The Effect of PTSD on Light Attack Aircraft and Unmanned Aerial Vehicle Pilots

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

David Gibbs

Spring 2020

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Sean M. Ferguson, Department of Engineering and Society

The Effect of PTSD on Light Attack Aircraft and Unmanned Aerial Vehicle Pilots

Introduction

Posttraumatic stress disorder (PTSD) was first recognized as a disorder in 1980, published in the Diagnostic and Statistical Manual of Mental Disorders (DSM-lll), after having origins from world war one and two commonly referred to as 'shell shock' (Crocg, M & Crocg, L, 2000). The Veterans Affairs office (VA) reports about thirteen percent of veterans who served in Operation Iraqi Freedom, Enduring Freedom, Gulf War, or the Vietnam War are diagnosed with PTSD (VA.gov, 2018). Conventional pilots, persons who are physically located in the cockpit of an aircraft they are in control of, and UAV (unmanned arial vehicle) pilots, persons who are not located in the cockpit of the aircraft they are in control of, both control aircrafts that can enforce damage on the enemy. Considering different conventional and UAV pilots experiences and studies, how do the diverse experiences of each type of pilot manifest as PTSD?

Mission Profiles

First and foremost, it is important to understand how conventional and UAV pilots compare, in order to understand their distinct mission profiles. Conventional pilots are limited to both the aircraft and their human nature. Conventional aircrafts are designed under different fundamental constraints than UAVs, the main one being housing at least one pilot. Incorporating a cockpit into an aircraft takes up a significant amount of volume and weight. One of the driving design parameters is weight when talking about aircrafts, so by inserting a cockpit the overall performance of the aircraft weakens. Secondly, conventional pilots are restricted by their own human limitations. Such limitations consist of how many g forces (gravitational forces) a pilot

can withstand through a corner. G forces are the forces exerted on the pilot and aircraft when the aircraft changes direction. Fighter pilots must withstand the greatest amount of g forces since fighter jets must perform the most g force intensive maneuvers in dogfights. A typical fighter pilot can endure up to 9 g forces and if they are wearing a g force suit, they can withstand these forces for a longer period of time. G force suits constrict pilot's legs so that when they maneuver the aircraft the blood does not all rush out of their head and result in them losing consciousness (Fosdick, 1988). On the other hand, UAV designs are not restricted by incorporating a pilot or limiting acrobatic maneuvers to a human g force constraint. This allows for a much more diverse mission profile UAVs could potentially perform.

Conventional pilots have very distinct mission profiles than UAV pilots because of the aircrafts different capabilities mentioned earlier. Conventional light attack aircrafts (LAA) missions are to strike strategic ground installations and provide close air support for troops on the ground. These missions last only a few hours since fuel quickly becomes an issue. However, mid air refueling is an option if the LAAs mission requires them to stay in the air for longer periods but refueling over combat zones is avoided. Therefore, generally LAA mission objectives consist of the aircrafts flying to deliver a strategic strike or to provide close air support for a given amount of time. In contrast, UAVs are not limited to certain design restraint like a cockpit, so their endurance, maximum time spent flying, in much longer. Additionally, UAV pilots can optimize their efficiency by switching shifts since they are not physically in the aircraft. This allows for duration of the mission profiles to supersede that of a LAA. The first UAV the United States used extensively, the MQ-1 Predator, was able to fly 460 miles to a target, loiter for twenty-four hours then return to base on one tank of gas (Ouma & Chappelle &

Salinas, 2011). UAV pilots are relayed an assortment of different sensor readings, like conventional pilots, but they have more advanced ground reconnaissance feeds they use to study points of interests (F-22 Raptor, 2015) (MQ-1B predator, 2015). These tools help to create the mission profile seen with most UAV pilots where they will loiter over a point of interest, study it, then either deliver a strike call off the mission or send in another UAV to take over for the fuel depleted one. Consequently, the main difference in mission profiles is the duration and objective of each aircraft.

PTSD research and tests

UAV Pilots

The first example of a test to determine whether UAV pilots are susceptible to PTSD was conducted in 2012 where six women and twenty-four men were split into two groups. The experimental group controlled a UAV simulated strike on multiple targets, then they watched a video of the aftermath. The control group did not control the simulated UAV strikes, but they watched the same aftermath videos. Once each group was finished with their respective task, they were asked to fill out a questionnaire. This questionnaire determined their distress level. They found that the experimental group showed a significantly higher distress level for both genders compared to the control group. Additionally, females were found to have a higher distress level than males, but it is worth noting female participants were limited compared to male (Lowe & Gire, 2012). The lack of female participants weakens their data's credibility since there was only a fourth of them compared to male participants so any claims on gender differences are taken with a grain of salt. Matthiesen and Einarsen (2010) claim that high distress levels correspond with the likelihood of PTSD symptoms. Lowe and Gires study support the idea

that carrying out a UAV strike directly correlates with higher distress levels leading to greater PTSD diagnoses.

Moreover, 'Symptoms of Psychological Distress and Post-Traumatic Stress Disorder in United States Air Force "Drone" Operators' sheds light on how active military UAV pilots respond to a questionnaire which determines their distress levels and PTSD symptoms (Chappelle, McDonald, Prince, Goodman, Ray-Sannerud & Thompson, 2014). The study consisted of 1,094 Predator/Reaper UAV pilots which spanned across 17 different squadrons base in the United States. This was a total of about 49% of the total UAV pilots at the time. Participation was voluntary and anonymous to help with the validity of the responses and to mitigate self-disclosure. The participants first filled out a demographic's questionnaire for the purposes of correlating different demographics with whether they were at high risk or not for PTSD once they cross analyzed the questionnaires. The second questionnaire contained 45 questions answered on a five-point scale, 0 being never and 5 being almost always. Once all the data was collected, they found that 22% of participants experience high distress symptomology and 12% of participants experienced high PTSD symptomology. Some of the leading responses which indicated PTSD where about long hours, rotating shift work, low unit manning and deployed in-garrison status. Long hours and too few pilots combined with rotating shifts induce fatigue in the pilots which in turn amount to higher distress levels. Also, since UAV pilots are not deployed out of the country, they will still have most of the obligations as typical soldiers on the home front, so carrying out everyday tasks while still having to fly long hours produces a highly stressful environment. This article helps to provide an insight into how UAV pilots work environment facilitates high stress scenarios where PTSD is fostered.

Conventional Pilots

It is reasonable to assume that conventional pilots experience PTSD since they are in danger flying over enemy territories or in combat. The question is just how susceptible are they to PTSD and where does it stem from? This next study 'Common Mental Disorders Among US Army Aviation Personnel: Prevalence and Return to Duty' illuminates on the rate of conventional pilots that experience or are experiencing PTSD. The study considered a five-year period, 2010 to 2015, and examined the number of Army aviation personnel who were diagnosed with a menta disorder, including PTSD. Since this was in the Army's AERO database, a database that collects information on the Army's aviation personnel health, this information was readily approved for the study. They broke the aviation personnel into three groups, Pilots, air transport command (ATC) and unmanned aerial systems (UAS) operators. UAS operators are not going to be considered part of the UAV pilots' category due to the lack of description provided in the article about their operations. Nevertheless, 24,450 Army pilots were in operation during the five-year time frame studied, 298 pilots were diagnosed with PTSD. Specifically, 2% of Army pilots were diagnosed with PTSD between 2010 and 2015. The study also reflects whether the pilots may return to active duty after their diagnosis. PTSD was only waved 43% of the time after a diagnosis (Britt, McGhee, & Quattlebaum 2018). The fact that only 43% of pilots diagnosed with PTSD are able to return to active duty possess an obstacle for active duty pilots to get the help they need and may be way this study only has 2% of Army pilots diagnosed with PTSD.

Additionally, a retrospective study was conducted in 2013, which analyzed both conventional and UAV pilots and how mental health affected them. One of the subsets of mental health in their case was PTSD. The study was conducted through gathering data from October 1st 2003 to December 31st 2011, 709 service members were UAV pilots and 5,256 were

conventional pilots. They calculated PTSD incident rates for UAV and conventional pilots and found that UAV pilots are just a susceptible to PTSD as conventional pilots' (Otto, 2013). This helps to answer the question that both sets of pilots are at the same risk level as the other for PTSD. However, it does not indicate how PTSD is manifested between the two sets of pilots, so emphasis must be put on pilots' personal experiences.

PTSD on a personal level

The prior section sheds light on the fact that both conventional and UAV pilots are prone to PTSD. However, determining what the source of the trauma is has not been determined. The focus is now on what are key differences between the two groups of pilot's operations. Earlier articles such as, Chappelle, McDonald, Prince, Goodman, Ray-Sannerud & Thompson's study on UAV PTSD explored different scenarios that produced high stress environments. These are circumstances like, long work hours, shift changes and deployment status. Comparing these UAV pilot to conventional pilot environments will help polarize them and reveal where PTSD manifests for UAV pilots.

UAV Pilots Flying Cycle

Taking a deeper dive into UAV pilots' lifestyle, majority of the time they are operating they are doing surveillance on specific targets. For instance, a UAV will loiter high above a village and take note of specific instances while conversing with intelligence officers to help identify persons of interest. As mentioned before, once a UAV has depleted its fuel another may come in and take its loitering position. This can create long hours for UAV pilots since they are essential for ground troops halfway around the world to carry out their mission. This cycle may go on for hour, days, or weeks at a time, then the UAV may deliver an air-to-ground strike. UAV pilots are subjected to sustain multiple twenty-four hour plus shifts (Ouma & Chappelle &

Salinas, 2011). A common UAV, MQ-9 Reaper, is equipped with two hardpoints which can carry laser guided missiles and bombs. Unlike a conventional pilot the UAV pilot sees the repercussions of their strike and how the villagers, they have been watching for weeks on end, are affected (Ricks, 2014). As seen from Lowe & Gire's study the act of lunching the strike and watching the aftermath is a lot more tolling on the pilot than just watching the aftermath. This strenuous operating schedule is compounded with everyday stresses of being at home and other administrative tasks non-deployed military personnel most complete. Often these non-flying tasks are assigned without consideration of the overall work load it will entail leaving the UAV pilots in distress. Chappelle, McDonald, Prince, Goodman, Ray-Sannerud & Thompson study showed that on average 35% of UAV pilots worked greater than 50-hour work weeks. One of the leading causes of a high stress environment is when UAV pilots work six-day work week 50 plus hour with 12 hour shifts four days in a row. On top of that uncertain rotating day and night shifts to sustain around the clock operation adversely effects UAV pilots. In essence, high stress situations for UAV pilots stem from studying and fighting upon points of interest for extended periods, extremely long and unpredictable work hours, and having all of the responsibilities non-deployed military personnel have.

UAV pilots flying cycle has led to record number of pilots dropping in 2105 (Chatterjee, 2015). Media around the UAV pilots is poor, and they have even been described as fighting a "coward's war" since they are never in the line of combat. In 2015 about 180 new UAV pilots join annually, but 240 quit that year. Pilots have come forward and said that they quit since they were treated as second class citizens by their Air Force peers, over worked and announced symptoms of PTSD. The effect of UAV pilots flying cycle and peer acceptance has led to record numbers of them quitting.

Conventional Pilots Flying Cycle

Conventional pilots undergo a very different type of deployment cycle than UAV pilots since they get deployed out of the United States and typically into a combat zone. Most recently, a common place for conventional pilots to be deployed to would be either Iraq or Afghanistan. Specifically, Bagram Airfield is one of the main airbases in Afghanistan the United States Air Force and other branches use. There are four main components to the Air Forces deployment schedule for troops, including pilots. First, is the pre-deployment phase when a squadron is assigned an overall mission to complete. Troops will then spend the next few weeks preparing for said mission. Next is the deployment, these can last anywhere from four to twelve month for Air Force members. While deployed the military members family has numerous resources provided by the military to help them thrive while their loved one is deployed. Such resources are placed for the soul purpose of reducing stress on both the family and the military member. Next in the deployment process is reintegration, this phase lasts 30 days prior to returning home and 30 days after returning home. The main objective of this step in the deployment process is to reunite the family back together, or if they do not have a family then to reaccommodate the single solider back to everyday life. Coming back from a combat zone can be difficult for most, but this step helps the process. Finally, is the post-deployment phase which begins 30 days after returning home and lasts for 180 days. This phase puts more of an emphasis on reconnecting family member with some days off and less strenuous work schedule for the duration of 180 days (Home, n.d.). While on deployment the conventional pilots work long hours and are placed in combat zones. Just being deployed to a base can create a high stress environment, but also leaving the base and flying over/through enemy fire compounds the stress levels. Altogether, conventional pilots know that their family is being taken care of on the home front, and they

have 180 days to readjust to regular life with a lessened workload, but put their lives in danger when deployed to combat zones.

Key differences

Regardless of whether pilots operate UAVs or conventional aircrafts the working environment is intense and can lead to traumatic experiences. These traumatic experiences are manifested in the everyday life of each pilot. The pilot's personal experiences vary in three facets broken down into, their respective deployment status, potential for physical harm or death, and workload and hours.

The first main difference is conventional and UAV pilots have very different deployment statuses. Conventional pilots are deployed for four to twelve months at a time while UAV pilots typically do not deploy and stay at which ever base, they are stationed at. This key difference rases some concern for the UAV pilots that very frequently must rotate between controlling an aircraft that's mission is to strike strategic locations and being at home with their family. On the other hand, conventional pilots are told in advance when they will deploy and their overall mission, then deploy for a few months and come home. While deployed the military has setup programs to help take care of their loved ones so they can focus on the mission. Once they return home the workload is lessened, and they get to reconnect with their loved ones. UAV pilots do not have the luxury of having their family taken care of since they are technically not deployed. PTSD then comes from the high stress environment created by not only controlling an aircraft designed to kill but also the frequent switch mentality of controlling it daily for UAV pilots. Conventional pilots are left with more notice and preparation to switch on and off this mentality leaving them with lessened prolonged periods of highly stressful work environments.

Another difference in pilot experience comes from the psychological stress put on a pilot when they are in an aircraft. Whether they are training or in combat conventional pilots take a risk of being injured or even killed when flying their aircraft. During the Gulf War it was predicted 5% of F-117 Nighthawks bombing Bagdad would be shot down. Thankfully, this was not the case as none of the F-117 Nighthawks were shot down but know this prediction as a pilot going into combat creates a massive amount of pressure and stress (Tirpak, 2021). However, UAV pilots do not leave the ground when operating their aircrafts, so the risks conventional pilots face are non-existent for them. From firsthand experience, even conventional pilots conducting training missions can be dangerous. My father, David A Gibbs, passed away in 1999, due to a mechanical malfunction, while carrying out an Apache AH-64 training mission in Kosovo for the purposes of preparing for the Albanian genocide. Since then, military aviation is still questioned as for how safe it really is, but to retain the strongest air superiority conventional pilots must fly. Consequently, conventional pilots will always have death looming over their heads while flying creating stressful environments and UAV pilots will not.

Lastly, UAV pilot's workload is much higher than conventional pilots who are given more time to prepare for their workweek. Yes, conventional pilots work long hours, but when they are not deployed fucus is on training and not to fatigue the pilot. While deployed conventional pilots may work longer hours than the average UAV pilot, but only for short periods as, their aircrafts cannot remain in the air like a UAV. UAV pilots will have all the same responsibilities as other military members on a base, so it compounds with their already tolling workload. In fact, since the mission of the UAV is determined by what is going on halfway around the world, they will be on standby all hours of the day. UAV pilots frequently must switch between the day and night shifts, leading to lack of sleep. Not getting enough sleep can

create stressful situations. Although, conventional pilots have more predictable schedules, they still deal with stressful situations stemming from long work hours, but UAV pilots tend to get the worst of it.

Ultimately, both pilots are just as much at risk for PTSD as the other, but each manifest from different high stress aspects of their mission. UAV pilots work long unpredictable hours on the home front constantly switching combat mentalities which facilitate PTSD prone environments. While conventional pilots risk their lives to complete their training and combat mission. Both are extremely admirable careers that put military personal at risk for PTSD.

References

Crocq, M. A., & Crocq, L. (2000). From shell shock and war neurosis to posttraumatic stress disorder: a history of psychotraumatology. Dialogues in clinical neuroscience, 2(1), 47–55. https://doi.org/10.31887/DCNS.2000.2.1/macrocq

VA.gov: Veterans Affairs. (2018, September 13). Retrieved April 06, 2021, from https://www.ptsd.va.gov/understand/common/common_adults.asp

Fosdick, J., & School Of Aerospace Medicine Brooks Afb Tx. (1988, January). High-g training for fighter aircrew. Retrieved April 06, 2021, from https://apps.dtic.mil/sti/citations/ADA196171

Ouma, J., Chappelle, W., Salinas, A., & School Of Aerospace Medicine Wright Patterson Afb Oh. (2011, January). Facets of Occupational BURNOUT Among U.S. Air Force active

duty and national Guard/reserve MQ-1 predator And MQ-9 REAPER OPERATORS. Retrieved April 06, 2021, from https://apps.dtic.mil/sti/citations/ADA548103

F-22 Raptor. (2015, September 23). Retrieved May 04, 2021, from https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104506/f-22-raptor/

MQ-1B predator. (2015, September 23). Retrieved May 04, 2021, from https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104469/mq-1b-predator/

Lowe, M., & Gire, J. (2012). In the mind of the predator: The possibility of psychological distress in the drone pilot community. Retrieved 2020, from https://scholar.utc.edu/cgi/viewcontent.cgi?article=1202&context=mps

Matthiesen, S., & Einarsen, S. (2010). Psychiatric distress and symptoms of PTSD among victims of bullying at work. Retrieved November 05, 2020, from https://www.tandfonline.com/doi/full/10.1080/03069880410001723558?casa_token=Pg4KWFliidUAAAAA%3Aj-obHEgDUewHxQFqkBkp-1pxEAKs4VKv1wUXfGHx4U8jVMM7vsOpXGZ0Cg4fAjJeeGi63qZC5n_7

Chappelle, W., McDonald, K., Prince, L., Goodman, T., Ray-Sannerud, B., & Thompson, W. (2014, August 01). Symptoms of psychological distress AND post-traumatic stress disorder in United States Air Force "DRONE" OPERATORS. Retrieved April 06, 2021, from https://academic.oup.com/milmed/article/179/suppl_8/63/4210169?login=true

Britt, T. W., McGhee, J. S., & Quattlebaum, M. D. (2018). Common mental disorders among US Army aviation PERSONNEL: Prevalence and return to duty. *Journal of Clinical Psychology, 74*(12), 2173-2186. doi:10.1002/jclp.22688

Otto,, J. (2013). Mental Health Diagnoses and Counseling Among Pilots of Remotely Piloted Aircraft in the United States Air Force. Retrieved 2020, from https://towardfreedom.org/wp-content/uploads/2014/05/pages-from-pages-from-msmr_mar_2013_external_causes_of_tbi.pdf

Ricks, T. (2014, November 06). Interview with a U.S. Air Force drone pilot: It is, oddly, war at a very intimate level. Retrieved November 05, 2020, from https://foreignpolicy.com/2014/11/06/interview-with-a-u-s-air-force-drone-pilot-it-is-oddly-war-at-a-very-intimate-level/

Chatterjee, P. (2015, March 05). Drone pilots are quitting in record numbers. Retrieved May 06, 2021, from https://www.motherjones.com/politics/2015/03/drone-pilots-are-quitting-record-numbers/

Home. (n.d.). Retrieved April 08, 2021, from https://www.afpc.af.mil/Airman-and-Family/Deployment-Support/

Tirpak, J. A. (2021, April 07). Two decades of stealth. Retrieved April 08, 2021, from https://www.airforcemag.com/article/0601stealth/