/RPA operators mentally healthy. It is possible to successfully monitor operators weekly with surveys and questionnaires and medically biannually with cortisol testing. It is also possible to implement plans and strategies that could prevent an exposure to an event from becoming a permanently mental condition that will impair lives and livelihoods. The DOD, or the individual forces, could create self-reporting and help strategies such as affect labeling for operators to do at home or during downtime. They could organize group meetings twice a week on base or a neutral place for operators to talk about their experiences with others who understand what they are experiencing. The more the Air Force expands its mission loads, the more it will have to rely on operators to make those missions happen. If they are constantly pushing untrained operators, they are taking the risk that the operator will not last long. They must adhere to a goal of retention, but it must be healthy retention.

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VI. ANALYSIS

PTSD has become a highly studied and discussed subject among various medical fields, military branches, and the government. Research began in 1980 to address the growing incidence of gross stress reaction among people who witnessed traumatic events, including veterans, and slowly started connecting the dots that PTSD was a real medical issue. As war methodology advanced, PTSD incidence became more prevalent among active duty soldiers and veterans (Friedman, 2019). With the current trend of using drones to engage targets, drone operators have become the newest war generation to be susceptible to PTSD. The data in this thesis show that the three main causes of PTSD in UAV operators are a combination of overwhelming workloads, an insufficient number of pilots and operators for missions, and the lack of encouraging support (Bryant-Lees et al., 2020; Miao et al., 2018; GAO, 2015). All of these causes are interrelated. Without the use of renewed mitigation strategies within the Air Force, piloting unmanned systems will pose a threat to the psychological well-being of drone operators.

Overwhelming workloads and an insufficient number of personnel for missions go hand-in-hand when homing in on the causes of PTSD. The required number of drone pilots and operators is influenced by the growing number of missions required of the Air Force to complete (GAO, 2017). It is untenable to reduce mission requirements from a national defense standpoint, thus the Air Force must use their current personnel, despite low numbers (Bryant-Lees et al., 2020). Pilots and operators are running multiple missions in short periods of time, increasing their exhaustion, increasing their probability of experiencing a traumatic event, and decreasing the time to recover from those events. The RAND 2015 case study found that burnout is the unfortunate result of large workloads (Hardison et al., 2017). The Likert scale questionnaires of focus groups tied understaffed RPA units with grueling shiftwork. These around-the-clock working conditions can cause psychological distress, despite personnel being in garrison (Hardison et al., 2017). Although reducing mission requirements is not an option, the Air Force can strengthen their efforts to increase the numbers of RPA pilots and sensor operators.

Increasing the number of pilots and operators comes down to two aspects: recruitment and retention. The Air Force needs a positive flow of new recruits into the RPA pilot and RPA sensor operator Air Force Specialty Codes (AFSC). The GAO (2017) encouraged the Air Force to change their efforts to address personnel shortages, but at this current time the Air Force does not have adequate numbers. The current requirements for qualification outlined by the U.S. Air Force (n.d.) are strict to ensure competence, but this decreases the selection pool amongst applicants. Reviewing the limitations of collective guidelines from ASVAB scores, background checks, and prior military education can increase recruitment and ultimately focus more on potential individuals completing the AFSC school training requirements.

On the other hand, the low retention rate is the other part of insufficient amounts of pilots and operators. The Military Medicine 2020 case study highlighted those shortages in personnel result in long work shifts, lack of sleep, and lack of exercise for military members in the 18-25 year age group (Bryant-Lees et al., 2020). These variables can lead to burnout, which then leads to high turnover rates among the younger members without intervention. In this age demographic, the study showed prevalent signs of psychological distress and career disinterest (Bryant-Lees et al., 2020). Developing issues such as these at an early age hinders one's career advancement, adding to the low retention rates (Bryant-Lees et al., 2020).

In addition to the workloads and shortages, another cause of PTSD development in pilots and operators is the lack of encouraging support in the community. This support can be external, commanders caring and genuinely checking in with their operators, and internal, operators feeling encouraged enough to ask for help. The statements collected in the RAND 2015 case study showed that leadership only focused on the mission, without much concern for the welfare of their subordinates (Hardison et al., 2017). It is a commander's job to focus on the mission, but also on the personnel completing the mission. Another subordinate stated "[leaders]who come from other flying units arrive with an idea or mentality of how things should work. Do it my way even though it may not work" (Hardison et al., 2017, p. 41). Some commanders are not acknowledging the feedback of

their subordinates and that can lead to a poor working atmosphere, on top of strenuous working conditions.

Without encouraging leadership, it is difficult for pilots and operators to feel free to open up about their mental stress from the job. The Journal of Military and Veteran's Health 2017 case study found that pilots and operators felt that using mental health services was discouraged by their commanders (Wallace & Costello, 2017). They were also worried about being viewed as weak and harmful effects on their career (Wallace & Costello, 2017) if they ever spoke out about their psychological distress. Many individuals afflicted with PTSD do not want to make it public as shown in the Health and Human Rights 2020 case study (Baker et al., 2020). Most would rather keep it private and find their own way to deal with their mental status (Baker et al., 2020). One sensor operator attempted to get treatment from counselors, but instead was only told to "busy [him]self with other things (Pons, 2017, p. 1)" to avoid thinking about the traumatic event. RPA pilots and sensor operators lack the necessary support to seek help in times of mental suffering.

Overwhelming workloads, insufficient number of RPA pilots and sensor operators, and the lack of encouraging support are the reoccurring causes of PTSD. In the next section, the Recommendations outline ways the Air Force and DOD as a whole can mitigate PTSD development in pilots and operators of unmanned systems.

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VII. RECOMMENDATIONS, FUTURE WORK, AND CONCLUSION

A. RECOMMENDATIONS FOR THE AIR FORCE

1. Workload and Insufficient Number of Personnel

The ultimate recommendation for mitigation for UAV operators with PTSD is for intervention before pilots and operators become a PTSD statistic. Initial intervention starts at restructuring qualifications for RPA pilots and sensor operators so that potential recruitment increases. The Air Force needs a positive flow of military members into the drone AFSC community. By filling the gaps between supply and demand, the services that rely on drone missions can ease the conditions that push operators toward developing PTSD symptoms due to burnout and mental distress (Hardison et al., 2017). The hours demanded of operators do not give them time to clear their heads, process stress, or seek help with what they have experienced. It does not allow them time to spend with family, even though that is supposedly a benefit of being a dwell-in-garrison operator (Hardison et al., 2017). Increasing recruitment can potentially decrease burnout and mental distress suffered by pilots and operators already in the field.

2. Shiftwork

Expanding UAV bases to areas in different time zones keeps a base from having to run three shifts, thus shiftwork. Shiftwork is another issue that defeats the purpose of dwell-in-garrison if the operators are still not able to spend time with family (Hardison et al., 2017). When an operator is home, he or she is expected to engage with and participate in family engagements, but when the operator worked a 10-to-12-hour night shift, the operator struggles to meet the demands of the family (Hardison et al., 2017). This causes friction with relationships, thus stress on the operator. The operator would most likely try to meet the demands of both the family and job, thus lack of sleep, psychological disorientation, emotional imbalance (mood swings) (Hardison et al., 2017),

Another option is to follow the lead of fire departments with four days on, four days off. The operators would dwell-in-place at the base during their four-day shifts, thus getting

the rest they need and removing the burden of trying to appease the demands of two separate forces. Families can adapt and make alternative plans when they know their loved one is away. This is the cheaper alternative since the armed forces would not have to spend extra funding on additional bases.

3. Encouraging Support and Counseling

It is imperative that leadership take a more active role in looking out for their subordinates' welfare. That starts with setting a command climate that welcomes personnel to discuss any mental distress without the fear of losing their job. Commanders have the ability to encourage and empower subordinates to extinguish the chance of them feeling weak or inferior to their peers. The Journal of Military and Veteran's Health 2017 and Military Medicine 2020 case studies both discuss the significant of long-term monitoring (Wallace & Costello, 2017; Bryant-Lees et al., 2020). The leadership plays an important role in mitigating PTSD by also monitoring their subordinates' mental health. Commanders should be able to step in with enough time to recommend counseling before the psychological distress becomes too serious.

This thesis discusses multiple options for counseling and debriefing that the Air Force can use. Relevant and plausible research studies for counseling include CISM (Swab, 2020), Affect Labeling (Torre & Lieberman, 2018), weekly group sessions, and one-on-one sessions for operators after experiencing a traumatic event using the Likert Scale (Trochim, 2020). It is recommended that the Air Force make these resources available for RPA pilots and operators. Implementing mandatory weekly group sessions for defusing and debriefing, physical testing (cortisol levels), and time (e.g., normal workdays, no shiftwork, etc.) can have positive effects on the Air Force.

4. Cortisol Testing and Therapy

More research is needed in cortisol testing and therapy. Thus far, urinal and cheek swab testing proved promising, but it needs to be expanded to larger test groups (Pan et al., 2020). If UAV facilities could test incoming pilots' and operators' cortisol levels and compare them with periodic tests every three months, drops in cortisol levels could signal that an operator possibly needs an intervention. The intervention could be time off (not

demoting or retiring) with counseling. When retesting shows a normal cortisol level, the operator could resume UAV responsibilities.

Cortisol therapy also needs to be further researched. The therapy is still new but has shown positive results thus far using a high dose of mifepristone (RU-486), a glucocorticoid receptor blocker to increase cortisol levels (Pan et al., 2020). This treatment has not been expanded to PTSD patients enough to know if it would help deter PTSD symptoms. Trial studies would need to be held to see if the rise in cortisol levels remains stable, thus the HPA axis being able to properly function. Trial studies also need to show how long the treatment would last and whether it would have side effects in other areas. Since the pituitary gland is part of the HPA axis, there needs to be further research as to whether this would have a negative effect on both male and female operators concerning future fertility (Pan et al., 2020).

5. Training

Training should be the one thing no armed force agency should have to think twice about. Military machinery is expensive and budgets are prone to cuts periodically so every penny counts. Those in charge of recruits or new personnel should naturally have a plan set with the understanding that no one is placed in a position of operation that has not fully completed every aspect of training. The more training an operator has, the more confidence the operator has. From what operators have stated about pixilation and not fully understanding what they are looking at (Hardison et al., 2017), the more training they have, the better their chances of learning subtle cues that might help them keep from striking incorrect targets. This has the ability to decrease PTSD development.

B. FUTURE WORKS

Initially, this thesis aimed to interview active and retired UAV operators who have been diagnosed with PTSD. Initial steps were taken to reach out to medical centers across Air Force bases, such as Beale Air Force Base, in hopes to get in contact with psychologists. The Veterans Affairs Palo Alto Health Care System clinic in Marina, CA can be a local source of expertise to talk to psychologists specializing in PTSD treatment.

Unfortunately, time and circumstances did not allow for sufficient research using this method.

The qualitative study would gather up to date information to see the experiences that lead to PTSD development in drone operators. Interviews with medical professionals can also be used to gather insight into PTSD development and mitigation methods that intervene in PTSD development. Below are questions I designed to ask interviewees:

1. *Can you tell me how you developed PTSD?*
2. *After the event, did you notice any immediate effects after the traumatic experience (within 2 weeks)?*
3. *What were the short-term effects after the experience (within 1 year)?*
4. *What were the long-term effects after the experience (longer than 1 year)?*
5. *Did you notice any delayed effects from the experience?*
6. *How has this event impacted your work life (either in the military or post military work)?*
7. *How has this event impacted your family life?*
8. *How has this event impacted your social life?*
9. *Can you please tell me what methods were used for your recovery and/or management of PTSD?*
10. *How would you evaluate the effectiveness of that process?*
11. *Would you change, add, or improve anything specific toward this process?*
12. *Were there any practices on duty that were used to mitigate PTSD after missions?*
13. *What would you recommend to commanders and drone pilots to mitigate PTSD?*

These questions were quality checked by a psychologist to ensure appropriateness and sensitivity toward the interviewees. I recommend setting up safety precautions, for

example having a psychologist in the room during the interview. They should be able to determine when the interview needs to stop and will be able to tend to the interviewee immediately if necessary.

C. CONCLUSION

Drone use has been an exceptional tool for surveillance, reconnaissance, and striking targets where it would be dangerous or impossible for direct human intervention or manned aircraft. The armed forces have expanded drone use as the technology improves and have worked toward even smarter and more compact drone vehicles. However, this does not mean that there is no cost. UAV operators might not set foot in a foreign land or on a battlefield, but they are in combat and subjected to similar psychological distress as those who are physically present in combat. They are overworked and exhausted. They witness atrocities committed against innocent people and they cannot intervene. They witness the destruction of their targets and they witness death. As the Department of Defense expands its use of drones in combat without addressing the operator shortage and the psychological distress operators' experience, they leave operators vulnerable to permanent psychological damage. If intervention is not forthcoming, these operators could develop psychological disorders, such as PTSD, thus ending their careers. The Air Force then must fill the gap of outgoing operators, which is not as simple as conducting interviews and hiring.

Psychological distress that leads to PTSD can be prevented when conditions are structured with containment, intervention, and prevention in mind. Following GAO recommendations and applying scientific treatments and therapies, the armed forces have a chance to gain traction against its operator shortages without causing psychological distress to its personnel. As it is right now, the armed forces are risking the emotional and mental states of eager young people who join thinking they have a future to be proud of, but are finding out the hard way that their future is being senselessly compromised.

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LIST OF REFERENCES

Air Force Reserve. (n.d.). *Sensor operator*. Retrieved April 27, 2020, from https://afreserve.com/sensor-operator

American Psychological Association. (n.d.). Internalization. In *APA dictionary of psychology*. Retrieved April 6, 2021, from https://dictionary.apa.org

Baker, E., Stover, E., Haar, R., Lampros, A., & Koenig, A. (2020). A study of secondary trauma mitigation techniques in open source investigations. *Health and Human Rights, 22*(1), 293–304. PMCID: PMC7348432

Barth, S. K., Kang, H. K., & Bullman, T. (2016). All-cause mortality among U.S. veterans of the Persian Gulf War. *Public Health Report, 131*(6), 822–830. doi: 10.1177/0033354916676278

Blazeski, G. (2016). In 1898 Nikola Tesla tricked an entire crowd into believing they could control a boat by shouting commands—In fact, he invented Radio Control and piloted the boat himself. *The Vintage News*. https://www.thevintagenews.com/2016/10/01/1898-nikola-tesla-tricked-entire-crowd-believing-control-boat-shouting-commands-fact-invented-radio-control-piloted-boat/

Bowden, M. (2013). How the Predator drone changed the character of war. *Smithsonian Magazine*. https://www.smithsonianmag.com/history/how-the-predator-drone-changed-the-character-of-war-3794671/

Bremner, J. D. (2006). Traumatic stress: Effects on the brain. *Dialogues in Clinical Neuroscience, 8*(4): 445–461. doi: 10.31887/DCNS.2006.8.4/jbremner

Briggs, B. (2013). Why modern soldiers are more susceptible to suicide. NBC News. https://www.nbcnews.com/news/us-news/why-modern-soldiers-are-more-susceptible-suicide-flna1c8652817

Bryant-Lees, K. B., Prince, L., Goodman, T., Chappelle, W., Thompson, B. (2020). Sources of stress and psychological health outcomes for remotely piloted aircraft operators: A comparison across career fields and major commands. *Military Medicine*, https://doi.org/10.1093/milmed/usaa257

Chappelle, W., McDonald, K., Prince, L., Goodman, T., Ray-Sannerud, B., & Thompson, W. (2014). Symptoms of psychological distress and post-traumatic stress disorder in United States Air Force “drone” operators. *Military Medicine, 179*, 63–70. 10.7205/MILMED-D-13-00501.

Chekroud, A. M., Loho, H., Paulus, M., & Krystal, J. H. (2018). PTSD and the war of words. *Chronic Stress, 2*. https://doi.org/10.1177/2470547018767387

CISM International. (n.d.). *What is CISM?* Retrieved April 12, 2021, https://www.criticalincidentstress.com/what_is_cism_

Dekel, S., Tsachi, ED., Rosen, J. B., & Bonanno, G. A. (2017). Differences in cortisol response to trauma activation in individuals with and without comorbid PTSD and depression. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2017.00797

Edney-Browne, A. (2017). Embodiment and affect in a digital age: Understanding mental illness among military drone personnel. *Journal for Contemporary Philosophy* (1). https://archive.krisis.eu/embodiment-and-affect-in-a-digital-age/

Falkner, J. (2018). Leadership and overcoming obstacles. U.S. Army. https://www.army.mil/article/215137/leadership_and_overcoming_obstacles

Faram, M. D. (2020). Navy announces Expanded Operational Stress Control Program: Here are the details. U.S. Navy Office Information. https://www.navy.mil/Press-Office/News-Stories/Article/2454654/navy-announces-expanded-operational-stress-control-program-here-are-the-details/

Federal Aviation Administration. (2017). *SUBJ: Military unmanned aircraft system operators seeking credit for military experience towards FAA certificates and ratings* (National Policy. N8900.419). U.S. Department of Transportation. https://www.faa.gov/documentLibrary/media/Notice/N_8900.419.pdf

Friedman, M. J. (2019). *History of PTSD in veterans: Civil War to* DSM-5. U.S. Department of Veterans Affairs. https://www.ptsd.va.gov/understand/what/history_ptsd.asp

Giacomo, C. (2019). Suicide has been deadlier than combat for the military. *The New York Times*. https://www.nytimes.com/2019/11/01/opinion/military-suicides.html

Greenberg, M. (2018). How PTSD and trauma affect your brain functioning. *Psychology Today.* https://www.psychologytoday.com/us/blog/the-mindful-self-express/201809/how-ptsd-and-trauma-affect-your-brain-functioning

Hardison, C. M., Aharoni, E., Larson, C., Trochlil, S., & Hou, A. C. (2017). *Stress and dissatisfaction in the Air Force's remotely piloted aircraft community: Focus group findings*. https://www.rand.org/content/dam/rand/pubs/research_reports/RR1700/RR1756/RAND_RR1756.pdf

Hill, M. N., Campolongo, P., Yehuda, R., & Patel, S. (2018). Integrating endocannabinoid signaling and cannabinoids into the biology and treatment of posttraumatic stress disorder. *Neuropsychopharmacology, 43*(1), 80–102. doi: 10.1038/npp.2017.162

Inwood, E., & Ferrari, M. (2018). Mechanisms of change in the relationship between self-compassion, emotion regulation, and mental health: A systematic review. *Applied Psychology: Health and Well-Being, 10*(2), 215–235. https://self-compassion.org/wp-content/uploads/2018/05/Inwood2018.pdf

Inwood, K., Oxley, L., & Roberts, E. (2016). *Lifetime suicide risk in a representative cohort of World War I veterans*. University of Minnesota. https://pop.umn.edu/sites/pop.umn.edu/files/27.compressed.pdf

Jackman, A. (2020). Digital warfighting temporalities and drone discourse. *Digital War, 1*, 93–105. https://doi.org/10.1057/s42984-020-00003-0

Jevglevskaja, N., & Galliott, J. (2020). Airmen and unmanned aerial vehicles: The danger of generalization. *Wild Blue Yonder*. https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/2144225/airmen-and-unmanned-aerial-vehicles-the-danger-of-generalization/

Kaple, T. (2021). Top tips from nurses on dealing with burnout. *Nurse Journal*. https://nursejournal.org/resources/tips-for-avoiding-nurse-burnout/

Kang, H. K., Bullman, T. A., Smolenski, D. J., Skopp, N. A., Gahm., G. A., & Reger, M. A. (2015). Suicide risk among 1.3 million veterans who were on active duty during the Iraq and Afghanistan wars. *Annals of Epidemiology, 25*(2), 96–100. https://doi.org/10.1016/j.annepidem.2014.11.020

Kelley, M. (1999). The myth and reality of Vietnam vet suicides. *Orlando Sentinel*. https://www.orlandosentinel.com/news/os-xpm-1999-09-12-9909100393-story.html

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., Walters. E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry, 62*(6), 593–602. doi: 10.1001/archpsyc.62.6.593

Kime, P. (2020). Veteran suicide rate creeps up as VA makes new investments in prevention. *Military.com.* https://www.military.com/daily-news/2020/11/12/veteran-suicide-rate-creeps-va-makes-new-investments-prevention.html

Korody, N. (2019). Suburbicide. *Archinect*. https://archinect.com/features/article/150094126/suburbicide

Lande, G. (2011). Felo de se: Soldier suicides in America's Civil War. *Military Medicine, 176*(5), 531–6. doi: 10.7205/milmed-d-10-00340.

Lawson, T. (1840). *Statistical report of the sickness and mortality in the Army of the United States.* https://archive.org/details/statisticalrepo00lawsgoog/page/n8/mode/2up?ref=ol&view=theater&q=suicide

Linebaugh, H. (2013). I worked on the U.S. drone program. The public should know what really goes on. *The Guardian*. https://www.theguardian.com/commentisfree/2013/dec/29/drones-us-military

Lisle, D. (2019). Making safe: The dirty history of a bomb disposal robot. Security Dialogue. https://doi.org/10.1177/0967010619887849

Matto, M., McNiel, D. E., & Binder, R. L. (2019). A systematic approach to the detection of false PTSD. *Journal of the American Academy of Psychiatry and the Law, 49*(1). DOI: https://doi.org/10.29158/JAAPL.003853-19

Maucione, S. (2017). Air Force, Army strategy flies too low on drone pilot shortage. *Federal News Network*. https://federalnewsnetwork.com/defense/2017/01/air-force-army-strategy-flies-low-drone-pilot-shortage/

Maucione, S. (2019). New study shows grim outlook for future of Air Force pilot shortage. *Federal News Network*. https://federalnewsnetwork.com/reporters-notebook/2019/04/new-study-shows-grim-outlook-for-future-of-air-force-pilot-shortage/

McCammon, S. (2017). The warfare may be remote but the trauma is real. NPR. https://www.npr.org/2017/04/24/525413427/for-drone-pilots-warfare-may-be-remote-but-the-trauma-is-real

McKinney, J. M., Hirsch, J. K., & Britton, P. C. (2017). PTSD symptoms and suicide risk in veterans: Serial indirect effects via depression and anger. *Journal of Effective Disorders, 214*, 100–107. https://doi.org/10.1016/j.jad.2017.03.008

Meijer, M., & Weerts, J. M. P. (2004). Suicide among veterans: Research, models and data. *RTO-MP-HFM-108*. https://apps.dtic.mil/sti/citations/ADA433570

Merriam-Webster. (n.d.). Mitigation. In *Merriam-Webster.com dictionary*. Retrieved April 25, 2021, from https://www.merriam-webster.com/dictionary/mitigation

Miao, X. R., Chen, Q. B., Wei, K., Tao, K. M., & Lu, Z. J. (2018). Posttraumatic stress disorder: From diagnosis to prevention. *Military Medical Research, 5*(32). https://doi.org/10.1186/s40779-018-0179-0

Military History Now. (2012). War by remote control—2,500 years of unmanned vehicles. https://militaryhistorynow.com/2012/09/09/war-by-remote-control-2500-years-of-unmanned-vehicles/

Morawetz, C., Bode, S., Baudewig, J., & Heekeren, H. R. (2017). Effective amygdala-prefrontal connectivity predicts individual differences in successful emotion regulation. *Social Cognitive and Affective Neuroscience, 12*(4), 569–585. https://doi.org/10.1093/scan/nsw169

National Institute of Mental Health. (2020). *Post-Traumatic stress disorder: What is post-traumatic stress disorder, or PTSD?* https://www.nimh.nih.gov/health/publications/post-traumatic-stress-disorder-ptsd/index.shtml

Novotney, A. (2020). Stopping military and veteran suicides. *American Psychological Association, 51*(1), 32. https://www.apa.org/monitor/2020/01/ce-corner-suicide

Pan, X., Kaminga, A. C., Wen, S. W., Wang, Z., Wu, X., & Liu, A. (2020). The 24-hour urinary cortisol in post-traumatic stress disorder: A meta-analysis. *PLOS ONE*. https://doi.org/10.1371/journal.pone.0227560

Pawlyk, O. (2020). The Air Force risks a drone pilot shortage, GAO finds. Military.com. https://www.military.com/daily-news/2020/06/26/air-force-risks-drone-pilot-shortage-gao-finds.html

Pediatric Endocrine Society. (2018). Pediatric endocrinology fact sheet / adrenal insufficiency: A guide for families. American Academy of Pediatrics. http://pedsendomd.com/wp-content/uploads/2018/04/Adrenal-Insufficiency.pdf

Pons, A. (2017). A former pilot's silent struggle. Air Force's Personnel Center. https://www.afpc.af.mil/News/Article-Display/Article/1246712/a-former-pilots-silent-struggle/

Psychology Today. (n.d.). Emotion regulation. https://www.psychologytoday.com/us/basics/emotion-regulation

Rosa, G. C., Marques, M. M., & Lobo, V. (2016). Unmanned aerial vehicles in the Navy: Its benefits. *Sci. Bull. Nav. Acad, 19*(1), 39-43.

Salavera, C., Usán, P., & Teruel, P. (2019). The relationship of internalizing problems with emotional intelligence and social skills in secondary education students: gender differences. *Psychology: Reflection and Criticism, 32*(4). https://doi.org/10.1186/s41155-018-0115-y

Schultebraucks, K., Qian, M., Abu-Amara, D., Dean, K., Laska, E., Siegel, & Marmar, C. R. (2020). Pre-deployment risk factors for PTSD in active-duty personnel deployed to Afghanistan: A machine-learning approach for analyzing multivariate predictors. *Molecular Psychiatry*. https://doi.org/10.1038/s41380-020-0789-2

Shane, L. (2019). Historic data on military suicide shows no clear link with combat operations. *Military Times*. https://www.militarytimes.com/news/pentagon-congress/2019/12/13/historic-data-on-military-suicide-shows-no-clear-link-with-combat-operations/

Shatté, A., Perlman, A., Smith, B., & Lynch, W. D. (2017). The positive effect of resilience on stress and business outcomes in difficult work environments. *Journal of Occupational and Environmental Medicine, 59*(2), 135–140. doi: 10.1097/JOM.0000000000000914

Singer, P. W. (2009). Wired for war: The robotics revolution and conflict in the twenty-first century. New York: Penguin Press.

Sisk, R. (2017). Some vets with PTSD are scamming the VA: Testimony. Military.com. https://www.military.com/daily-news/2017/06/08/some-vets-with-ptsd-are-scamming-va-testimony.html

Skinner, R., & Kaplick, P. M. (2017). Cultural shift in mental illness: a comparison of stress responses in World War I and the Vietnam War. JSRM Open. *Journal of the Royal Society of Medicine, 8*(12). https://doi.org/10.1177/2054270417746061

Smith, J. A., Doidge, M., Hanoa, R., & Frueh, B. C. (2019). A historical examination of military records of U.S. Army suicide, 1819 to 2017. *JAMA Netw Open 2*(12):e1917448. doi:10.1001/jamanetworkopen.2019.17448

Strauss, M. (2020). The Navy's drone fleet is growing. *Air & Space Magazine*. https://www.airspacemag.com/military-aviation/command-and-control-sea-180974477/

Substance Abuse and Mental Health Services Administration. (2018). Children and youth in the United States are frequently exposed to traumatic experiences. *U.S.* Department of Health & Human Services. https://www.samhsa.gov/sites/default/files/brief_report_natl_childrens_mh_awareness_day.pdf

Substance Abuse and Mental Health Services Administration. (2020). Reducing toxic stress in childhood. U.S. Department of Health & Human Services. https://www.samhsa.gov/homelessness-programs-resources/hpr-resources/reducing-toxic-stress-childhood

Swab, J. (2020). Critical incident stress management: Perspectives on its history, frequency of use, efficacy, and success. *Crisis, Stress, and Human Resilience: An International Journal, 1*(4). https://www.crisisjournal.org/article/12211-critical-incident-stress-management-perspectives-on-it-s-history-frequency-of-use-efficacy-and-success

Teeters, J. B., Lancaster, C. L., Brown, D. G., & Back, S. E. (2017). Substance use disorders in military veterans: prevalence and treatment challenges. *Substance Abuse and Rehabilitation, 8*, 69–77. https://doi.org/10.2147/SAR.S116720

Torre, J. B., & Lieberman, M. D. (2018). Putting feelings into words: Affect labeling as implicit emotion regulation. *Emotion Review, 10*(2), 116–124. doi:10.1177/1754073917742706

Traynham, S., Kelley, A. M., Long, C. P., & Britt, T. W. (2019). Posttraumatic stress disorder symptoms and criminal behavior in U.S. Army populations: The mediating role of psychopathy and suicidal ideation. *The American Journal of Psychology, 132*(1), 85–95. https://doi.org/10.5406/amerjpsyc.132.1.0085

University of Houston. (n.d.). CAPS defusing and debriefing process. *Counseling and Psychological Services*. https://uh.edu/caps/crisis-intervention/defusing-debriefing-process/index

U.S. Air Force. (n.d.). Remotely piloted aircraft pilot. Retrieved April 7, 2021, https://www.airforce.com/careers/detail/remotely-piloted-aircraft-pilot

U.S. Department of Veterans Affairs. (n.d.). Suicide risk and risk of death among recent veterans. *Public Health*. https://www.publichealth.va.gov/epidemiology/studies/suicide-risk-death-risk-recent-veterans.asp

U.S. Government Accountability Office. (2015). Unmanned aerial systems: Actions needed to improve DOD pilot training https://www.gao.gov/assets/gao-15-461.pdf

U.S. Government Accountability Office. (2017). Unmanned aerial systems: Air Force and Army should improve strategic human capital planning for pilot workforces. https://www.gao.gov/products/gao-17-53

U.S. Government Accountability Office. (2020). Unmanned aerial systems: Air Force should take additional steps to improve aircrew staffing and support. https://www.gao.gov/products/gao-20-320

U.S. National Library of Medicine. (n.d.a). Statistical report on the sickness and mortality in the Army of the United States: compiled from the records of the Surgeon General's Office: Embracing a period of sixteen years, from January 1839 to January 1855. Digital Collections. https://collections.nlm.nih.gov/catalog/nlm:nlmuid-101523692-bk

U.S. National Library of Medicine. (n.d.b). Statistical report on the sickness and mortality in the Army of the United States: compiled from the records of the Surgeon General's Office: embracing a period of five years, from January 1855 to January 1860. Digital Collections. https://collections.nlm.nih.gov/catalog/nlm:nlmuid-101523698-bk

Venki. (2017). An exciting trip through the history of RC cars. *Product 145*. https://product145.com/history-of-rc-cars/

Walimbe, S. (2020). The role of autonomous unmanned ground vehicle technologies in defense applications. Aerospace and Defense Technology. https://www.aerodefensetech.com/component/content/article/adt/features/articles/37888

Wallace, D., & Costello, J. (2017). Eye in the sky: Understanding the mental health of unmanned aerial vehicle operators. *Journal of Military and Veterans' Health, 25*(3). 36–41. https://jmvh.org/wp-content/uploads/2017/10/AMMA-JMVH-July-2017_print.pdf

Werner, A., Kreutzmann, U., Glowka, S., & Schinkel, C. (2020). The new quality of aviation unmanned aerial vehicles (UAV) prevent psychological stress of military drone operators. *Clinical Medicine Research*, 9(1), 25-30. doi:10.11648/j.cmr.20200901.15

Wimm, S. E., & Sinha, R. (2019). Drug-induced stress responses and addiction risk and relapse. *Neurobiology of Stress, 10*. https://doi.org/10.1016/j.ynstr.2019.100148

World Health Organization. (2019). Burn-out an "occupational phenomenon": International Classification of Diseases. https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases

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