

Psychological Skills of Canadian Military Pilots

by

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Thesis submitted to the Faculty of Graduate and Postdoctoral Studies

in partial fulfillment of the requirements for the degree of

Master of Arts (M.A.) in Human Kinetics

School of Human Kinetics, Faculty of Health Sciences

University of Ottawa, Canada

May, 2011

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Acknowledgements

I would like to take this opportunity to acknowledge the Canadian Air Force pilots at 15 Wing Moose Jaw for their valuable contributions and enthusiastic participation in this study. It was a rare pleasure to meet and work with such honest, dedicated, and self-aware individuals. Many thanks also to Lieutenant Colonel Gary Hook and to all of the DND personnel in Ottawa and Moose Jaw whose support and organization made this project come to life.

Thank you to my supervisor Dr. Terry Orlick for offering your wisdom, support, and heart. Your dedication to personal excellence and your vision for a better world are truly inspiring. Thank you Dr. Natalie Durand-Bush and Dr. Tanya Forneris for your patience, kindness, and guidance. The expertise that you bring and the contributions that you have made to this thesis are greatly appreciated.

There are no words to express my gratitude to my family, whose support and encouragement is not only endless but also sincere. To my parents, Jill and Joe, and my family, Carter, Michelle, Erin, Kristen and Rory: Thank-you for your unwavering confidence in my abilities and for your readiness to support me in any way that you could. To Josh: Thank you for listening and for making me laugh when I needed it. Lastly, thank you to my friends, both new acquaintances and old. I am truly fortunate to be in the company of such wonderful people.

Abstract

For decades, elite athletes have used mental skills training to enhance their performance. The effectiveness of these skills and strategies have been measured, documented and supported in research (e.g., Feltz & Landers, 1983; Vealey, 1994). As the remarkable benefits of mental skills continue to reach an ever-growing community of performers, it is surprising that many military organizations, known for their high standards for performance and little tolerance for error, have yet to take full advantage of this type of training. Canada's Air Force (CAF), home to a world-renowned pilot training program, now finds itself seeking additional tools to empower pilots to achieve consistent, high quality performance under demanding, high stress conditions.

The purpose of this research was to explore the psychological skills used by elite Canadian military pilots to perform successfully in this highly demanding occupation. Sixteen in-depth interviews were conducted with elite Canadian pilots at a CAF base in Saskatchewan. Results indicated that pilots utilized all seven elements of Orlick's (2008) *Wheel of Excellence* over three phases of flight: pre-flight preparation, mission execution, and post-flight debriefs. Pilots also drew on elements of the *Wheel of Excellence* during deployments to combat zones. Effective stress management played an especially important role in this context. Recommendations for future research include mental skills usage and preparation specific to deployment contexts as well as the implementation of a specific, relevant mental skills training program within the existing CAF pilot training program.

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CHAPTER 1

Introduction

Some of my pilots in Afghanistan, some saw things that were [difficult to put into words]...and the thing you have to understand it's not only seeing, it is...death has a smell. Anyway, I don't want to get into the nitty gritty of it, but. . .you know, when somebody gets amputated, from an IED, there is one person who will pick this piece of his leg 20 feet away and will bring it back in the helicopter and put it on the floor. That's the reality. You know, some people have a lot of difficulty tolerating it, a person who gets put on your helicopter and he is in excruciating pain. He's bleeding profusely, he is yelling like you would not believe, while other pieces of his body are being brought on board. Some guys, we had to sit down with them and explain that they've got to shake it off. But that's the reality of being very close to it. Fighter pilots won't see that because they'll be at 35,000 feet waiting for a coordinate to drop a bomb. But they have other equally challenging moments where they're gonna have tough decisions to make, and it will affect them. You know, look at 9/11 [September 11, 2001]. Picture yourself as a father of three, flying an F-18 and being told that you're gonna have to take out this airliner because we're not too sure who's flying it. That's military flying. (Participant 16)

The decision to participate in high-risk activities is one that confounds many people: Why would an individual willingly place him/herself in harm's way day after day? What is it that separates these individuals from the rest of us? How are they able to maintain the focus necessary to perform well when the consequences of a small error or failure are so high? Canadian military pilots represent one such group of individuals. Among the most elite performers in the world, Canadian military pilots do something every mission that most of us spend a lifetime trying to avoid: they face death. How then, one might ask, are these individuals able to defy the odds and evade the risks time and time again? How are these pilots able to perform consistently in the face of such high demands and even higher consequences? The answer is simple: they are excellent.

The present investigation was undertaken as part of a collaborative effort with Canada's Department of National Defense (DND) to examine the psychological underpinnings of Canadian military aviation excellence. The purpose of this study was to explore the following question: What psychological skills are used by elite Canadian military pilots and how are these skills used throughout their highly demanding aviation careers? The following related questions were also addressed in this study: (a) what does the term 'focus' mean for pilots who live, train, and perform in the military context? And (b) how do pilots contend with the risks and stresses implicit in this unique profession?

A review of relevant literature is presented in this thesis, including an overview of Orlick's (2008) *Wheel of Excellence* and current research findings from international military aviation departments. Following the review of literature, descriptions of the research methods are provided as well as an example of the data analysis strategy. The thesis concludes with a presentation of the research results, a discussion of the findings within the context of performance psychology and aviation psychology literature, and implications for future research.

Canada's Air Force

A brief introduction to Canada's Air Force (CAF) and its training regime will be of value in this discussion of military pilots and performance excellence. The CAF assumes many roles within Canada's Department of National Defense, delivering everything from humanitarian and diplomatic assistance (e.g., delivering aid, transporting individuals), to combat and support roles, search and rescue and domestic security missions (e.g., fisheries patrol) (DND, 2003). The CAF's frontline fighter pilots, the intrepid commanders of the CF-18 Hornet, represent some of the best talent in the CAF. Capable of speeds up to Mach 1.8, the Hornet is built to perform in both air-to-air and air-to-ground combat (DND, 2007a). The CAF also relies on various multiengine aircraft, such as the Aurora and the Hercules, as well as rotary-wing aircraft including the Chinook and the Griffon (DND, 2010). The diverse nature of the roles and missions fulfilled by the CAF requires that pilots have the ability and tools to adapt to changing

demands and conditions; they must be ready to act without hesitation, focused through distractions, flexible to unforeseen events, and perpetually aware of their surroundings. To optimize performance under such heavy stipulations, the CAF has developed a world-renowned training program now employed for the training of pilots of allied countries around the world (DND, 2009).

Prior to joining a CAF fleet as a combat-ready pilot, Canadian military pilots must pass through a stringent selection process and complete a rigorous training program. The Air Force Undergraduate Pilot Training System (UPTS) provides pilot training for service in one of three types of aircraft: helicopter (rotary-wing), jet, or multi-engine (DND, 2007b). The CAF conducts UPTS activities using facilities at three bases, located in Portage la Prairie, MB; Moose Jaw, SK; and Cold Lake, AB. Only general details of CAF pilot training are accessible to the public, however program overviews specify that the intensive training begins with the successful completion of a series of written, practical, and medical tests. The CAF notes that the UPTS emphasizes efficiency in skill and knowledge acquisition, requiring students to consistently perform to progressively higher training standards at each level of the program. Students are also expected to adapt to the “rigorous learning curve” in preparation for future training with individual fleets (DND). After approximately 19 months of undergraduate training, plus additional officer and second language training, pilots are streamed into one of the three aircraft fleets (helicopter, jet, or multi-engine) to begin operational and tactical training. Students who are selected to proceed to fighter jet training are required to complete one additional lead-in phase; this phase enhances the students’ tactical skills and knowledge, thereby reducing the total time necessary to produce combat-ready pilots.

The Nature of Flying

Contrary to the archetype so enthusiastically promoted by the media, the work of a military pilot is not all thrills and glory. The risks are many in number and, unfortunately, very real. As with many high-risk activities, perhaps the greatest hazard is the fallibility of the human species. For example, Gillingham (1988) stated that the gravitational stress, or G stress, experienced by modern fighter pilots

can be debilitating, possibly resulting in G-induced loss of consciousness (GLOC). According to Woods (2009), himself a Canadian CF-18 pilot, the single greatest challenge for a fighter pilot is maintaining situational awareness (SA). SA can be described as a “working knowledge of all of the details” of the engagement, including radar, weapons, wingmen, fuel, and location to name but a few (Woods, p. 4). Woods stated, “fighter pilots must continuously study and rehearse their craft in order to be effective” (p. 4). To add to the potential for incidents created by human error and physiological limitations, the CAF has reported several deficiencies with the aircraft themselves: Over the last ten years, a marked increase has been documented in “the number of occurrences [incidents] related to survival and safety equipment in several fleets” (DND, 2008, p. 37). The CF-18 Hornet has shown an upward trend in incidents associated with pneumatics (including heat and ventilation) and weapons systems (DND, 2008). The CP-140 Aurora has experienced an elevated number of incidents involving anti-icing/de-icing mechanisms, hydraulics, and survival and safety equipment (DND, 2008). Many aircraft have seen over a 200% increase in these incident trends (DND, 2008). Such risks place an added significance on a pilot’s ability to maintain focus and react quickly to unexpected events.

As is almost inevitable in any high-risk activity, incidents within the CAF, both in air and on ground, occur every year; it is a testament to the abilities of today’s CAF pilots that incidents are as infrequent as they are. According to the DND’s *2007 Annual Report of Flight Safety* (2008), accidents in all aircraft types declined at a steady rate between the years of 1997 and 2004. As of 2004 accident rates have remained stable, with no further decline apparent (DND). Of the air occurrences reported in 2007, seven aircraft were reported as destroyed or missing, another seven aircraft were classified as having sustained serious or very serious damage, and an additional 1587 reports of minor damage were recorded (DND). Over the past ten years, 18 aircraft have been written off as destroyed, including two CF-18s. As for the pilots themselves, the 2007 year saw one fatal injury (the aircraft was destroyed), one very serious injury (blood clots), and two serious injuries. A total of 62 minor injuries occurred (DND).

The CAF's occurrence history is certainly commendable, however, if any future incidents can be prevented or mitigated by an investigation of psychological skills, then such a study is worthwhile.

The CAF utilizes a Human Factors Analysis and Classification System (HFACS) to investigate the human causes of aviation accidents (DND, 2008). According to the HFACS report for 2006 and 2007, the total active cause factors (e.g., decision making, attention) of air occurrences decreased by 3% (DND, 2008). While this is indeed a promising figure, the HFACS analysis goes on to reveal that the actual mental state of personnel as a latent causal factor increased by 14% (the percentage for ground occurrences was even higher at a 50% increase). Even though active cause factors are said to be in decline, they are still certainly prevalent: the *2007 Annual Report of Flight Safety* determined that personnel factors accounted for 47.9% of the cause factors in air accidents, as compared to material (33.7%), environment (12.2%), undetermined (6.1%), operational (0.12%), and foreign object damage (0.06%) (DND, 2008). Personnel factors accounted for an even greater percentage of ground occurrences at 82.4% (DND, 2008). While the Report stated that no significant differences were evident in the distribution of cause factors for 2007, it should be noted that in recent years personnel factors have increased noticeably both in air occurrences (from 40.0% in 1997 to 47.9% in 2007) and ground occurrences (from 57.4% in 1997 to 82.4% in 2007) (DND, 2008). It is clear, therefore, that in order to reduce future accident rates, efforts must be focused not only on equipment and machines but also on personnel and elements that are under their control.

Canada's Air Force Today

A devastating trend within the CAF over the past decade has been a staggering decrease in the amount of flying hours for most aircraft (DND, 2008). For example, the CF-18 fleet logged 21,519 flying hours in 1998, but only 13,142 in 2007. Helicopters accumulated 51,004 flying hours in 1998 compared to 38,782 hours in 2007 (DND, 2008). Such a marked decline in practical experience immediately raises two important questions: (a) what are the more experienced pilots doing to maintain their skills? And

(b) if this trend continues, what kind of effects will be seen in student pilots? The *Pilot Proficiency Trend Analysis* (2007c) is a report produced by the Directorate of Flight Safety for the DND with the objective of analyzing proficiency-related incident trends within the CAF. Factors such as attention, information processing, and anticipation were included in the definition of proficiency. Incident rates for the CF-18 have proven to be low, however the report suggested that the decrease in flying hours was taking its toll on pilot performance, with a "strong relationship [emerging] between the decrease in flying hours...and the increase in the rate of proficiency related cause factors" (DND, 2007c, p. 7). A similar relationship was noted in three other aircraft fleets (DND, 2007c). Should flying hours remain below optimal levels, both new and experienced pilots will require alternative training methods for skill retention and applied learning. These alternatives may be found in a psychological skills training program.

It comes as no surprise, given the rigorous student pilot training, demanding working conditions, and high-risk nature of the occupation, that the CAF has been crippled for many years by a chronically high attrition rate. While this is to be somewhat expected among novices who join the CAF only to discover that it is not, in fact, what they had imagined it to be, attrition rates have recently begun to increase at an alarming rate among the CAF's more senior pilots. The CAF is in the midst of launching a massive personnel campaign in an attempt to retain the highly trained and highly skilled individuals presently employed, as they are difficult and expensive to replace. In 1998, a new pilot incentive program was implemented in response to the high attrition rate, which had doubled from 6% to 12% (DND, 1998). Kinsman, a former Chief of the Air Staff, supported this incentive program, stating, "The bottom line is that we cannot afford to keep losing pilots at the current rate" (DND, 1998). Since 1998, the attrition rate has stabilized to some extent, with the 2009 year predicted to see a rate of 8% (Watt, 2008); in an occupation with an already minimal number of yearly recruits however, a doubled attrition rate in 1998 is likely still being felt. Watt, also a former Chief of the Air Staff, reported that the CAF is currently operating at a 13% deficit of preferred pilot personnel and has been for almost 10 years. In

addition, the CAF is losing an increasing number of pilots with 12-16 years of experience – experience that cannot be easily replaced (2008).

Recovery from excessive loss of personnel can be costly both in time and money. Pilot training is expensive and the CAF can only offer a limited number of spaces each year in the UPTS; thus, it would not be feasible to simply increase recruitment following a spike in losses (as we will see however, even recruitment levels are currently well below the preferred mark). In addition to the financial drain, pilot training is time-consuming and can sometimes extend four years after pilots stream into operational units (DND, 2003). Even if recruitment were amplified, therefore, it would still take several years before the new recruits were able to fill the void as combat-ready, experienced pilots. Competing estimates are available as to the actual cost of pilot training in the CAF. In a 1998 interview with the Standing Committee on National Defense and Veterans Affairs, Marcotte estimated that the cost of training one pilot is “approximately \$5 million” (Standing Committee of National Defense and Veterans Affairs, 1998). Citing a report produced by the DND, Ploughman (2004) stated, “it can cost up to 27 million dollars to train a pilot to the highest achievable flying category” (p. 3). While an official CAF report disclosing these training costs is yet to be uncovered, the fact remains that pilot training in Canada is an expensive proposition; the CAF cannot afford to train pilots only to lose them later.

The pressure created by the attrition crisis on the military pilot occupation and the CAF is further compounded by the recent decrease in new applicants. In 2004, the stated recruitment goal for new pilots was 222 individuals; after the third of four pilot selection boards, however, only 72 offers of admission had been made due to a shortage of applicants (DND). More recent numbers offer little to quell the unease: approximately 80 new pilots are graduating each year, well below the target of 105. The CAF hopes to train 21 CF-18 pilots per year, yet the 2008 year saw only 12 complete the program (Watt, 2008). While the goal of 21 itself is small, this would represent an increase of almost twice the current graduating class – a lofty goal when one considers the recent drop off in recruitment numbers.

Looking to the Future

With the host of roles assumed by the CAF, military pilots engage in numerous important missions and (seemingly) endless hours of training and preparation. Whether transporting goods as a relief effort or training for combat situations, military pilots provide an essential service to our nation and others in need. The most experienced of these CAF pilots possess an invaluable reserve of knowledge and experience: regrettably, their numbers are dwindling. Strenuous working conditions, risky operations and missions, and the potential for injury or death make this an occupation that many find too difficult to manage. Furthermore, the recent decrease in flying hours may be leading to an increase in pilot proficiency errors (DND, 2007c). The elements described here together create a challenging situation for the future prospects of the CAF: declines across the board in practical experience, recruitment levels, and experienced pilots, combined with increased costs, and what seems to be an increasing trend in human error, make for less-than-ideal occupational resources. This investigation may present the beginnings of a plan of attack for the CAF. By discerning how today's experienced military pilots have gained success the CAF can ensure that these same precursors to success are cultivated in novice pilots. Doing so may allow the CAF to retain a few more of these precious resources each year.

CHAPTER 2

Review of Literature

Performance Psychology

Research has consistently demonstrated the advantages of mental skills training (MST) for the enhancement of quality and consistency in sport performance (e.g., Feltz & Landers, 1983; Fournier, Calmels, Duran-Bush, & Salmela, 2005; Orlick, 2008; Vealey, 1994). MST also has implications for performance enhancement in disciplines outside of the realm of sport. Researchers have demonstrated links between the use of mental training and enhanced performance in the corporate workforce (Neck & Manz, 1996), surgery (McDonald, Orlick, & Letts, 1995; Sanders, Sadoski, Bramson, Wiprud, & Van Walsum, 2004), music (Talbot-Honeck & Orlick, 1998), and space flight (Manzey & Schiewe, 1992; Orlick & Hadfield, 1999). Through the use of such techniques as focus enhancement, distraction control, imagery, and controlled breathing (Orlick, 2008), athletes and other performers have acquired the ability to effectively enhance performance, on a consistent basis, in a variety of contexts.

The domain most frequently associated with MST, and in which its techniques seem to be most frequently employed, is elite sport performance. In an effort to discern the psychological skills most important at the elite level, Mahoney, Gabriel, and Perkins (1987) administered a questionnaire to 713 male and female athletes from a variety of sports at a range of skill levels. Their data indicated that in comparison to non-elite athletes, elite athletes experienced greater moderation in anxiety, more efficient deployment of concentration, stronger self-confidence, more internally focused and kinesthetic imagery, and more motivation and personal meaning in their sport. Orlick and Partington (1988) also identified several key mental strategies, or success elements, of elite athletes in a landmark study involving 235 Canadian Olympic athletes. The amalgamation of interview and questionnaire results yielded several specific success elements important at this level: total commitment, quality training (including goal setting, imagery and competition simulation), and quality pre-competition mental

preparation (including a competition plan, focus plan, and post-performance debriefs). Such research spurred the development of many psychological skill taxonomies for various groups of athletes.

More recently, Gould, Guinan, Greenleaf, Medbery, and Peterson (1999) interviewed Olympic athletes and coaches from teams who had achieved varying levels of success at the 1996 Summer Games in Atlanta. The researchers aimed to examine factors underlying these differences in performance. Results from the discussions with 10 coaches and 23 athletes verified existing research on peak performance in sport, such as Orlick and Partington (1988). The researchers noted that successful Olympic performance was associated with well-developed routines and plans, high levels of motivation and commitment, coping or distraction control skills, mental readiness, and high quality training. The researchers linked poor Olympic performance to inability to refocus or deal with distractions, changes to effective routines, and late team selection.

Orlick (2008) summarized the key mental skills necessary for high-level performance (in any domain) in his *Wheel of Excellence*: focus, commitment, mental readiness, positive images, confidence, distraction control, and ongoing learning (Figure 1). Focus is situated at the center of the wheel and is identified as the driving force or the “core of excellence” (Orlick, p. 11). Orlick contended that the remaining six elements of excellence develop out of an effective focus. In previous studies, athletes and other performers have certainly placed a marked emphasis on the role of focus in their successful performance (e.g., Mahoney et al., 1987; Orlick & Partington, 1988; Werthner 2002).

The specific link between focus and excellence in performance has been investigated and demonstrated in research. Werthner (2002) conducted a series of interviews with eight elite athletes, all of whom were medal winners in Olympic games or world championships, or were world record holders in their sport. All eight athletes indicated that the ability to focus on the now was essential to an excellent performance. In their study with Canadian Olympic athletes, Orlick and Partington (1988) concluded that focus was one of the “most important statistically significant athlete skills directly

related to high level performance” (p. 25). Talbot-Honeck and Orlick (1998) investigated mental factors related to excellence in elite musicians. The researchers reported that “musicians felt that concentration was a necessary element of excellence and. . . a determining factor in a quality performance” (p. 69). McDonald, Orlick and Letts (1995) conducted in-depth interviews with 33 surgeons who were identified as highly proficient in their specialty. All surgeons described experiencing a fully focused state while performing at their best.

Figure 1. The Wheel of Excellence

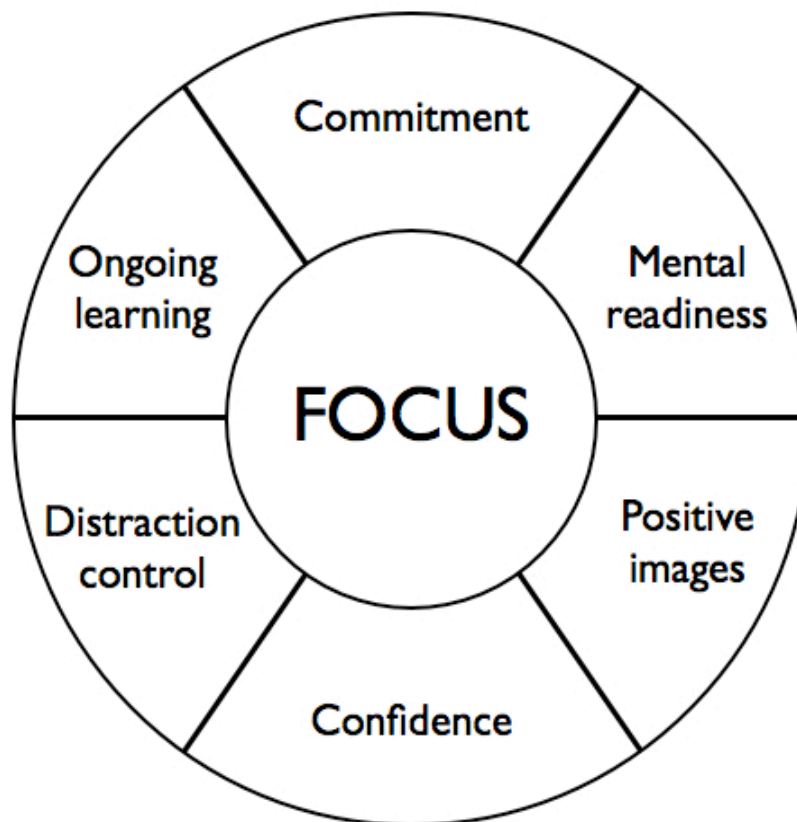


Figure 1. From In Pursuit of Excellence (p. 12), by T. Orlick, 2008, Champaign, IL: Human Kinetics. Copyright [2008] by Terry Orlick. Reprinted with permission.

As a multi-faceted and highly subjective experience, definitions of focus can vary throughout performance psychology literature. Orlick (2008) described focus as the ability to concentrate fully on the task at hand, to the exclusion of all other distractions: Focus is total connection with the task. When the performer is able to fully connect with what he/she is doing, excellence in performance can be

achieved. Werthner (2002) depicted focus as a balance between concentration on a few important aspects of the task and trusting one's abilities and instincts. Werthner also stressed the active role that the performer must play in entering this state of focus; the performer must actively shift from outcome-oriented thoughts to task-oriented thoughts.

As in the work of Werthner (2002), the concepts of attention and concentration are used throughout performance psychology literature in relation to focus. Wilson, Peper and Schmid (2006) highlighted concentration as the primary mechanism of focus. They defined concentration as "the ability to direct one's full attention to appropriate cues in the present task instead of being controlled by irrelevant external or internal stimuli" (p. 419). Nideffer and Sagal (2001) suggested that attention requires the control of two types of focus: width and direction. The width of attention can be broad, as when a performer needs to attend to many cues, or narrow, as when only one or two cues require attention. The direction of attention can be internal, such as on one's own thoughts or feelings, or external, such as on an opponent. The work of researchers such as Orlick and Partington (1988), Werthner, Wilson et al., and Nideffer and Sagal are indicative of the continual growth of research supporting not only the use of mental training, but specifically the development of an effective focus as a key contributor to performance excellence at an elite level.

As indicated here, a foundation of research data exists to indicate that MST, and focus in particular, holds important implications for excellent performance at the elite level (e.g., Gould et al., 1999; McDonald et al., 1995; Orlick & Partington, 1988; Werthner, 2002). In recent years, however, the growing popularity extreme sport has shed light on a new facet of the MST puzzle: facing risk. In elite performance involving a high-degree of risk, the associated stress, fears and anxiety can often compete for a performer's attention, with the possibility of detrimental results.

Fear and Anxiety

Fear can mean many things to many people. Gullone and King (1997) defined fear as a state of apprehension in the presence of a perceived threat. Fear has also been defined as an emotion: Hanin (1999) counted fear among 47 basic emotions developed from the work of 23 investigators. Hanin postulated that if certain emotions correspond to certain situations, different subtypes of fear might have evolved to deal with multiple types of threats. Emotion theorists, however, are still far from a consensus on such fundamentals as a definition of emotion, identification of basic emotions, and the functions of emotion, making it difficult to assert any claims with confidence. Rachman (1990) suggested that fear arises when the individual feels that he or she has little or no control over a perceived threat. This conceptualization of fear seems to go one step further, involving not only an appraisal of threat but also an appraisal of controllability. While its definition may still be contested, the presence of fear and its possible detrimental effects on performance in sport are well documented.

Fear is often spoken of in conjunction, and even interchangeably, with the element of anxiety; however, subtle differences can be found in the literature to differentiate these two concepts. Blanchard, Blanchard, Griebel and Nutt (2008) distinguished fear and anxiety in the following way: Fear prompts behaviours associated with the exposure to clearly threatening stimuli, whereas anxiety prompts behaviours associated with potential or uncertain threats. McNaughton and Corr (2004) refer to this discriminating factor as the “defensive direction”: Fear allows the organism to actively avoid by leaving threatening situations while anxiety allows the organism to assess risk by entering threatening situations or to passively avoid by withholding entrance.

Fear is a concept often identified in elite performance domains, appearing in a variety of manners including fear of injury (Chase, Magyar, & Drake, 2005); fear of failure (Martin & Marsh, 2003); fear of cowardice (Rachman, 1990); fear of loss of face (Murray, 1999); and even fear of success (Ogilvie, 1968). While the cause or focus of an individual’s fear may vary, the potential negative effects on

performance seem to be ubiquitous (Bandura, 1990; Feltz, 1982; Heil, 1993). Heil's (1993) Psychophysiological Model of Risk presented the self-perpetuating cycle that can result from the perception of fear. Heil postulated that fear produces physical effects, such as tension and increased heart rate, as well as psychological effects, such as decreased concentration and decreased self-confidence; these physical and psychological perceptions diminish performance through various means, including the disruption of skill execution and disregard for performance related cues. The subsequent decrease in performance can then act to exacerbate the initial physical and psychological precipitators, thus perpetuating the cycle. The question that remains, then, is how does one stop the cycle?

Within the elite sport domain, researchers have identified some key concepts and strategies that are effective in combating the potential negative effects of fear, such as self-efficacy (Bandura, 1990). A common assumption, however, is that in order to ensure an excellent performance one must overcome or suppress a fear response. For example, Fenz and Jones (1972) conducted an examination of heart rate and respiration rate among sport parachutists. They reported that fear responses did not dissipate during the course of the jump sequence (i.e., from the arrival at the airport to the conclusion of the jump) but that jumpers were able to inhibit or control the response. While this strategy may be effective in some circumstances, as Blakeslee (2002) explained, there are more efficient ways of preventing fear's potentially negative effects:

By regarding fear as a pathology to control or cure, we assume that life without its presence is possible, normal, or even desirable. But once we accept fear as a habitual acquaintance in an imaginative, meaningful life, we can begin to cultivate a conversation with it rather than engage it in a fight. (p. xvii)

Blakeslee suggested that instead of attempting to eliminate fear, individuals can learn to use it to their advantage. It may be possible for individuals to deliberately approach their fear responses, both somatic and psychological, as facilitative rather than debilitating.

More commonly addressed in research, anxiety has been dually identified as a potential source of sport performance decrement (e. g., Pijpers, Oudejans, Holsheimer, & Bakker, 2003; Beilock & Gray, 2007) and enhancement (e.g., Hanin & Syrjä, 1995; Mahoney & Avenier, 1977). Pijpers, Oudejans, Holsheimer, and Bakker (2003) investigated the subjective, physiological, behavioural manifestations of anxiety using a climbing wall task. All participants were novice climbers and completed a climbing task in one threatening condition (high on the wall) and one non-threatening condition (low on the wall). In the first of two experiments, the researchers reported increased anxiety in participants on the high condition as opposed to the low condition, as indicated in self-report scores. The participants also displayed increased heart rates on the high condition, which researchers linked to increased muscle fatigue and a higher blood lactate concentration (indicating more muscle tension). In the second experiment, the researchers measured the fluency of participants' climbing movements to determine whether the subjective and physiological changes prompted a regress to lower skill levels (i.e., rigid and jerky movements). Measurements revealed a higher entropy of climbing trajectory in the high condition, indicating "a less smooth displacement of the body's centre of gravity that is also characteristic of less skilled climbing behaviour" (p. 299). In an additional follow-up study, preliminary results showed more exploratory hand and foot movements and slower movements between holds in the high condition.

Conversely, Fenz and Jones (1972) provided evidence of a beneficial relationship between autonomic arousal and performance in sport parachutists. The researchers recorded heart and respiration rates from two groups of parachutists: novice and experienced. Measurements were taken at various significant times in the jump sequence. Results indicated that novice jumpers experienced a continuous increase in both heart rate and respiration rate during the pre-jump sequence. In comparison, experienced jumpers displayed an elevated heart rate and respiration rate until approximately the time that the pilot started the engine. At this point, both heart rate and respiration rate declined. Of special interest is the finding that quality of performance in participants was related to

autonomic arousal during the jump sequence. When comparing the measurements from the good performers and the poor performers within each group, the researchers noted that the good performers in each group displayed the same inverted v-shaped response pattern, for both heart rate and respiration rate, as was seen in the overall measurements of experienced jumpers. The researchers concluded that the most adaptive response pattern is one whereby autonomic arousal increases early in the jump sequence and then sharply decreases, returning to a nearly normal level just prior to the jump.

As anxiety can seemingly affect performance in various ways and at various levels of proficiency, it may be more useful to turn the discussion towards the mechanisms by which anxiety can be utilized in a beneficial way. Fletcher and Hanton (2001) conducted a study with 114 non-elite competitive swimmers to investigate the link between psychological skills and facilitative anxiety. They found that athletes who made use of relaxation strategies reported more facilitative interpretations of both cognitive and somatic anxiety symptoms. Neil, Mellalieu, and Hanton (2006) investigated competitive anxiety responses (worry and somatic) and psychological skill usages in 115 rugby players of differing skill levels (i.e., elite and non-elite rugby). Results showed no differences in the intensity of anxiety responses across skill levels; however, the elite athletes viewed these responses as more facilitative to performance than did the non-elite athletes. The researchers suggested that this discrepancy may stem from the greater self-confidence reported by the elite athletes. Analysis of the data also indicated significant differences in imagery, self-talk, and relaxation use. Specifically, the elite athletes reported greater use of imagery and self-talk in competition whereas the non-elite athletes reported greater use of relaxation strategies. The researchers stated, “nonelite performers primarily use relaxation strategies to reduce anxiety intensity while elite athletes appear to maintain intensity levels and adopt a combination of psychological skills to interpret symptoms as facilitative” (Neil et al., p. 421). With this work in mind then, it is not unreasonable to suggest that participants in other high-risk activities can acquire the ability to channel anxiety and fear into a focused connection with the task at hand.

The study of the psychology of sport is continuing to yield an increasingly comprehensive body of literature related to the attainment of excellence in performance. To date, one of the more widely recognized models of excellence is Orlick's (2008) *Wheel of Excellence*. Drawing on many years of experience in research and application, Orlick's model summarizes the main components of successful performance as follows: focus, commitment, mental readiness, positive images, confidence, distraction control, and ongoing learning. Such concepts have proven applicable and beneficial in many performance realms beyond sport (e.g., Neck & Manz, 1996; McDonald et al., 1995; Talbot-Honeck & Orlick, 1998; Manzey & Schiewe, 1992). As researchers have gained a greater understanding of these concepts they have also learned new techniques and methods through which they can be (and already are being) applied. One such use is in anxiety provoking environments or situations. By utilizing these techniques as mediation devices, more and more performers are acquiring the ability to successfully effect change in the quality of their performance.

High-Risk Sport and Occupations

The notion of investigating psychological skills specific to high-risk environments and activities is now, more than ever, attracting the attention of researchers. In an early discussion of stress and the workplace, Sloan and Cooper (1986) reported that the stress induced by the possibility of occupational physical danger is often lessened when the employee feels adequately prepared to deal with the emergency situation. More recently, Burke and Orlick (2003) explored the mental strategies employed by successful Mount Everest climbers. From interviews with ten climbers, the researchers reported that the mental strategies used in a Mt. Everest climb occurred in three distinct phases: in the preparation phase, climbers relied on detailed planning, imagery, and developing mental strength; during the ascent, climbers reported using mental toughness, focusing, short-term goals, lessons from past experiences, belief in their capacity, and team support; and finally, during the descent, climbers employed focusing

and short-term goal setting as their mental strategies. The researchers concluded that a frequently cited and important component of success in this high-risk activity was a positive mindset and effective focus.

Coleman and Orlick (2006) examined success elements in the high-risk sport of big mountain freeskiing. This study involved interviews with nine North American elite freeskiers. Similar to the strategy used by Burke and Orlick (2003), Coleman and Orlick also categorized success elements into three distinct temporal groups. The pre-performance preparation phase was characterized by drawing upon past experience, physical readiness, careful line selection/inspection, and clear visualization. During performance execution, athletes relied on confidence, execution focus (i.e., task at hand), refocusing, doing without thinking (i.e., subconscious thought), and conscious thought (i.e., unforeseen decision making). Finally, during the post-performance reflection and learning phase, athletes described the application of reflections and lessons. The major success elements common to all nine athletes were a focused connection with the task, love for the sport, and the ability to remain calm.

The use of psychological skills has also been investigated and supported in high-risk medical environments, specifically with surgeons (e.g., McDonald et al., 1995; Yule, Flin, Paterson-Brown, & Maran, 2006). In their in-depth interview study, McDonald et al. (1995) asked surgeons to rate the relative importance of mental, technical, and physical preparation for excellent performance in surgery. The mean response was as follows: mental readiness, 49%; technical readiness, 41%; and physical readiness, 10%. The researchers concluded that all seven elements of Orlick's (2008) *Wheel of Excellence* were evident in all surgeons who performed high-mortality-risk surgery. Yule, Flin, Paterson-Brown and Maran (2006) conducted a review of literature (psychological and surgical) pertaining to non-technical skills of surgeons. Synthesizing the results compiled from the review, Yule et al. proposed a draft taxonomy of these non-technical skills. The taxonomy contained two categories: interpersonal skills and cognitive skills. Interpersonal skills included communication, leadership, teamwork, resource management, briefing/planning/preparation, seeking advice and feedback, and coping with

pressure/stress/fatigue. Cognitive skills included situation awareness, mental readiness, assessing risks, anticipating problems, decision-making, adaptive strategies/flexibility, and workload distribution.

Psychological Research in the Military

The ability to maintain performance quality under conditions of stress is an especially relevant issue for individuals in military occupations. For many of these men and women, a less-than-best performance is not an option. Military fighter pilots, in particular, face many risks every time they climb into the cockpit: incidents such as GLOC (Gillingham, 1988) and loss of situational awareness (Woods, 2009) as well as those caused by faulty equipment (DND, 2008) are difficult or impossible to recover from and can have deadly consequences. Add to this the possibility of being thrust into a war torn country, far removed from anything they have ever experienced, and the potential outlook for these pilots is certainly not rosy. For these and other reasons, military pilots must take advantage of any relevant training that may enhance the quality, consistency, and safety of their performance.

Principles of performance psychology have proven invaluable in sport and other performance domains (e.g., Feltz & Landers, 1983; McDonald et al., 1995; Talbot-Honeck & Orlick, 1998; Manzey & Schiewe, 1992), yet they have received very little attention within the context of military organizations. Thompson and McCreary (2006) explained the potential consequences of this oversight:

While many [military personnel] learn these implicit yet vital mental lessons over time, the remaining people will have varying degrees of difficulty acquiring these psychological skills. At best, this can delay their skill acquisition, and at worst this will leave them and their colleagues consistently at risk, and potentially limit their ability to remain in the military. (p. 2)

Pilots may learn these important mental skills after many years of experience, however why waste an opportunity to enhance their abilities and chances of success right now? Given the many potential risks associated with military aviation and the critical role these individuals could play in the protection of our nation, a remarkably small amount of research is available in this area.

Boyd's *A Discourse on Winning and Losing* was an early attempt to conduct psychological research with military pilots; it was in this work that he first introduced his *OODA Loop* concept (as cited in Brehmer, 2005). The name OODA is an acronym, which refers to observe, orient, decide, act. Now recognized as a valid construct within the field of Industrial-Organizational Psychology, the *OODA Loop* was originally developed as a mechanism to explain the success of American fighter pilots over their enemies in the Korean War. According to the loop, there are four cognitive stages in fighter jet combat: observe, orient, decide and act. The *Observe* stage involves the pilot's detection of an enemy aircraft. During the *Orient* stage, the pilot maneuvers the aircraft to point at the adversary, to gain an advantageous position for the next stage. The *Decide* stage involves formulating a plan or a course of action, which is then carried out during the *Act* stage.

Boyd theorized that, as a result of superior training and superior aircraft, the American fighter pilots were more proficient at each stage of the loop and were therefore able to enter into, or disrupt, the OODA Loops of their enemies (as cited in Brehmer). The American fighter pilots were able to observe, orient, and decide faster, thereby acting at a faster pace than their enemies. Because the American pilots completed the cycle first, the enemy pilots would be forced to re-orient to the action taken by the American pilots, in essence returning to the beginning of their OODA Loop.

While Boyd's theory is seldom used within today's military research, it nevertheless holds important implications for future research in the field. For example, some theorists hold that anxiety can result in increased likelihood of distractibility or attentional narrowing (e.g., Beilock & Gray, 2007; Eysenck, Santos, Derakshan, & Calvo, 2007). If this is the case, pilots who are unable to control their fears and anxiety may experience difficulty entering into their own decision-making cycle, or OODA Loop, as their observational abilities may be impaired. What can these pilots do to ensure that they are mentally capable of entering the loop? Unfortunately, little research exists to address such a dilemma, as the general focus of military research has been directed elsewhere for quite some time.

Much of the research related to the psychological abilities of military pilots has been conducted at the pilot selection phase, focusing on three main tenets believed to predict future performance: psychomotor/skill quickness, intelligence/aptitude, and personality/character (Hilton & Dolgin, 1991). Questions of reliability, however, have created uncertainty in the research community regarding the merits of such a method (e.g., Roscoe & North, 1980). The issue appears to be rooted not in the actual indicators themselves, but in the measurement of the validity of these predictors. Insufficiencies in early research coupled with the challenge of differentiating between true correlations and moderated correlations result in a difficult task of adequately estimating the validity of these predictors (Martinussen, 1996). What seems to be lacking in the field at this time is an investigation of the effects of learned skills, and learned mental skills on pilot performance after the pilot selection phase.

One must assume that both students and experienced pilots continue to learn and develop skills related to both preparation and flying once they have been accepted into the pilot training program; as such, this subsequent learning may have an impact on performance. If pilots do not stop learning once they have passed the selection phase, then the psychological abilities that are developed during training warrant an investigation equal to that of psychological abilities at the selection phase. In one study involving Navy personnel, researchers did incorporate this idea of learned skills by examining the effects of preparatory information on perceived anxiety and performance in a stressful situation (Inzana, Driskell, Salas, & Johnston, 1996). It was determined that preparatory information relating to the nature of the stressors, possible effects, and suggested coping mechanisms, resulted in decreased anxiety and enhanced performance in both high stress and normal stress conditions. Similar to findings in high-risk sport, preparation may also be a key factor for success in high-risk military activities.

As research has primarily concentrated on the pilot selection phase, little data is available concerning the experiences of military pilots with fear or anxiety and mental skills training. In his 1947 study, Flanagan examined factors related to reduced fear in American military pilots after World War II.

Seven major factors were identified as contributing to the pilots' moderated feelings of fear: confidence in equipment, confidence in crew, confidence in leaders, continued activity, observation of a calm model (e.g., a calm commanding officer), and a circumscribed tour of duty (as cited in English, 1996). While these are undoubtedly important and relevant elements, attention must be drawn to the fact that not one of these elements is completely, or even moderately, controlled by the pilot. One cannot assume that pilots have no control over their fears and anxiety, as research shows this to be otherwise in sport (e.g., Chase, Magyar, & Drake, 2005; Neil, Mellalieu, & Hanton, 2006); if athletes can successfully learn to control their feelings of anxiety and fear, military pilots likely also can possess this ability. It is imperative, therefore, to investigate those elements of stress and anxiety management that are under a pilot's control, and through which he or she can achieve performance excellence.

In his book *Fear and Courage*, Stanley Rachman (1990) identified several elements that he believed played a role in the reduction of fear in military pilots. These elements included feelings of control over the aircraft, ideological factors (i.e. belief in the war aims), anger (as a distraction from fear), and being in a group. These elements seem slightly more yielding to a pilot's command than those described by Flanagan (as cited in English, 1996), but may be difficult to practice or exercise in a completely controlled manner. Moreover, the question must be raised as to whether it is even advantageous to reduce fear or anxiety in a military context; Symonds (1943) suggested that the physiological responses to fear (e.g., heightened awareness, enhanced effort) might be critical in the successful response to an emergency. Symonds further contended that fear only becomes dangerous when it dominates thoughts, distracting a performer from potential benefits of other emotions such as anger. What is needed, then, may be a toolbox of mental skills and strategies that can be imparted to all CAF pilots; a set of relevant skills to channel arousal and enhance performance, that can be implemented whenever necessary and that depend solely on the individual for success.

Toong and Koh (2005) investigated the effects of a mental skills intervention on the performance of novice military parachutists. Participants were 127 conscripts who were attending a mandatory three-week Airborne course as part of their training. They were randomly assigned to either a Mental Skills group or a Control group. Trainees in the Mental Skills group received a three-hour instructional program involving classroom-based lectures followed by guided practical application sessions. The mental skills program consisted of three components: relaxation training (using self-monitoring and breathing techniques); visualization/imagery (understanding the concept and general principles); and mental focus (using positive/instructional self-talk and maintaining an appropriate task focus). Using self-report measures (confidence and anxiety levels) in combination with objective measures (instructor assessment and rates of attrition due to injury), the researchers reported that significantly more trainees in the Mental Skills group successfully performed the tower exit task (a jump from a three storey tower) when compared with trainees in the Control group. The researchers concluded that “mental skills training can potentially have a positive impact on military performance, especially on tasks that are performed under stressful conditions” (p. 6). The researchers suggested that a taxonomy of specific mental skills appropriate for specific military tasks would add value to the current technical focus of training methodology.

The first apparent advancement towards an individual-focused, psychological skills training strategy for military aviation came from Roth and Andre (2004). Using an experimental design, the researchers attempted to ascertain the value of chair flying as a pilot training activity. Chair flying was defined as a preparation technique by which a pilot, seated in a chair, mentally rehearses each sequence of the impending mission. The rehearsal involves all necessary movements (e.g., moving the throttle with his/her hands) and may sometimes involve props (e.g., a bottle to simulate the throttle). Using 60 participants with no previous flying experience, Roth and Andre compared the performances of a Memorization group, Simulator group, and Chair Flying group in a simulated flying task. Each of the

three groups was assigned a different preparation technique: the Memorization group studied an Operating Handbook, the Simulator group practiced the mission with a computerized simulator, and the Chair Flying group received instructions and practiced with the chair flying method. Results showed no statistical differences between the performances of the Chair Flying group and the Simulator group, but a marked difference (decline) in performance by the Memorization group. It was concluded that chair flying can be equally as effective as computer based simulator training in preparation for a simulator mission, but further research is required to determine whether chair flying can be effective in preparing for a real mission.

High-risk activities and those who participate in them have long seemed to occupy a space somewhat removed from mainstream society. Labeled as 'adrenaline junkies', 'sensation seekers', or 'risk takers', some have assumed that these individuals conquer their goals riding a wave of surging hormones, propelled by a blinding affinity for self-destructive behavior. As we begin to delve deeper into the psyche of such adrenaline junkies however, it quickly becomes apparent that many of these individuals encounter the very same experiences as the rest of us. The challenges and successes, the distractions and focus, the elation and anxieties: we are all performers, simply separated by the vehicle through which we chose to perform. In high-risk sport and occupations, empowering novice performers to develop effective psychological skills would allow them to perform closer to their capacity, safely and more consistently. By investigating the use of strategies identified by experienced and successful military pilots, essential mental skills and appropriate learning methods may become clearer. We can then draw upon and expand this knowledge to develop and refine much-needed MST programs for student pilots, ultimately saving time, money and possibly lives.

CHAPTER 3

Methodology

Purpose

This investigation of the psychological skills of Canadian military pilots was undertaken using a qualitative case study methodology. To elicit deep, rich, and detailed interview responses, Rubin and Rubin (2005) suggested using a mix of main questions, follow-up questions, and probes. A tour question is a main question that allows the researcher to maintain a broad scope and encourages the conversational partner to speak freely about the issue (Rubin & Rubin). The following tour question provided the major structural and directional guidance for this study: What psychological skills are used by Canadian military pilots and how are these skills used throughout their highly demanding aviation careers? To conduct a comprehensive examination of this issue, several minitour and comparison questions (Rubin & Rubin) were also explored in depth. The minitour and comparison questions included the following: (a) what does the term 'focus' mean for pilots who live, train, and perform in the military context? And (b) how do pilots contend with the risks and stresses implicit in this unique profession?

The short-term research objectives of this study were three-fold: (1) to contribute to the existing research and theoretical foundations of high-risk activity and performance psychology; (2) to gain insight into this unique population of performers and the psychological skills they draw upon; and (3) to disseminate this knowledge to others who may benefit from the experience and expertise of these elite performers. It is hoped that in the long-term, this research will provide the foundation for the creation of a mental skills training (MST) program to be implemented within the CAF's student pilot training and possibly lead to the introduction of MST programs for other performance teams within DND. In this way, these research findings might contribute to a safer, more efficient, and more successful CAF program.

Research Paradigm

This study examined the psychological skills of Canadian military pilots using a constructivist paradigm. Constructivism stems from the fundamental belief that there exists no one set of rules that governs human behaviour: various factors, such as intentions, beliefs, and social norms must be considered in the investigation of the phenomena of human behaviour (Plack, 2005). The emic perspective adopted by constructivists accepts that a single unifying explanation for the phenomena under study may not be found; as such, constructivist researchers strive to present all substantial viewpoints individually, recognizing that their own viewpoints may differ from those of the individual participants (Appleton & King, 1997). The constructivist epistemology “suggests that each one’s way of making sense of the world is as valid and worthy of respect as any other” (Crotty, 2003, p. 58). While emphasis is placed on the importance of individual meaning and experience, social interaction is also recognized as essential to the meaning making process.

A major acknowledgement of the constructivist paradigm is the prevalence of social influence in the meaning making process; thus, constructivism emphasizes the integral role played by the researcher throughout the participant-researcher interaction. Constructivism acknowledges two distinct instruments at work in the creation of meaning, positing that reality is created both at an individual and social level, within a given context: Individuals create their own realities, but these realities are socially influenced by the social world in which they live and interact (Plack, 2005). It follows that as knowledge is socially influenced, the knowledge and data collected during the research process will itself be created and influenced by the interaction between the participant and the researcher – the researcher serves to socially validate the individual meanings created by the participant (Plack, 2005; Appleton & King, 1997; Candy, 1991). Candy refers to this intersubjective creation of meaning as reactivity.

The joint role in the construction of meaning has two important implications for the researcher and research design. The first implication is the significance of the role of the researcher. Appleton and

King (1997) suggested that the researcher plays a key role as a research instrument; he or she must have the ability to perceive and respond to contextual cues so as to effectively guide the study and foster the development of a genuine relationship based on mutual respect. Without a sound research relationship, true richness and depth of data is difficult to achieve. This issue was addressed through the researcher's respectful and genuine interactions with participants, as well as complete transparency with regards to the research process and objectives. The researcher attempted at all times to approach interactions with an open mind, without bias, and with sensitivity to the participants' differing circumstances and experiences. The second implication of reactivity is the flexibility required throughout the research process. Appleton and King acknowledged that because data is created during the course of the study, the research design must be a tentative one. Ongoing reflection and analysis are imperative as design adjustments may be necessary to ensure the most pertinent and essential data are collected. With this in mind, the researcher engaged in reflection and discussion with the research supervisor before and after each interview and at the conclusion of each interview day. These meetings involved discussion of possible new interview questions as well as specific language concerns and overall impressions.

While constructivist research is not uncommon in contemporary academia, its relativist ontology still proves to be intimidating for many researchers (Appleton & King, 1997). As a result, the constructivist paradigm is victim to several unwarranted criticisms. One such criticism described by Appleton and King (1997) is the accusation that constructivism is akin to solipsism, the school of thought which refutes the existence of a true reality. Appleton and King discredited this claim, stating that constructivism is, in fact, a more centrist perspective that settles midway between realism and radical relativism. Constructivism does not deny the existence of an outside reality, but rather suggests that we are only now beginning to understand it (Candy, 1991). Another common concern associated with the constructivist paradigm comes from a seemingly pervasive preoccupation with the generalization of research findings; this creates difficulty for some in seeing the value of a data set that is specific to small

groups and unique contexts. Appleton and King also addressed this concern, stating that the aim of constructivist research is not to fit the interpretation of the findings to other populations by gross generalizations using large sample populations. Instead, transferability is sought, whereby individuals can determine whether the research findings fit with their own experiences and can be applied in their own contexts. The researcher simply presents the findings, inviting readers to take what they feel is relevant for them and leave the rest.

Conceptual Framework

Miles and Huberman (1994) described a conceptual framework as a (preferably) graphic or narrative account of the main concepts to be studied and the presumed relationships among them. Orlick's (2008) *Wheel of Excellence* was selected as an appropriate conceptual framework for this study. The *Wheel of Excellence* is the product of thousands of interviews conducted by Dr. Terry Orlick with performers across domains as well as his decades of applied experience in the field of sport and high performance psychology. With such an expanse of knowledge and experiences as its foundation, Orlick's model provided a strong guide for potentially rich avenues of inquiry. The conceptual framework also ensured that the interview exploration experience was somewhat consistent for each participant.

Orlick's (2008) *Wheel of Excellence* is comprised of seven concepts or "success elements" that were developed using the personal experiences of high level performers: focus, commitment, mental readiness, positive images, confidence, distraction control, and ongoing learning. Orlick theorized that these seven success elements form the basis for consistent, high-level performance. Above all else, an effective focus is integral to the achievement of consistent excellence in high-level performance domains. Focus is placed at the center of the *Wheel of Excellence* and drives the development of the remaining six elements. This model of excellence has been validated by numerous investigations in recent years (e.g., Burke & Orlick, 2003; Coleman & Orlick, 2006; Talbot-Honeck & Orlick, 1998). It is worth noting that two of these more recent studies (Burke & Orlick, 2003; Coleman & Orlick, 2006)

involved participants in a high-risk pursuits (Mount Everest climbers and big mountain freeskiers). These studies provided support for the use of the *Wheel of Excellence* as a framework in the high-risk and highly demanding context of military aviation.

Gilbert (2001) conducted a review of 25 case studies of elite performers to analyze two models of “talent development elements”, one of which was Orlick’s (2008) *Wheel of Excellence*. Gilbert concluded that neither model provided “a complete portrait of the full range of elements required for talent development across domains” (p. 13), citing a lack of discussion regarding the importance of genetics, opportunity, and a robust social support system. While these elements may certainly contribute to the development of talent and high-level performance, one must bear in mind that Orlick’s model was not intended as a holistic model (i.e., one that addresses physical, psychological and environmental concepts). Rather, the *Wheel of Excellence* concerns itself only with those psychological factors over which the performer can exercise personal control. One could argue that the overwhelming value of the *Wheel of Excellence* is precisely that it provides performers with the guidelines to effect positive change on their own; it is meant to be applied, to guide performers with a valuable collection of performance enhancement tools that can be nurtured and refined. Elements such as genetics, external opportunities, and support systems are often determined by circumstances beyond a performer’s direct influence. The success elements found in Orlick’s model of excellence can help performers to focus on appropriate goals or pursuits and to cope with a variety of variables that might otherwise interfere with their performance. The personal performance goal is to achieve the highest level of excellence possible within the parameters of the performer’s physical abilities and environmental circumstances.

As Gilbert (2001) highlighted, one danger of employing Orlick’s (2008) *Wheel of Excellence* in this research was the potential for new and potentially crucial elements of performance psychology to be overlooked. To mitigate this possibility, the researcher ensured that the interview questions were structured in an open-ended manner. Some interview questions did explore concepts from the *Wheel of*

Excellence such as the roles of focus and confidence. However, during the interviews the researcher took care to ask participants to identify and discuss the concepts and experiences that were most meaningful for them, regardless of whether they appeared in the model. The researcher also made note of any unique language or terms introduced by the participants and attempted to explore these ideas in the context of the interviews. Some terms introduced by the pilots were synonymous with terms in the *Wheel of Excellence*, such as chair flying (positive imagery). In these cases, the researcher attempted to use the new term whenever possible within that interview and any subsequent interviews.

Research Design

The present study was guided by a qualitative research design. Appleton and King (1997) encouraged the use of qualitative methods for research within a constructivist paradigm. Due to their flexibility and emic perspective, qualitative methods are well suited to data collection in a natural setting. Qualitative methods have become increasingly popular in performance psychology research as they allow the researcher to “examine the way people perceive, create, and interpret their world” (Munroe-Chandler, 2005, p. 68). Creswell (1998) outlined several generally accepted characteristics of qualitative research, all of which are compatible with a constructivist paradigm and a case study methodology: (a) occurrence in a natural setting, (b) researcher/instrument duality, (c) inductive analysis of data, and (d) a focus on the participants’ meanings. Through these means, qualitative research allows for a greater understanding of subjective experiences, which was the goal of the present research (Munroe-Chandler, 2005).

A qualitative approach allows for flexibility in design and emphasizes description and meaning in data (Creswell 1998; Appleton & King, 1997). A descriptive research design was required for this investigation, which draws its data and knowledge from individual experiences. The flexibility enabled by the qualitative design was imperative for an exploration involving elite military pilots as very little is known about this group and the previous research with pilots on which predictions can be based is

limited. The qualitative design allowed the researcher to modify the project as needed (e.g., the interview guide) in an effort to pursue the most pertinent subjects and richest sources of data.

A case study methodology was employed in this investigation. Yin (2003) stated that when using case studies, investigators can espouse a simultaneously narrow and broad approach to the inquiry: It is possible to “understand complex social phenomena,” while at the same time retaining a sense of “the holistic and meaningful characteristics of real-life events” (p. 2). A case study methodology is suited to questions of a “how” or “why” nature, and allows the researcher to examine contemporary events within their context without relying on the manipulation of relevant behaviours (Yin). This research utilized a multiple case design, with individual military pilots as single cases. Yin stated that, “the evidence from multiple cases is often considered more compelling, and the overall study is therefore regarded as being more robust” (p. 46). The multiple case design allowed for the comparison of cases to identify important similarities and differences in experiences.

A multiple case study approach was well suited to the research objectives and the phenomenon of interest in this study. While perhaps generally underrepresented within the performance psychology domain, case studies in the field have been successfully undertaken in the past (e.g. Krane, Greenleaf & Snow, 1997; Savoy, 1993; Striegel, 1993; and Heyman, 1990). The present research investigated a phenomenon occurring in a unique population within a unique context; this emphasis on both the atypical case and the influential context is a key requisite for a high-quality case study. Lincoln and Guba (1985) recognized that “it is not possible to understand any phenomenon without reference to the context within which it is embedded” (p. 302); when investigating a phenomenon that occurs in such an exceptional environment as the military, this caution must not be overlooked. With this in mind, the researcher attempted to elicit the participants’ thoughts and opinions regarding their context and the military environment. These comments are best presented in a brief contextual description prior to the dissemination of the results. As Yin (2003) noted, a multiple case study methodology also allows for

comparison of the cases. Case comparisons were extremely beneficial for this research, as individual differences as well as group commonalities surfaced during analysis. The researcher exercised caution to ensure that all relevant similarities and discrepancies were identified. The results are presented so as to highlight both sides of the data, as important discussions may arise from these nuances.

Participants

The present study employed purposive sampling (Appleton & King, 1997) in the selection of participants; this is in keeping with the norm of sampling in case study research (Jones, Torres, & Armino, 2006). Purposive sampling is a technique by which cases are gathered based on their potential to provide the richest data, resulting in an in-depth investigation (Appleton & King, 1997). This method is especially effective for studies, such as the current one, that are limited by very small sample sizes. Stake (2005) noted that even in larger case studies, sample sizes are frequently too small to allow for random sampling; instead, purposive sampling should be used to allow researchers to capitalize on opportunities for variety and richness of data. Because sample sizes are so limited, each participant must have the potential to bring some valuable information to the study.

The researcher relied on senior personnel within DND to recommend suitable participants for this study. The DND contacts were provided with a detailed brief outlining the objectives of the research and some preferred participant criteria (e.g., high level performers, some combat or deployment experience if possible). Every pilot who successfully completes the rigorous CAF pilot training program and who is awarded wings (a pin signifying proficiency and graduation from training) is considered an elite performer. The stringent selection process used by the CAF coupled with the rigorous training and evaluation system results in a group of highly skilled, outstanding graduates. Every student who completes the training and earns his/her wings is an exceptional pilot. Given this reality, the researcher and research supervisor, together with DND, chose to interview pilots with differing levels of experience so as to: (a) facilitate an understanding the challenges faced at different times during the pilots' careers,

Table 1. Participant Experiences and Accomplishments

Participant	Aircraft Flown	Special Categories/Achievements	Combat Experience
1	Helicopter, jet (Tutor, Hawk)	Part of special-ops team	3 deployments (Somalia)
2	Jet (Tutor, Harvard, Hawk), helicopter	Security for G8 Summit in Kananaskis	4 deployments (Bosnia, Afghanistan)
3	Jet (type unknown)		
4	Jet (Hawk, T-33, Hornet)	A1 instructor (highest category)	
5	Jet (Hawk, Hornet)	Completed fighter weapons school ("PhD of flying")	
6	Jet (Tutor, Harvard, Hawk)	A1 instructor	
7	Jet (type unknown)		
8	Jet (Harvard, Hawk)		
9	Jet (Tutor, Dash 8), multiengine (Hercules, Airbus)		
10	Jet (Harvard, Hawk)		1 deployment (Iraq)
11	Jet (Harvard), helicopter (Sea King)		
12	Jet (Harvard, Hawk)	Element lead (qualified to lead formations)	
13	Jet (Harvard), helicopter		
14	Jet (Harvard), helicopter (Sea King)		2 deployments (Iraq, Pakistan)
15	Jet (Tutor, Harvard), multiengine (Aurora)	A2 instructor	
16	Helicopter (type unknown)	Led elite emergency response team, security for Three Amigos summit in Montebello	Multiple deployments (Bosnia, Commanding Officer in Afghanistan)

and (b) allow the researcher to explore how mental skills are incorporated at various times throughout the pilots' careers. Table 1 provides a brief overview of the participants' notable experiences; this information was gathered during the interview process.

The interview sample consisted of 22 elite military pilots. Fifteen of these interviews were selected for full analysis. All pilots had completed the UPTS successfully. Of the 15 participants selected for analysis, some were training to become instructor pilots, others were high ranking instructor pilots, and two occupied top supervisory positions. There were 14 male participants and one female participant. Four participants had been deployed to combat zones and two participants had been deployed multiple times. This work also includes relevant quotes relating to excellence in military flying from a 16th interview participant who was in a command position. His comments, however, were not included in the full data analysis. All participants expressed sincere enthusiasm for the study and participated in the interviews with an honest and open attitude. Many felt that an investigation of this nature was overdue at the CAF and that the potential implications could be of great value. Several pilots noted their vested interest in the possibility of a relevant, high quality MST program, as the prospective students who would benefit from the training could one day fly alongside them in combat.

Instrument

Semi-structured interviews provided the data collection method for this investigation. Prior to conducting the interviews, the researcher constructed an interview guide (see Appendix C). The interview guide was based on Orlick's (2008) *Wheel of Excellence*, the conceptual framework for this study, as well as previous interview studies with high-level performers (e.g., Coleman & Orlick, 2006). The majority of the questions in the interview guide were open-ended, allowing the participant to freely discuss the experiences, ideas and concepts related to the use of psychological skills that were most important to him/her. The research supervisor, key CAF personnel, and the DND Social Science Research Review Board evaluated the interview guide independently for clarity of questions and relevance to the

participants. DND personnel suggested minor changes to the language of some interview questions. The researcher discussed these requests with the research supervisor and implemented the changes that were deemed appropriate.

The roles of the researcher and research supervisor in this study were also instrumental to the data collection (interviews were conducted by both the researcher and research supervisor). Appleton and King (1997) recommended that researchers act as tools through which the knowledge and experience of participants can be translated and presented in a valuable manner to a wider audience. Through the collection and dissemination of these research results, the researcher acts as a conduit, connecting the reader with new information that may be relevant and meaningful in his/her own unique context. During the interview process, the researcher also provided an open and respectful social venue for the participants to clarify and explore their experiences and, as a result, construct and share their knowledge. By asking questions and soliciting and clarifying opinions, the interviewers guided the participants through a process of exploration, realization, clarification and confirmation of knowledge.

Data Collection

Yin (2003) described the interview as “one of the most important sources of case study information” (p. 89). Retrospective descriptions provided the most viable option for data collection because it was not feasible or safe to interview these individuals as they were experiencing the phenomenon (i.e., while flying) or to determine pertinent psychological skills simply through observation. Additionally, for some participants the process of open, honest, and detailed discussion brought to light new ideas or connections that had not previously been thoroughly considered or shared. Retrospective descriptions therefore elicited valuable information, both for the researcher and for the participants.

Prior to the commencement of the data collection, all participants were sent, via email, a brief information letter describing the research aims and protocols (see Appendix A). Before beginning the

interview process, the researcher and the research supervisor reviewed the interview questions and discussed them in detail to ensure that there was a common understanding of what was being asked, both in terms of the specific interview questions and the larger, overall research aims. In addition, at the beginning of each interview, the researcher and research supervisor reviewed the purpose of the investigation and offered to address any questions the participant may have had. All participants expressed a keen interest in and a desire to contribute in any way possible to what they felt was an extremely worthwhile investigation. Interviews took place over a period of four full days at 15 Wing Moose Jaw. Each participant engaged in a face-to-face, in-depth interview that lasted from 45 minutes to 90 minutes.

The researcher and research supervisor began the investigation by conducting the first two in-depth interviews together. This allowed the researcher to closely observe, listen to and learn from the research supervisor's vast experience. The research supervisor led the first interview, while the researcher observed. The researcher supervisor led the second interview as well, with the researcher playing a much more active role in the discussion. Following each of the first two interviews, the researcher and research supervisor discussed in detail their thoughts and feelings regarding the fluidity of the interview, the suitability of the questions, the relevancy of the responses, and the characteristics and qualities of the participants. The researcher and research supervisor continued to engage in debriefs following each interview and an extensive debrief was done at the end of each day. The researcher and research supervisor felt that after the initial two interviews, both had a good understanding of the context and natural flow of the interviews as well as some of the more unique language and the best way to approach more sensitive topics such as emergency or deployment experiences. Following this, the researcher and research supervisor conducted interviews separately. The final two interviews were also conducted together. In total, the researcher and research supervisor each conducted nine interviews separately and four interviews together.

Semi-structured interviews have proven invaluable in past explorations of human experience and performance psychology. In their influential study with Canadian Olympic athletes, Orlick and Partington (1988) adopted a mixed methods design. While several data collection methods were employed throughout the study, individual interviews were used as one of the major sources of data. Orlick and Partington justified this approach with the assertion that interviews facilitate open probing, necessary for the in-depth exploration of new topics. Furthermore, interviews enhance the understanding of context-specific language and personal experiences. Semi-structured interviews continue to provide the foundation for in-depth data collection for much of the research conducted in the performance psychology domain; such research includes Cohn's (1991) exploration of peak performance in golf, Kabush and Orlick's (2001) investigation of focus in elite mountain bike racers, and Burke and Orlick's (2003) examination of mental skills employed by elite Mount Everest climbers.

Kvale and Brinkmann (2008) stated that the interview method is "an active process where interviewer and interviewee through their relationship produce knowledge" or generate a deeper understanding of the topic being explored (p. 17). The semi-structured interview method allowed the researcher to pursue rich and important avenues of inquiry that were individually relevant for the participants. By constructing research questions of an open-ended nature the researcher supported this active process and created opportunities for new and different knowledge to surface. Semi-structured interviews thus provided a viable method for the collection of rich, relevant data, while adhering to the basic assumptions of the constructivist paradigm.

This study incorporated Rubin and Rubin's (2005) "responsive interviewing" approach. The responsive interviewing strategy entails three central assumptions: (1) the interviewer and interviewee are two human beings who form a relationship; (2) the main goal of the interview is not to gain breadth, but depth of understanding; and (3) the project design must remain flexible. Rubin and Rubin also emphasize self-reflection throughout the research process, calling attention to the importance of

ongoing examination of one's own biases, reactions, behaviours, and understandings. The researcher engaged in self-reflection throughout the course of the investigation through discussion with the research supervisor, DND personnel, and peers. The researcher also identified potential sources of personal bias, such as familiarity with Orlick's (2008) *Wheel of Excellence* and a personal fear of heights, as a preventative measure; this reflection ensured that the researcher was continually aware of these predispositions and monitoring her own actions and reactions for any signs of bias.

Data Analysis

The analysis of data was ongoing throughout the course of the investigation, commencing immediately after the first interview. Following each interview and at the conclusion of each day the researcher and research supervisor discussed and made notes of emerging themes and important areas. The strategy of concurrent data collection and analysis allowed the researcher to refine and modify interview questions as well as develop new avenues of inquiry within the project as needed (Pope, Ziebland, & Mays, 2000). For example, early in the interview process the researcher and research supervisor decided that the theme of coping with fear was not emerging as a central component of the interviews. Participants gave the general impression that fear was not a common issue for them, although many described experiences involving arousal and anxiety. The researcher and research supervisor thus decided to actively pursue the theme of anxiety and stress management rather than coping with fear. It was also decided that the transition into a full focus prior to flight was an idea that may prove valuable and was therefore added to the interview questions.

All participants were interviewed over the course of four days. Due to the busy schedule and need to travel, the researcher was unable to begin transcription until all interviews had concluded. Once the transcription was completed, copies of the interview transcripts were sent back to each respective participant via email for verification and/or modification. Any follow-up questions that arose during the transcription were included in these emails. Participants returned the verified transcripts and follow-up

answers via email. One participant requested a minor change to one of the interview comments; this comment was modified immediately to the satisfaction of both the researcher and participant.

The verified transcripts were analyzed both inductively and deductively. Through the use of inductive analysis, a common practice within the qualitative research realm, the researcher was in a position to identify new and unique themes in the data. Several unique ideas did surface, such as the use of ongoing learning strategies during performance. The inductive analysis was carried out first, to allow for consideration of the full range of concepts in the data. Following the inductive analysis, the researcher conducted a deductive analysis by examining the data in the context of Orlick's (2008) *Wheel of Excellence*. Previous research in the domain of performance excellence has shown that mental training strategies are relatively stable despite changing contexts (e.g., Mahoney et al., 1987; McDonald et al., 1997; Orlick & Partington, 1988); thus, a deductive analysis allowed the researcher to incorporate these established themes into the categorization of data.

Rubin and Rubin (2005) discussed the analysis of qualitative interview data in terms of two phases: (a) preparation of transcripts, identification and refinement of themes and concepts, and coding of transcripts to retrieve participants' perspectives regarding the themes and concepts; and (b) comparison of themes and concepts across interviews or the combination of accounts to form detailed descriptions of the setting. Both of these phases of analysis were conducted manually, without the use of computer coding programs such as QSR NVivo. Creswell (1998) stated that such programs simply provide an easily accessible storage solution for data and codes – the researcher remains as the coder and categorizer. If the researcher is not familiar with the program, the process of familiarizing him/herself with the operations and capabilities may be time-consuming, eventually outweighing any benefits of such a program.

During the initial phase of analysis the researcher broke each interview transcript into sections of meaningful data, or 'meaning units', by labeling portions of the text in electronic documents (i.e.,

using Microsoft Word). These meaning units were then organized into a hierarchical system of sub-categories, categories and themes. Several sub-categories and categories together produced a theme. The themes, categories and meaning units were transferred into a Microsoft Excel spreadsheet to facilitate the comparison of case data. This first phase of analysis was mainly inductive in that the researcher attempted to categorize meaningful units of text using the participant's own words, rather than searching for themes identified from the literature.

During the second phase of analysis the researcher grouped relevant meaning units, sub-categories and categories together from various participants. Both complementary and contradictory meaning units were grouped together according to their respective categories. This phase was mainly deductive in that the data was organized according to the elements of the *Wheel of Excellence* (Orlick, 2008), where possible. This strategy allowed for verification of the relevancy of the *Wheel of Excellence* (Orlick) model to this population as well as the creation of a simplified hierarchy of themes and categories. A sample of the coding strategy used is provided in Table 2.

Throughout the course of the interviews and analysis it became apparent that the use of psychological skills coincided with three distinct temporal phases. Such segmentation in data has been noted in previous studies investigating high-level performance psychology (e.g., Burke & Orlick, 2003;

Table 2. Example of data analysis and development of themes (Mission Execution phase)

Raw data meaning units	Sub-categories	Categories	Themes
Told myself I knew what I was doing	Positive self-talk	In abilities	Confidence
Tell yourself you've learned this			
It showed me my resilience	From past experiences		
No reason to believe I wouldn't succeed			
Another coin in the purse			
All the things I had accomplished			
Trust he is doing what he should be	Trust	In fellow pilots	
Trust must be maintained			
Take every advantage on the radio	No unnecessary risks	In safety	
Rather be on the ground than not have options			

Double check everything			
Won't fly alone anymore			
Don't push it	Respect personal limits		
Stay within comfort zone			
Ignore pressure from others			
Have to understand your limitations			
The rest doesn't exist	Shut everything else out	In the moment	Focus
Other things being ignored			
In your zone and don't let anything distract you			
100% of your brain			
Finish one thing and move on to the next	Anticipation and flow of tasks		
Not really searching for that next thing			
Know what's next before it happens			
Can never focus on one thing	Capacity		
Able to subconsciously monitor			
Core focus is automatic			
Drawn into the environment	Situational awareness		
Keep your scan going			
	Doing without thinking vs. overthinking	Connected	
All I have to do is let the airplane fly			
Get into a groove and do it			
Can't think fast enough			
Hesitation is the end of it			
Success was the only outcome		Positive	
Never think about the risks			
Feel more alive			

Coleman & Orlick, 2006). The researcher elected to categorize the data within the following temporal groups in which they occurred: pre-flight, mission execution, and post-flight. The pre-flight phase refers to all time leading up to and in-between flights; this includes the pre-flight brief. The mission execution phase begins when the pilot steps onto the flight line and ends when the pilot exits the aircraft. The post-flight phase refers to all time following the flight, before the pilot begins to prepare for the next flight; this includes the post-flight debrief. The element of commitment appeared to exist beyond the confines of any one phase of flight, and in most cases was evident prior to employment in the military. As a result, this element was analyzed and presented as a unique component of performance excellence. In addition, the researcher created a distinct phase for 'deployment', owing to the extreme challenges faced and the atypical nature of this environment.

Trustworthiness

Prior to commencing this study the researcher made a concerted effort to become familiar with the world of military aviation. Having no personal experience in aviation or the military, the researcher educated herself through the use of DND publications, peer-reviewed journal articles, books (including personal memoirs) and television documentaries. The researcher also consulted with DND personnel before and during the investigation on matters ranging from NFTC program information to technical and unfamiliar language. Finally, the researcher and the research supervisor together interviewed a high ranking pilot in a top command position; this interview provided an additional opportunity for the researcher to learn about the role that these pilots play in national and international contexts, outside of the daily training routines in Moose Jaw. This pilot also shared some personal experiences (e.g., combat, diplomatic security missions) and explained, from the perspective of the CAF, why an investigation of this nature is such a valuable endeavour.

Patton (2002) identified the following elements as sufficient criteria to judge the quality of constructivist qualitative inquiry: subjectivity acknowledged (e.g., biases accounted for),

trustworthiness, triangulation, particularity (justly examining unique cases), enhanced and deepened understanding, authenticity, and contributions to dialogue. This investigation embraced these criteria to enhance the quality and credibility of the research design and data. The researcher primarily relied on member checks, researcher reflexivity, and analyst triangulation to enhance the quality and trustworthiness of the research process and results.

Member checking is a strategy by which the interpretations and conclusions reached independently by the researcher are shared with the participant; this allows the participant to clarify ideas, add new and important information, or remove inaccurate interpretations (Baxter & Jack, 2008). Each participant received his/her interview transcript via email and was asked to review the document for confirmation and/or alteration. One participant requested a change to the interview transcript. By engaging in member checks, all participants were given the opportunity to verify that their comments had been accurately recorded and to modify any comments to ensure that their meaning would be correctly interpreted. The researcher has submitted a full copy of this work to DND for review and will address any concerns or suggestions that may arise. The researcher and research supervisor also plan to present these results to the student pilots and instructor pilots at 15 Wing Moose Jaw in the near future.

Researcher reflexivity has been defined as “critical self-reflection” on pre-existing biases, ideologies, or perspectives that may influence the investigation (Merriam and Associates, 2002, p. 31). The researcher engaged in reflection and self-analysis prior to and during the research process. Any potential sources of personal bias that may have affected the interview or analysis process were identified. The researcher then took care to maintain an ongoing awareness of these elements. Through this process of dissemination the researcher will also share any possible sources of bias with the reader, allowing for an additional level of analysis. Reflection and analysis are only of limited value, however, if one does not act on the conclusions of the introspection. The researcher evaluated her performance following each interview and identified areas of improvement for the subsequent discussion. Areas of

improvement included refraining from looking for experiences with fear, as well as more technical elements such as allowing for silence before beginning a new question and choice of language.

Triangulation can be defined as the use of multiple viewpoints to verify data interpretations and meanings; this allows for the identification of alternate ways of viewing the case (Stake, 2005).

Triangulation functions on the basic principles of amalgamation of ideas and confirmation of interpretations (Baxter & Jack, 2008). By incorporating various viewpoints in the interpretation of the data, triangulation ultimately enhances the credibility of the study (Stake, 2005) while simultaneously maintaining the constructivist emphasis on the value of individual perspectives (Crotty, 2003). This study employed analyst triangulation: The research supervisor reviewed the categorizations, interpretations, and conclusions to ensure consistency. Over the course of the data analysis period, dialogue between the researcher and peers also reduced any potential bias introduced by a single researcher.

One final source of trustworthiness can be found in the character of the participants themselves. From the immediate onset of the interviews, it was apparent that this was a group of confident, reflective, and extremely intelligent individuals who strongly believed in the value of this research. Participants were careful in their choice of words during interviews, being sure to select language that truly reflected their thoughts and feelings. Participants were also very aware of how their comments were being received and were quick to correct any misconceptions or misunderstandings. Orlick and Partington (1988) described a similar experience in their research with Olympic athletes. They concluded that the athletes were “highly self-directed, autonomous, and sometimes assertive in presenting their responses and clarifying their views” (p. 4) and that “it would be extremely difficult, if not impossible, to manipulate the responses of these high level Olympic achievers” (p. 4). The researcher is confident that the strategies employed throughout this research process (member checking, reflexivity, triangulation), coupled with the strong characteristics of the participants and the openness of the interviewees, have resulted in a truthful and trustworthy investigation.

CHAPTER 4

Results

Contextual Description

Key to understanding and interpreting the results of this investigation is an informed perception of the military context within which these pilots live and perform. Stake (2005) stated, “The case to be studied is a complex entity located in a milieu or situation embedded in a number of contexts or backgrounds”. While it was not possible to compile an exhaustive narrative of the context given the short duration of the researcher’s visit to 15 Wing Moose Jaw, the information that was gathered will be presented here. The contextual description will provide a backdrop to the research results, allowing for greater depth of understanding. Earlier in this thesis a brief overview of the CAF organization was presented to clarify the training process and general operations. The following account will focus more on the day-to-day procedures and experiences of pilots at 15 Wing Moose Jaw. The information presented in this description was gathered from the inductive analysis of interview data as well as observations made during the researcher’s visit to the base.

The pilots stationed at 15 Wing Moose Jaw are not simply pilots: They are instructors, supervisors, standards officers, flight safety officers, course directors, examiners, flight commanders, and much more. With many roles to fill and a limited pool of candidates to draw from, 15 Wing Moose Jaw is a community constantly on the go. While the basic routines of flight may remain stable for these pilots, their lives certainly do not. The military world is a system in constant flux; job duties, schedules, and places of residence can (and do) change with little or no warning. Many participants described long days on the base, little free time, and a feeling of always having something ‘on the horizon’ (e.g., upcoming tests, upgrading certifications). While some participants felt that their job duties were reasonable in duration and intensity, many expressed feelings of fatigue and an inability to recover

sufficiently. One participant described his current energy level as worse than when he was on tour [deployment], stating:

The problem is I work 10 to 12 hours a day here, so at the end of the day, here I'm actually tired. Unlike Afghanistan, I tend to be very, very tired here every day. I want to be [exercising] a lot more, but I just truthfully haven't been in the last while. It's something I gotta get myself back to that focus again. It's terrible when you're on a course, like again I'm on this Flying Instructor course now for the Hawk, and now I've got to be a student again, more or less. (Participant 2)

Another participant described the effect of this exhaustion on his mental performance, commenting, "With this job, I never get to that level that I wanna be at, 'cause you're never refreshed. So it takes more for me to absorb the information then " (Participant 1).

Not all aspects of life at 15 Wing Moose Jaw are so changeable, however; in fact, many things endure. Within a very short time, for example, it is unmistakably apparent that the CAF is still very much a male dominated community. DND personnel readily discuss the discrepancy, noting the steps taken in recent years to improve female recruitment levels and the positive contributions and experiences of female pilots; however, the gender composition of the pilot community appears relatively unchanged. The values espoused by DND and the CAF also seem to remain, stalwart and unwavering throughout the years. Among the more obvious of values instilled in recruits are discipline, respect, and accountability. Looking a little deeper, one finds that the CAF also encourages self-directed learning and innovative problem solving. Whether they were aware of it or not, every pilot interviewed spoke of at least one of these values and demonstrated others in their actions. Many found utility for these values in challenging situations, which, one can only assume, is precisely what the CAF intends.

The flight sequence itself is comprised of three major events: the brief, the mission, and the debrief. Typically a pilot is expected to prepare for flights on his/her own time. This preparation can include reviewing manuals, procedures, maneuvers, and checks (the standardized checklist all pilots

must run through before taking off), as well as anticipating potential incidents and emergencies. The time spent on preparation varies with a pilot's level of experience and the type of mission to be flown. Shortly before the scheduled take-off, the pilot will attend a brief. The purpose of the brief is to review the aim of the mission, address outstanding concerns or questions, and generally reiterate important information. The procedures of the flight itself can vary widely and are completely dependant on the mission type. Prior to take-off, the pilot will strap-in and quickly go through the checks from memory. Once in the air, the pilot is in communication with Air Traffic Control (ATC) for information regarding other air traffic and landing permission. If flying formation, the pilot will also be in communication with other aircraft, coordinating maneuvers. When flying with students, the pilot will demonstrate maneuvers or take control in emergencies however, for the majority of the flight he/she observes and analyzes the student's actions. Immediately following the flight, the pilot will attend a debrief wherein every possible detail of the flight will be reviewed, generally with most of the emphasis on mistakes made and how to correct those mistakes for future flights. Pilots are expected to implement any changes or corrections resulting from this debrief immediately, to avoid future mistakes or risks.

Participants described many risks and sources of stress that they encountered on an ongoing basis, both in flight and on the ground. Risks in flight included flying with others at night, contact with another aircraft due to drifting or limited vision, pulling G's and flying with students. One participant noted, "Being able to handle the stress is obviously very, very important: there is a lot of stress, whether on course or day-to-day flying" (Participant 13). Aside from the risks involved in flying, one of the more prevalent sources of stress seemed to be the balancing of a demanding work environment with family or personal life. Participant 4 articulated this challenge:

Guys show up here with their family, so most of those guys now have two stressors: they have the course and then they have their kids or their wife or whatever is happening in their life. So it

is more challenging in some aspects. They have wings, they're pilots, but sometimes they're working hard and they're really tired.

In their continued training, pilots also noted stressors such as a feeling of constant assessment (specifically flying the F-18 or when they were students) and receiving criticism. Participant 2 experienced the stress of criticism in a try-out for the Snowbirds:

That [Snowbirds try-out] was probably one of the harder things I've had to do as an aviator. I'm used to telling myself that I suck at certain times, but to have 20 people in a room and some other guy telling you how badly you suck in front of everybody is just, wow. So that was probably one of the harder ones in my career so far.

As always, however, the CAF has a reason behind its ways. They make no attempt to hide the blatant tactics through which they push their pilots to the limits. In fact, it is quite the opposite.

All pilots were aware that many of the stressors and challenges they faced were presented in the interests of serving a higher purpose: to create a thinking pilot. One participant noted, "memorizing everything is only good for those things confronting the objective, the expectations, whereas in aviation it's so encompassing that we have to be able to respond – identify, respond, and think that way" (Participant 6). Thus, the CAF may be an environment that is fraught many different kinds of stressors, but all pilots understand that this will make them better aviators in the end.

But you see, in our training here, we cannot duplicate all these things [deployment stressors]. What we can do is try our best to simulate the effect that all those incidental pressures are gonna have on the body and on the mind, and through different mechanisms, and simulate that inside the cockpit. So we will push them. We will. And not to the break point, because we have to build their confidence as well, so they've got to be able to come out of the aircraft saying 'today you threw a few things at me and I succeeded'. But we will not satisfy ourselves with that success. We want them to experience their limits and we'll take them to their limits. And we will debrief them and we will say 'hey, you've got some pretty

strong limits' and it's not about, you know, when we took you to Stage 4 or 5, this trip is not about the fact that you failed at stage 5, it's about the fact that you went very smoothly to Stage 4 of this emergency. So it needs to be explained to them that they need to build on all the successes that they have to a certain point. And they need to understand that had they successfully completed Stage 5, we would have pushed it to the breaking point. So we have a job. We have to tell them that we're gonna push them and we have to tell them that we're going to expect that at some point in time, things are gonna snap. That's okay. How did it feel? (Participant 16)

Commitment

The element of commitment is presented independently of the three temporal phases (pre-flight, mission execution, post-flight) because this element seemed to extend beyond any single phase of flight. Commitment was also clearly present prior to the participants' employment in the military. All 15 pilots spoke of the importance of determination, perseverance, dedication, and focus towards pursuing certain objectives. Pilots directed their commitment by maintaining a focus on their goal of becoming an excellent military pilot. Participants also acted on their commitment in specific and positive ways, by making decisions and selecting routes or routines that could possibly lead to their objective. Participants described commitment in terms of three objectives: commitment to their dream, commitment to preparation, and commitment to excellence.

Commitment to the Dream

Several participants indicated that from a very young age they had dreamed of flying airplanes. They read fervently and worked hard at school to bolster their chances of attaining that dream. Participant 14 described his commitment as follows:

Where I started was one of those air shows. . . I was with my father, he took me there, and I told him that's what I wanted to do, looking up in the air. . . I think I was seven or eight. And then it never stopped from that point on, that's exactly what I wanted to do the whole time. So going

Table 3. Organization of Results

Phase	Theme	Category	Sub-category
Pre-flight	Commitment	Commitment to the dream Commitment to preparation Commitment to excellence Fun and enjoyment	
	Focus		
	Mental Readiness	Reviewing and retaining flight information Building capacity Learning from others Planning for unplanned events Simulators and alternative	
	Mental Imagery	mental rehearsal Chair flying Clear and realistic details Involving the senses Practicing routine procedures	
	Distraction Control Stress management	Environmental conditions Heavy workload Flight test stress Recovery	
Mission execution	Focus	In the moment	Situational awareness Capacity
		Connected focus Positive focus Focusing through emergencies	Automatic actions Task oriented focus Adaptation
	Distraction control	Verbal cues Refocusing	Compartmentalization Prioritization
	Confidence	Confidence in abilities Confidence in fellow pilots Confidence in safety	
	Stress management Ongoing learning	Flight test stress	
Post-flight	Ongoing learning	Personal debrief Group debrief Less-than-best performance	
	Stress management	Dealing with criticism Recovery	
Deployment			

to school I had that idea in my mind, therefore I knew I had to have good marks. . .be dynamic and so on; because those were all the things the Forces were looking for in officers.

Others found their interest in and passion for flight later in life, but still displayed similar levels of commitment in their training to those who had set this goal at a younger age. Some participants described obstacles in their journey, for example, in gaining admission to the UPTS or receiving their desired posting within the CAF. Participant 4 discovered, upon completing pilot college, that no jobs were available in either the civilian or military sectors. He then chose to attend police academy, but was forced to take a job as a truck driver while in school to pay his tuition. Several years later he finally received the call he had been waiting for from the military. Referring to his challenging career journey, he stated, “That was hard. But I never gave up. Even my friends back home, they can’t believe how much I had to struggle to make it [to] where I am now. But I never gave up”.

Participants also described an attitude of not wanting to fail, which seemed to elevate their levels of commitment. Participant 1 was expelled from a pilot college after failing to achieve a required test score, even though the score he received was technically a passing grade. He recalled:

So then I joined the military. And I remember when I got here [UPTS], having really a good kick in the arse from that [pilot college] thinking ‘man I worked hard too and I still failed, yet passed’. . . . I knew when I got here, I was not going to fail. So I spent more time studying than most people on this course because I needed to somehow grow up or figure out how to pass. And that’s when I started to try to visualize, getting up early in the morning to study and all of that.

(Participant 1)

Once these participants had identified their dream of becoming a pilot, they remained committed to that dream regardless of the time it took and the sacrifices required. Two participants did point out that flying was not their dream career, however, their level of commitment to the training process was equal to that of other participants.

In the same way that participants committed to their dream of flying with the military, they also expressed a strong commitment to other, more general goals in military and personal life. For example, participants described committing to the goal of a mission and simply going for it, not holding anything back. Participants also described committing to laborious or time-consuming tasks outside of flying.

It's a culture. The culture is you will not fail because the Prime Minister is the one who actually comes to you and says 'you're the last resort – you need to fix this or we lose as a nation'. Well to me that's pretty clear. I'm not going to lose, no matter what. Failure is not an option? Alright. So I have to be ready no matter what. And that is how every guy at that unit thinks, so you just evolve to that or they fire you – it's one of those two. (Participant 1)

I think [doing the Iron Man] helps me, because I've gone through that whole process. You know, when you're out there on the road that long during the day, you have your highs and your lows and you just keep moving, right? And you see that it's all gonna be good in the end, as long as you keep focused and keep driving towards the goals. So that seems to help. (Participant 8)

It's also innate I guess because I used to do huge projects by myself all the time. I always have ground away at one thing. Like I asked [my parents] when I was 10 years old if I could make a pond on the side of their yard, and they didn't think I would, so they said 'sure, dig a pond here' and they put me in the bushes. And I sat out there for like two months and dug a 15-foot around, 3-foot deep pond when I was only like 11 years old. And I set lights up so I could do it at night. So they've always just sort of lined me up with something and then I just chip away at it until it's done. So I guess it's kind of a personality thing, too. (Participant 3)

With a goal in mind, whether it was the finish line of a race, a mission objective, or the date of an important upgrade, participants were able to maintain that focus and follow through to completion.

For many, a source of external support, primarily family, seemed to be essential to this level of commitment. Participant 12 simply stated, "My family has been with me the whole time. It would have

sucked without support”. For these participants, families provided encouragement, a home environment where they could work (sometimes) without distraction, and a source of stress relief. Many spoke (with obvious appreciation) of a spouse or a family who had moved so that they could pursue their military flying career. Having a supportive family seemed to free the participants to fully commit to their goals, without holding back.

Commitment to Preparation

Throughout their training and flying careers, participants described a strong commitment to learning about and preparing themselves for flight. Participant 1 described his attitude towards studying (when he was a student) as an obsession. He stated, “You lived, ate and breathed flying and studying”. Participants also expressed a keen desire to learn and made a habit of seeking out opportunities to do so. Participant 9 stated, “When I went through here [UPTS] I wasn’t a great student, I wasn’t like that Mr. Superior guy that came through here and had an easy time; I worked hard”. Participants had differing views of their own academic abilities: some recalled having to exert a considerable amount of energy in their studies, while others found aspects like memorization came fairly easily. Regardless of their academic prowess, however, many indicated that they truly wanted to learn.

I was getting these crappy grades and – he [instructor] was the first guy I flew formation with on the Hawk – and that was the first formation experience I’d had since the Harvard, where I didn’t do very well. So I was getting all these ‘achieved standard’, ‘achieved standard’, ‘achieved standard’ grades, and then I flew with somebody else and I got a ‘standard exceeded’. So I went from middle of the road grade, like a C, to the best grade, like an A. And I’m like ‘huh. Maybe I am doing all right’. Because I didn’t fly that much better for the [second] guy, so it kind of clued me in that okay, yeah, [name removed] is just being a hard ass. But you know, so be it, because I got better. . . .It pissed me off because I wanted to get good grades, but he was a good guy to fly

with. He wasn't a screamer; he had good tips to give me. He was teaching me a lot. So I enjoy flying with those kinds of guys even if my grades aren't that great. (Participant 10)

In describing their experiences in the UPTS, participants recalled that they were constantly studying. Most took one or both days of the weekend to recover, but during the week there was no escaping.

Well every hour in the airplane is about 12 hours of preparation, as a student, because there is so much to learn. Just to give you an example, the TDC [Throttle Designator Control] on the F-18, which is a small switch on the throttle, that in combination with another one on the throttle, there's 105 functions, so it gets a little overwhelming. So you have to study a lot for every small one-hour trip you do in that airplane. And everybody's the same. We just studied our ass off.

Worked hard. (Participant 4)

As students, their lives were consumed by the desire to learn and prepare for the next flight. Many described reviewing maneuvers and protocols until they were drilled into their minds. Participant 5 recalled that he would "chair fly the maneuver until I could do it in my sleep". The commitment to this process enabled these pilots to spend exceptional amounts of time preparing.

As pilots and pilot instructors, many participants still demonstrated this incredible commitment to preparation in their ongoing quest to learn, improve and re-learn. Participant 15 found opportunities to continue to learn through the regular duties of being a pilot instructor: "I mark everybody's exams, so I'm learning while I do that or reviewing myself while I do that. So you're picking up those pieces along the way". Participant 9 shared his philosophy on learning, stating "Once they [students] get their wings – I call it a license to learn, now you have a license to re-learn and you won't be flogged so much – it takes the pressure off and it becomes a better, or an easier learning environment". As pilots become more experienced and gain familiarity with the aircraft and maneuvers, the preparation required before each flight diminishes. All participants, however, retained that commitment and still engaged in some level of meaningful preparation.

I don't really prepare that much anymore, as much as I used to. For a check ride or something I will. If there's something new or something that I haven't done in a long time, maybe, on courses and stuff I'll prepare, but not as much anymore. I'll think about it a little bit and just come up with a flow, so then I kind of know what's coming up. But other than that I don't do much anymore because I've looked at it all a thousand times. (Participant 12)

All participants demonstrated a commitment to a learning and preparation routine that, while significantly more pronounced during their training as students, has remained with them over time.

Commitment to Excellence

In the same way that participants committed to achieving their flying dream and to learning and preparing at every opportunity, they also committed to achieving the highest level of personal excellence possible. Many participants felt that they had made a deliberate choice to achieve their own personal best as a pilot.

I think you can choose to perform well. . . .I think you can choose to at least set yourself up for success. You can't control everything, but you can at least put yourself in the best state of mind or emotionally, physically ready to perform. (Participant 8)

I'll give you another example that you might be aware of: the airplane that crashed near Buffalo like two years ago. Those two young pilots. . .What I can't believe is that they thought that they had all the knowledge when they didn't. Because they called for the ice, they looked at the ice, and yet they did the exact opposite that they needed to do to keep that airplane flying. And for me, that's scary because I know what to do. I could have taken that airplane with no training [specific to that aircraft] and brought it on the runway. And I can guarantee that I would have done it. But they did the exact opposite that was required. So they had a major lack of training to be where they were. . . .They just got their job, they were happy where they were, and they knew they would slowly go up because that's how it is in the civilian [airlines], it's just by

number or seniority. You don't need to be good. You just need to be in. And once you're in, you move up. Air Force? No way. They don't care who you are, they don't care when you got in; it's all about skills and how much you're willing to give to make it up there. Because at the end of the day, we're all paid the same. So even though I'm at the top of my game right now, the guys that are just starting, that are Captains, are making roughly the same as me. . .Us, it's not about money. It's about pride; it's about doing a good job. (Participant 4)

Participants described wanting to know that if they failed, it would not be for lack of preparation or effort on their part. Many described a desire to achieve the highest category possible, and all were constantly striving to become better pilots. These participants did not want to be good pilots; they wanted to be the best pilots possible.

Fun and Enjoyment

Fun and enjoyment seemed to strengthen the level of commitment felt by participants. Most participants specifically identified aspects of flying from which they drew positive feelings. For all pilots, evidence of this enjoyment could be seen and heard in the way they spoke when recalling certain events or discussing various aspects of their jobs.

It definitely is [stressful]. But the people that do [this] job absolutely love it. So it doesn't feel like work, you know what I mean? I'm sure this stuff is fascinating for you, what you're doing for your [degree] and all that stuff, but maybe it doesn't feel like work to you when you're doing it. It's the same thing for me when I do the fighter flying. (Participant 5)

I just loved the military aspect of discipline and stuff like that. And the local Cadet unit just happened to be an Air Cadet unit. . . And then basically the seed was sown. (Participant 11)

At times, participants felt that they could make a choice to feel positively about flying. This was especially important during challenging situations, such as when experiencing difficulty with a course or when feeling stressed by work-related pressures.

The older I get [the more I] understand that life is short and if you focus on the things that don't really make any difference to your life, then you'll have a pretty shitty life. So now I just focus on coming to work with a smile on my face, going home, seeing my kids laughing and giggling.

(Participant 5)

You know [failing the F-18 course because of vision problems] actually made it easier, because it's almost like that's just the way it is. It made it easier for me to accept that hey, I'm just supposed to be here. I'm supposed to be here at the Big 2 teaching. . . And that goes back to me making the decision to focus on the positive. And I decided that I was supposed to be here which made it easier for me to focus on the good time I got here as opposed to 'I should be flying fighters', grumble, grumble. (Participant 10)

Many pilots stated that if they ever stopped having fun, they would know that their time in the military was up.

For some participants, positive experiences when they were younger were responsible for engaging their hearts and minds in the pursuit of military aviation. Pilots described memories of special outings with parents to see air shows or flying with a family member who had a private license.

One of my cousins had a small airplane and he was spotting fires in New Brunswick so he was flying for the government of New Brunswick, spotting fires in the summertime. I went up with him a couple times, so I thought it was cool. (Participant 7)

Some of these pilots also seemed to come from strong, supportive family units where the aviation dreams invoked by these first experiences were encouraged. Participants continued to experience these positive flight events throughout their careers.

You definitely get moments where you're elated and you just kind of go along and you're like 'this is awesome'. Like I got to lead a six-ship [formation flight with six aircraft] the other day for

a graduation, so six airplanes, five flying off you and you're doing fly-bys. I mean, you're pretty happy about that. (Participant 8)

It's just being up in the air. I think it's just a job that is entirely different from everybody else and every day I go up and I'm like 'this is awesome, I get paid to do this'. And a lot of people actually pay just to go up and have fun just for a few hours, we're getting paid to do that everyday, and it's just amazing. (Participant 7)

These participants found joy in their opportunities to engage in unique formation flights or individual missions, or simply from feeling free, traveling through the air, above the earth.

Other participants described positive feelings towards certain specific aspects of their jobs, such as working in a crew environment.

I loved it [flying multiengine]; it was good. . . I really enjoyed my time on the Aurora, I got to do a lot of traveling, I liked the crew environment because again it was a supervisory and management position. (Participant 15)

I believe, from what I've seen and from what I've been experiencing, that this is the best job. Everything that I was expecting and more, both on the officer side, leadership wise, because you get to have a bunch of extremely motivated, young individuals, and older, working for you, whether they are experienced instructors or students. There is always something different, always some challenges. (Participant 14)

The experience of constantly being challenged was also very satisfying for many participants. Challenges came in many forms, such as instructing or completing difficult missions or flights.

I remember we had a blast. [The training exercise] was very successful, except for one guy that didn't follow the instructions and he ended up running out of gas. So he had to go back, so we ended up finishing the fight with only three guys. And we just made fun of him, and he ended up

with a new call sign. So there's always something like that. But it was very exhilarating, knowing that you made it work, and it's fun. It's very challenging. We still talk about it. (Participant 4)

The teaching is really fun, especially when you get – and here's the whole 'I like a challenge' thing – a student that's having difficulties and you get to help fix them and help them overcome that problem and see their confidence improve because of it. It's satisfying. (Participant 15)

I would say that I definitely preferred to be running at full speed with the crazy special-ops guys.

. . .Because it is my mentality. I don't like bad guys to win. (Participant 1)

In whatever they were doing, these participants enjoyed a challenge and the CAF presented them with plenty of opportunities to push themselves. These challenges kept them focused, energized, and engaged, enhancing their drive to do whatever was required to succeed.

Pre-Flight

Focus

An important part of the pre-flight preparation for all pilots was bringing an effective focus into the preparation routine. Five pilots referred to the term "focus" as a skill that was important during their preparation, however it was evident from their descriptions of study techniques and chair flying that a focused connection was an integral component for each participant. A key characteristic of an effective focus was being in the moment. During their pre-flight preparation participants were not thinking about irrelevant events of the past or the future, but were totally absorbed in what they were doing at that time.

I tune out the entire world and I'm flying my mission as I'm walking around my basement. My kids will come downstairs, they might ask me something and I'll answer them, but I'm still doing my checks and I'll be walking, literally, walking around my basement. (Participant 1)

I flush everything else [when preparing for a test]. I get rid of everything else in my life, it becomes not as important during that time. . . .everything else kind of outside of work or

associated with work gets pushed to the side. So I'll cancel everything, just won't go to anything, and my wife's pretty stellar that way. I'll go lock myself in a room from 6:30 to 10:30, 'nobody bug me'. And we have trips planned or things planned – it all gets cancelled. Just until it's done. And then once it's done, it's done. So I just kind of delve right into that and then leave everything else alone and worry about it later. (Participant 12)

But usually I'm in a state of focus when I do it [chair flying], whether it's lying down in bed or driving. It's probably bad to say that [laughs]. . . .You just have to sit down and not be distracted.

I couldn't do it in front of the TV or anything like that; I have to do it in quiet. (Participant 15)

Participants were aware of what they needed to do to effectively achieve this type of focus and would take steps to ensure that the correct conditions were in place (e.g., removing themselves from a distracting environment).

Participant 12 explicitly noted a positive element to his focus experiences in the pre-flight preparation. Most of the participants implied that it was a positive experience when they were focused in preparation; however, only Participant 12 described these positive feelings. He stated that he found chair flying calming and when asked if he felt that he was fully focused during these times he replied "Yeah. It's another weird time that I'm nice and relaxed". For this participant, a state of focus was characterized by the absence of tension.

Participants also described their pre-flight preparation focus as being of the same quality as their performance focus; they would engage with the same high level of focus in their mental rehearsal as they would in their mission execution.

There's no way to simulate [an engine fire] in real life, but in the simulator. . .I'll do the maneuvers. And I exercise myself in the same way: I don't take it nonchalantly. I just breathe, 'okay, this, this. Okay, co-pilot do this, navigator do this' and then I'll action a few other things.

So I try and keep it as close to as if I would do it in real life. I've only had one true [engine fire] experience real life. (Participant 11)

Participant 12 also stated that when preparing it was important to fully engage as one would in a flight. He commented, "Don't pay it lip service: actually study it".

Mental Readiness

A key component for all pilots during the pre-flight preparation was ensuring that they were mentally ready to execute their mission to the best of their abilities. All 15 pilots discussed the concept of mental readiness through ideas such as capacity building, studying, and anticipating various aspects of the flight. This preparation was especially important in achieving success and improving skills as a student. Pilots used various skills and strategies to achieve this goal, and all clearly emphasized the importance of this preparation.

Preparation, I really think, was what it's all about. So even to this day, if I know I'm not going to fly for a week I will always go back to the books that the students use and that I used, and I will re-read the books. Because never should I – even though my day is predominantly running the [flight] school and all the issues that go with that – never can I go to a cockpit and not be prepared. (Participant 1)

Participants described the development of their mental readiness as being driven by several important elements: reviewing written material (e.g., flight procedures and maneuvers), building their capacity (i.e., the ability to attend to multiple stimuli), learning from others, planning for unplanned events, and engaging in mental imagery (which included visual, auditory and kinesthetic components).

Reviewing and retaining flight information

Many participants indicated that the revision of pertinent material allowed them to feel comfortable and confident before the flight. Participants felt that through their review process, they were able to formulate a plan for the flight and were better equipped to deal with surprises.

I think it's a combination of I know what to expect, I know what the surprises can be, I know what I need to do. Yeah. It's almost like going through the flight mentally before, without really thinking about it. Without really sitting down and going through it. But being comfortable with what will happen. (Participant 13)

Not only did they review their material, but pilots also took extra steps to ensure that they understood all of the complexities and were able to retain that information for use in flight.

Several pilots explained how they simplified the material by breaking it down into smaller pieces, allowing them to commit it to memory more easily. Another technique used to simplify the often complicated or abstract information was to link it to some concept or skill that was already familiar.

I just block things up into pieces; I guess that's the best way to say it. Everything's blocked up into procedures, like you proceduralize everything. When you're memorizing, like a checklist, I would always block it into pieces. (Participant 15)

You try to link everything to something else that [you or the students have] seen or done or know. Everything new, well you know how to do this because you've done this, so it's like something you know. . .go back to something you know. (Participant 12)

Through these methods of simplification, participants enhanced their understanding and retention of a staggering amount of complex information. Linking or breaking down material was an efficient and effective way to study; once pilots had determined this, they stuck with these methods throughout their training and flying careers.

Some pilots also mentioned prioritization as a technique in their pre-performance preparation.

Participant 3 described a study routine that he used frequently:

First I slowly run through all the information I think is pertinent to the flight. I try and be as careful as I can to go through our simple, direct procedures like how to fly the maneuver. And then anything associated with that maneuver, like for instance if we're going to go out and do a

solo check I try to run through all the orders and find out what associates with a solo check. And then I try and put it into my own [words]. . .so I can understand what I've gone through. Then I try and re-order it to run as the flight will run. . . .So I organize the study package and then I try and skim it down as much as possible; I try and cross out stuff that I think will not be useful information until hopefully I have [everything I need] – like right now I'm going to do a four-ship [a formation flight with four aircraft] this afternoon, my first four-ship work up flight, and I've kind of paired it down to about 10 pages of information that I'm hoping is the information that I should have studied.

Using these techniques, participants were able to memorize all of the required procedures and technical information, and began to anticipate possible sequences of events for the upcoming flight. This allowed them to feel prepared, comfortable and confident.

Building capacity

Most participants noted the importance of capacity in the successful execution of a mission. For the purposes of this investigation, capacity is defined as one's ability to effectively attend to multiple, often dynamic, variables. Participants made a conscious effort through their preparation to enhance this ability, which would allow them to perform more safely and efficiently in flight. One simple technique that four pilot instructors reported using and recommending to their own students was to engage in a secondary activity while reviewing protocols or performing mental imagery.

I used to do my red pages while juggling. My red pages are [procedures for] critical emergencies, like you have to say them out loud, by heart. So I used to juggle and then do my red pages [at the same time] or cook dinner and then somebody asks you [i.e., tests your knowledge of the red pages]. . . .If you always go through your procedures when there's no other distractions, well you go out there obviously you're gonna get distractions. The tower controller will call you,

there's gonna be a traffic conflict somewhere, there's gonna be a bunch of different things. So it's good to go over procedures while you're distracted. (Participant 7)

Participant 11 described incorporating that condition of multiple inputs directly into his mental imagery routines, practicing the sequence in which he would attend to various stimuli:

Some [pilots] are just better than others [at doing] a couple of things at the same time. But you can practice it. When you go through training, we have something called chair flying; it's basically you sit down and you focus, you go through a certain maneuver [imagining it in your mind], but you can practice that 'okay when I'm doing this I'm gonna do that, look out here, look out there, do this, do that', so you can practice that to a certain level.

Pilots explained that this capacity was an important part of their mental readiness as it allowed them to carry out their procedures in flight in a fluid manner, often without looking or consciously thinking about what they were doing. Participant 1 commented, "if you cannot go flying and procedures happen without even thinking of them because all the other stuff's coming on your plate, you're going to fail".

Learning from others

An extremely valuable source of information for many participants was the experience and insight of other pilots and student pilots. Participants described seeking out other pilots when preparing for a new project or mission to gather relevant information. Often, participants found it helpful to speak with several different pilots, all of whom had experience with their particular task or challenge.

If you listen to what other guys have gone through, and maybe made a mistake, then you won't make that same mistake. . . .I might make one mistake and everything else is okay so I might think that's how you do it, when another guy might go do the same mission and make a different mistake that I didn't even think about. You have to talk to that other guy to keep learning about what to do and what not to do. I think that's incredibly important. (Participant 5)

There's an awful lot of conversations, in our flight anyways; it's like 'we went up and this guy did these things' and 'what should I tell him?' And you can draw on other people's experience and there's certainly a lot more experienced instructors than me. But they'll kind of add 'well when he did this, did these things happen?' and 'this is kind of a common malfunction with this maneuver'. And it's quite interesting, the 'aha' [moment]. It's almost like being an intern I guess.

(Participant 9)

The ongoing dialogue between pilots and student pilots seemed to focus mainly on the avoidance of potential mistakes and specific tips or tricks that were useful in completing various tasks successfully. Pilots used this technique of learning from others in preparation for missions as students, pilots, and instructor pilots.

When preparing for a particularly challenging event, participants specifically noted seeking out information from others.

I've had things thrown at me a couple times too quickly. . . Which was daunting and overwhelming. But I ended up doing okay with it. . . At first it's like 'holy shit, really?' because that's pretty fast. And then after that, I search for other guys for the information they have and then just go home and study. (Participant 12)

Gathering information from others before an exceptionally challenging or unexpected task empowered participants to feel more comfortable with their capacity to succeed.

Two pilots also made a point of mentioning the importance of listening to others on a day-to-day basis.

I remember going through a phase in my youth where I realized there are people that talk and don't listen, and there are people that sit there and listen [but] don't talk. And in the perfect situation, neither of those is a good deal. And I went through a conscious point of my life where I was probably inclined to talk more and not listen, and I forced myself to be the one who listens

the most. I think by doing that, I may have trained myself or I may have become more observant than what I would have naturally been if I hadn't concentrated on that. (Participant 5)

By listening attentively to others, participants opened themselves to many more learning opportunities. Participant 5 also found that by listening to others, he was able to pinpoint issues, provide effective advice and help them to learn.

Planning for unplanned events

Participants emphasized the importance of planning for possible incidents and emergencies before a flight. This process would include thinking about potential circumstances they may encounter (gathered from textbooks or other pilots' experiences), how they would respond to these circumstances, and often visualizing their preferred responses or a number of possible responses. As students and now as pilots, these participants felt that it was important to always have options, to know that should a situation arise, they would have a predetermined set of responses from which to choose.

As many scenarios as you could possibly think about, you have to talk about because once you're actually doing it, you can do stuff on the fly but it's very difficult to articulate what you want someone else to do in another airplane that's a mile away on the radio. Very hard. So you have to have a plan before you go. (Participant 5)

One thing that I also notice, flying with new pilots, is always thinking about the 'what if this happens' and always have many options. So that's one thing that I found, especially in my last few years. . . . So if something doesn't work, I already have thought about five or six other options, so I pick one of them. . . it has become natural and I guess that's because of the job, because I've been flying for a long time. And I find myself doing that at home sometimes, it drives my wife insane [laughs]. (Participant 13)

Participant 15 planned for these possible events using mental imagery or by mentally running through scenarios: "Potential distractions and emergencies are both part of the chair flying process for me. For

example, I will often ask myself, and visualize how I would recover from a particular emergency during a particular phase of flight". One participant noted that far too many potential circumstances existed for pilots to adequately prepare for every single one. He reasoned that by training only for certain emergencies (through chair flying and simulations on the ground and in flight), as the CAF does, a pilot would enhance his/her general problem solving abilities; this would allow him/her to respond to an unplanned event appropriately without having trained for that specific event.

Mental Imagery

Mental imagery, chair flying or visualization was an important part of student training for every participant. It remained a useful tool as they gained more experience as pilots and took on new and more challenging tasks, and was also important when returning to an aircraft after a period of absence (i.e., vacation, flying a different aircraft etc.). All 15 participants described the use of mental imagery as part of their preparation for flight. The most common type of mental imagery training used within the CAF is chair flying. When a pilot engages in chair flying, he/she sits down (or stands, if preferred) and runs through the flight, or key sections of the flight, mentally. This mental rehearsal can involve one or a combination of the following elements: visual images, kinesthetic motions or sensations, and auditory signals. In addition to chair flying, participants also described using flight simulators and other alternative methods of mental rehearsal for a flight.

Simulators and Alternative Mental Rehearsal

Flight simulators are a computer based training tool intended to closely replicate the cockpit environment and the upcoming mission requirements. The simulator consists of an exact model of the cockpit, which faces a large, wrap-around screen. A computer projects the horizon onto the screen, showing a close approximation of what the pilot would see as he/she progresses through the mission. All students trained on some type of computer simulator, with the current version being much more technologically advanced than previous simulators. Several participants expressed an appreciation for

the more advanced equipment. Participant 2 stated, “Nowadays it’s definitely easier to practice those [routine procedures and checks] with the flight simulators that we have”. Unfortunately, these simulators also have their limitations:

With these flight simulators, it more or less simulates flying and they’re great for this whole idea of procedures, going one step to the next step to the next step. They’re not identical to how the airplane flies, and there’s definitely some differences between the two; one of them is the lack of sensation that you have with regards to G forces. Like when I pull 4 G, I know what 4 G feels like without even looking at a G-meter. I can pull the 4 G and know that that’s what it is, I just look over and yep, it is, and carry on. Because I know the physical feelings of it. (Participant 2)

Students also have restricted access to simulators due to the high cost (and therefore scarcity) of the equipment and as a precautionary measure, to avoid the reinforcement of self-taught errors.

For many of the pilots in this study, however, the simulators on which they trained were not nearly as advanced as those in use today. Participant 9 described how the simulators available during his training were “nothing anywhere near as good as the box they use now”.

We had just a clear, it was kind of a white glass, and there was no movement, only the dials moved, and there were no visuals at all. So I think that’s a huge bonus, because they can practice the clearhood portions or the visual flying in that box. But we could only practice the instrument flying. And there was no sensation of movement or anything else, it was quite an antique, in comparison to what we have now. (Participant 9)

Restricted usage, lack of realistic movement, and incomplete compositions of the horizon (e.g., the current simulators cannot project additional aircraft into the skies on the screen) were all cited as downfalls of the simulator training. While it provided some valuable experience in the cockpit, participants felt that this training was not sufficient on its own.

Four participants discussed their own alternative techniques for mental rehearsal or visualization, to supplement their simulator and chair flying exercises. These strategies varied depending on the individual, but always included progression through the different stages of the mission and enabled the pilot to create some sort of tangible representation of the abstract procedures or checklists presented in their textbooks.

I'm a big visual learner, and a lot of pilots tend to be, like 3D spatial and that kind of learning, so the other thing I'd do is I'd draw out all the sequences and put little ticks beside the next function that goes along, with everything I do. And I still do that, even with flying a new airplane. A lot of visualization. (Participant 2)

I've even used model aircraft for learning aerobatics and things like that – [it's difficult] to imagine it without some kind of a real thing in front of you, and what the airplane's going to do. I found it was useful to hold the little airplane in front of me and go 'okay when it gets here, where does it want to turn? What does it want to do? And when I bring it to here, how am I gonna get it to there?' And I found that a useful thing, and I even recommend it to my students because it's like we can watch this on a movie, but you have to be able to make that movie stop and then what's happening here and what's happening here? (Participant 9)

In these alternative methods of mental rehearsal for the flight, participants relied on the manipulation of props, such as paper diagrams or model airplanes, to provide a physical representation of the flight.

Chair Flying

Chair flying encompassed a large portion of many participants' pre-flight preparation. A trusted technique within the CAF, every participant was familiar with chair flying and had practiced it at some point. It is worth noting, however, that even though chair flying is a recommended training exercise, formal instruction in the method of chair flying is not provided. Participant 8 noted this discrepancy: "It's

interesting because everybody says chair flying, but nobody really teaches anybody how to do it". Most of the learning, it seems, is either completely self-directed or arises from dialogue between students.

Instructors would tell me to sit there and just go through your checks. How I do it is just something I did on my own, I don't know. I basically just put one of those boards up [diagram of the cockpit] and started going through my checks. (Participant 2)

We would see all the [students ahead of us in the course], because we're all living kind of together in the same barracks, small rooms. And you would walk in on somebody doing it and like 'dude what's going on?' Then he would show you. So there's a lot of learning happening between students as well. (Participant 4)

Not surprisingly, when describing their methods of chair flying, participants often differed in the quality of their experience and in the details of their execution. Also, while all participants believed in its utility as a learning mechanism for routine procedures, some were skeptical or uncertain of its applicability to the practice of more dynamic maneuvers or situations. One experienced pilot was a strong advocate for the use of chair flying in any situation. He explained his belief in the following way:

I think chair flying works awesome, I always have. I hate it when people tell me they can't chair fly something because I think it's bullshit. I think you can do everything mentally before you go up in the plane and do it. And I think it makes it way easier. You have guys say 'well you can't chair fly formation'. Bullshit. Yes you can. That's my advice to them. . .when you have a book full of information, it sucks because you're reading it and you're like 'wow, how am I supposed to turn that into something that I do?' So turn everything into procedure and chair fly it, that's my [advice]. Don't fly by the seat of your pants, it just doesn't work. (Participant 12)

This participant seemed to have a stronger view on the utility of chair flying for learning and performance in the military context. However, all pilots generally emphasized the use of chair flying throughout training and for subsequent missions or tests.

Clear and realistic details

An important characteristic of chair flying was the inclusion of clear and realistic details. Nine pilots specifically noted that they “put themselves in the cockpit” or used a first person perspective in which they saw the cockpit and the horizon as they would in real life, looking through their own eyes.

When I say that I’m going to do something, if I can I’ll move my hands and do it or I will imagine myself through my eyes looking at it and pulling. And by doing so, my brain now knows where to look and what to do. (Participant 11)

Participants described seeing the hundreds of buttons and switches as well as their gauges and what the various readings would be. Participant 15 stated, “You’d see the attitudes in the airplane, you’d see the button pushing”. In the initial stages of learning, participants would situate themselves in front of a cardboard diagram of the cockpit so that, if necessary, they could refer to a visual representation depicting the placement of the various instruments.

Participants emphasized the importance of practicing chair flying so that they would know exactly what to expect during their mission. Participants focused on mission-specific elements and attempted to incorporate as much detail as possible to achieve this understanding of the flight.

That’s just what I’ve always done actually, even when I was going through pilot training. And I try to sit down and teach the guys that I fly with, how I armchair fly, and to visualize, literally, not only the checks and the flight and the calls and what the winds are doing, but the more clear you can visualize it before you’re out there the better off the flight will be because it’s like you’ve already rehearsed it. (Participant 1)

You know most of the stuff you need to be [doing in a specific mission] – so you focus on [that] stuff, because you have a list of stuff that’s going to be carried out. You can’t just think that you’re just flying ...after you’re done you can do that. [Participant 4]

Another thing that I recall I did as a student was we had a TV room in the barracks that was a large room, and there were two doors on either side and there was a hallway. And there was essentially a rectangular path that one could walk, not unlike the traffic pattern [standard path used for take-off or landing]. So I would actually walk, simulating what I would do, and I'd roll out and I'd check this, speed's this, select the gear down, and I was doing it while walking. And it gave somewhat of a geographical comparison: here I am, here I am. . . It's a step up, say, from chair flying, but it would be what we would call chair flying. I have seen, in the parking lot, two students on their mountain bikes doing some of the tactical type formation to practice, where you can walk through it. I would imagine that from a mental preparation stage that the closer we can simulate the activity, that we're using those gears, we're turning the same gears that would turn in the airplane. (Participant 6)

Participant 8 recalled an experience in which he observed the Snowbirds, Canada's elite formation aerobatic flying team, practicing a group chair flying session:

I've seen the Snowbirds prepare themselves and if you watch them, they sit as a team in a room, they close their eyes, all of them, and then the lead starts taking them through every maneuver, and they all start doing their parts and you hear them all talk at different times. And you can see them visualizing the loop or whatever they're doing as they're doing it.

To the researcher's knowledge, the participants of this study did not use this team chair flying technique in their current positions, even though they did fly formation flights similar to those of the Snowbirds.

Team chair flying was also not used in the formation flying portion of student pilot training. One instructor explained that while this may be a useful tool, there was simply not enough time to incorporate such a practice into their already busy schedules.

Participants also practiced chair flying to develop a complete understanding of the procedures (i.e., they did not want to have any unanswered questions about the maneuvers). Participant 7

explained, “If it’s not clear in your mind before you’re walking out the door, it will not be clear in the airplane, that’s for sure”. Participants used various methods to achieve this goal, including writing down any questions so that they could be addressed in the brief before the flight, and practicing their chair flying with a manual close by to answer questions that arised. One participant explained a technique that he relied on when he was a student pilot:

I make recipe cards so that I don’t miss anything; that’s what I did as a student anyway. And I have a stack of them. So for each [type of flying] I have [a certain number of cards], like for the clearhood stuff I have 50 cards. And I just go through each one, start to finish, and it’ll be like the start of the flight to the end of the flight, and that just makes sure that [I’m prepared]. In front of [the card] I have what the procedure was and on the back of it, if I forgot anything, I’d have everything written down. And I’d just kind of flip though, just sit there and think about it, start to finish. Flip to the next one, same thing. Just visually go through it. That’s what I had to do.

(Participant 12)

For these pilots, chair flying was an opportunity to pinpoint any uncertainties so that they could attend to those areas before the flight. They understood that to fly their best, there could be no doubt about what was expected of them and what they had to focus on to perform their best.

To ensure that their chair flying was as realistic as possible, some participants attempted to perform the maneuvers in real time, or close to that. Participant 6 stated that he would “simply run through the procedure as close to real time as possible, with obvious compression in there for necessity’s sake”. Participant 11 further stated, “I think more importantly, play it out real-time. Don’t fast-forward”. Other participants described manipulating the timing of procedures by compressing their chair flying if time was limited or if they were already fairly familiar with the maneuvers. Participants also increased the amount of time spent on certain parts, such as new material.

It won't be the full length. If it's like a 1.3 sort of mission, so like an hour and 18 minutes, I chair fly it in 20 but I'll do it three times. So it's not always, it might not be real time but it's pretty damn close. (Participant 12)

Two participants made specific mention of the importance of flow in their chair flying, however if they were distracted during their chair flying experiences they had different ways of re-engaging in the exercise. Participant 5 stated that if he was interrupted while chair flying (such as by having to write down a question), he would often return to the beginning of the imagery "so that there's no breakdown in the flow". Participant 12, on the other hand, stated that he would simply return to where he was in his mental flight.

Involving the senses

For many participants, chair flying was largely a visual experience. These pilots described the experience as simply running through the flight in their minds.

I wouldn't sit in front of a thing [cockpit poster] and actually move, but I would lie in bed and mentally do it. Yeah, I would think it through, like visualize it in my mind. . . You'd see the attitudes in the airplane, you'd see the button pushing. (Participant 15)

I do sit down and think about everything I need to do. . . I picture it in my head. I think I'm a visual learner, so if I see something I can usually replicate it. So if I do it in my head and fly that trip in my head, then I think I can easily go up and fly afterwards. (Participant 5)

Some participants noted that their chair flying would include orientation towards important stimuli.

Participant 1 described this as follows: "I'm looking where I need to be looking for ground crew or looking just to make sure the chocks are out". Most participants specified that they closed their eyes, however, some practiced chair flying in front of a cockpit poster, which would presumably require that they open their eyes at least intermittently. Participant 6 also made the following comment regarding

chair flying: “whether that involves closing your eyes or not, I think some people would [close their eyes]; I didn’t personally do that”.

Some participants described the use of kinesthetic components in their chair flying. These pilots practiced hand movements such as reaching to flick certain switches or pulling back on the throttle. Participants also described leaning their upper body in synchronization with the movement and turns of the aircraft.

If you watch somebody chair flying with their eyes closed, they’re leaning back and forth. The other thing you see pilots using is their hands, a lot. So you know if they turn, or in formation, it tends to be a lot of flying talk like this [hand movements]. It usually drives outsiders bonkers. It’s the same when I chair fly – I tend to close my eyes and I move, like ‘okay I need to turn left’, and I visualize where the instruments are going, what they’re doing. (Participant 2)

I had a friend actually go ‘hey, are you pointing at things as you’re doing it?’ and I’m going ‘no’, but then I thought ‘well that kind of makes sense’, like if I’m gonna look over here it might make sense that I physically tell myself that, you know, my cross-check should go left-right-center, and then I should be looking at the power meter while I’m adding the power. Not sure if that works, but it was a technique that I picked up a little bit. (Participant 8)

While many participants incorporated a kinesthetic component by physically moving their bodies, only one participant specifically described being able to feel the sensation of flying. Participant 1 commented, “it’s as if I’m flying. . . Even if it’s G. I can feel the G”. When Participant 2 was asked whether he experienced these types of sensations, he gave the following answer:

I wouldn’t try to reproduce it in chair flying, but I’ll know that when I do the maneuver I’ll be like ‘okay I’m gonna turn and I’m gonna pull to a light buffet [slight shaking]’ and I’d be telling myself ‘okay, pull light buffet’ and in my head I’d be telling myself to physically go and feel for light buffet, like I’d be looking for a sensory feedback I guess for what that would feel like. I can’t

simulate it even in a chair, like I wouldn't try to shake myself, but I'd know that what I'm doing right now is I am thinking about feeling it. It tends to be right in the seat of your pants, that feeling that you feel as you go around the corner, and then the what's next again.

Participant 2 did not attempt to replicate the sensation of movement in his chair flying, but was conscious of the fact that this would occur at certain points during the chair flying.

Some participants also described using auditory elements in their chair flying. This often involved hearing the various calls being made over the radio during the flight.

I visualize everything from what I see outside to controls in the cockpit. I even go over what ATC [Air Traffic Control] will say/ask and what I will verbalize to myself when I need to do checks in the cockpit. (Participant 5)

Participant 3 stated, "I guess I'm a good daydreamer. . . I mean it feels real to me, as much as I know the airplane I can put those sort of sounds and whatever into my imagination". While discrepancies between participants were obvious in the chair flying methodology, it was clear that all participants attempted to engage in a realistic replication of potential flight events and their preferred responses, any way they knew how.

Practicing routine procedures

For most participants, chair flying was used to practice routine procedures, or procedures with clearly delineated steps. The majority of participants felt that chair flying was not as effective for dynamic maneuvers that often involve reacting to environmental cues or other aircraft and can generate certain distinct physical feelings.

You can benefit greatly from the chair flying of the slow flying or the stall because it has those procedures and steps, and what people mess up is they lose their cadence in that; whereas in a loop, you really can't chair fly that to any great degree. I could say 'I do this and I do that', but it's a dynamic maneuver that has feel and feedback that you need to do, and so where the value

of chair flying lies is on the opposite side of the dynamics and feel. I wouldn't traditionally send a student to chair fly dynamic maneuvers. In the same way that our simulator around the corner here, we don't do the aerobatics, not good enough feedback and graphics to do the aerobatics. We can do the more mundane, the more procedural things. (Participant 6)

Chair flying is probably one of the most important things you can do for very routine sequences. And that's what basic pilot training is going to be, a lot of sequences where [students] can predict things are going to happen in the next little while. As flying training goes on, some things become a little more fluid, a little more dynamic. . . So that's a little bit harder to chair fly. . . It becomes one of these more feeling things, like when you're riding a bike, how to keep your balance. (Participant 2)

Participants used chair flying to commit the routine procedures to memory, as they were used often and did not change. As these routine procedures entailed the same steps every time, participants gradually became able to anticipate the upcoming steps in flight.

Practicing routine procedures also allowed participants to eventually perform the procedures without conscious thought in flight. With enough time spent chair flying, participants found that when it came time to execute these same procedures during a mission they were very familiar with the steps and were able to complete them quickly and without hesitation.

The other thing I find that chair flying helps with is it automatically makes you think 'what's next'; so you have the rhythm of what's coming up and you know what to do. With military flying a lot of it is very structured in the sense that, in the case of a Hawk [training aircraft], as I'm coming up to a target on a navigation route I have certain checks that I go through to make sure that my weapons are armed and everything is good for the target that I'm going to. So if you do them the same way every time, they just become so that you are able to do them very rapidly. And it takes practice, so again, chair flying and practicing those. (Participant 2)

When [students] chair fly they usually train for procedures and checks, to memorize things.

Because you tell them once they know their checks, they know the procedure, that frees a lot of brain cells to do other things. Check the instruments, look outside, fly the aircraft. So that's what they mainly focus on when they chair fly. (Participant 13)

I did [use a poster of the cockpit] when I first showed up as a student, to figure out how to get it started up. It's the same sort of thing when you're reading a checklist. You've got all these things in front of you, but how are you supposed to do it – you kinda gotta see it. Might be the same thing with chair flying, you kinda gotta see it and turn everything into a step by step process. So that helped big time because it took all the mystery away. (Participant 12)

The chair flying of routine procedures allowed participants to build what they called “muscle memory” and perform procedures in flight without concerted attention, or in a more automatic manner. They also gained a better understanding of what would happen following each step of the procedure. As a result, they became so familiar with these procedures that they knew what to expect after each step and were eventually able to execute the steps effectively while consciously engaged by other stimuli.

Distraction Control

Seven participants discussed their use of distraction control strategies during their pre-flight preparation. For many of these pilots, distraction control came in the form of identifying potential distractors and either removing the distractors from their environment or removing themselves from the distracting environment.

I came through [UPTS] with a one year old and a two year old, and it worked out. Because I could just close the door and not have any distractions and it worked. But I know that guys who don't have that environment are screwed. You just can't do it. It's overwhelming and daunting and you just fall behind and fall off the wagon. (Participant 12)

Participant 15 commented, “One thing I can’t do, I can’t study with distractions. I’m not somebody who can sit there with the TV in the background and study. I need quiet”. Knowing this, Participant 15 would make a commitment to avoid such distractions when it was time to study.

Other participants noted that the environment was simply different during their time in UPTS. Many suggested that the environment today is one that is full of potential distractions, whereas they were exposed to far fewer distractions as students.

The odd guy had a desktop computer, maybe there was a bookworm that read, but if you walked about the barracks and you poked your head into somebody else’s door, there was a high probability that he was studying or he was looking at something. So the environment has changed quite significantly, to challenge the student of today to remain focused. (Participant 6)

Participants noted the gradual increase in age of the average student over the past two decades (due in part to a new requirement that recruits hold a university degree). With this shift in age came an increased number of students with families to care for. Participant 1 exclaimed:

The demographics are the biggest piece. When I went through, everybody was 19, single, roughly. You had maybe two married dudes on your whole course. . .Almost everybody now is mid 20s or later, mid 20s to mid 30s, some guys are early 40s, married, kids, divorced, single parents, kids with disease, parents dying of cancer – because the whole shift has gone 10 or 15 years because we’ve now said that we want everyone to have a degree. . .Well that focus piece – we had a guy on course with triplets for god’s sake. I mean he doesn’t tell anybody. Dude! No wonder you can’t study, you can’t even see. Like, that is a piece...you go back to the focus and I agree, but your demographics are completely different now than 20 years ago.

Thus, while participants made a conscious decision to avoid potential distractors in their study environment, they also had fewer distractors to contend with than the student pilots of the UPTS today.

Environmental Conditions

Possibly the most frustrating distractor for pilots in the pre-flight phase was the delay of flights due to weather conditions. Participants emphatically described the disappointment of learning of a delayed flight, the agony of prolonged waits (and sometimes multiple delays), as well as the difficulty of regaining the motivation and focus required to fly after winding down from their initial pre-flight preparation and focus.

Those are the worst times [delayed flights], especially in the winter, because we can't fly in icing conditions. But this airplane, sometimes you're scheduled first wave [group of take-offs] in the morning and then because of the conditions of the day, 'oh, well we'll do it second wave', and then second wave the weather didn't improve enough so now you get pushed back to the third wave. So you get ready for your flight, you're all ready to go you're mentally prepared and everything, and then you get pushed to the second wave. So you kind of let it go for an hour or two and then, 'okay, I gotta refocus again'. And it gets, funny enough, you get home at the end of the day, you're tired. And I remember as a student, when that happened, being pushed back from first wave, second wave, third wave, hoping I'm just not gonna go because you get to a point where you're just not in your zone anymore; you just hope that you're not gonna go because you know that it's not gonna be necessarily a good trip. Spooling up and then spooling down, 'okay I'm ready, I'm ready', 'no, we're not going'. It's not cool. (Participant 7)

When asked what pilots usually did when flights were delayed, Participant 5 responded as follows:

Not much [laughs]. You just sit around and wait. It's not instantaneous that you get your motivation back, it sorta takes a while, but you get into that routine of that same thing you do every single time when you go out in the airplane of strapping in, doing a walk-around, starting the engine up. As soon as you get into that flow, it comes back, that motivation.

Participant 5 relied on the routine of his pre-flight preparations to bring him back into the focused mindset required for flight. Participant 7 consciously attempted to shift his attention back to the mission, refocusing on what he needed to do, before flying.

You really have to get yourself together and, for me, it was just going away from everybody.

Because days like that [delayed flights], everybody hangs out and talks and everything, and that gets all your focus and attention away from what you're gonna have to do in a few minutes. So I usually go somewhere where there's nobody in there and think about what's gonna happen and stuff like that, and try to get ready as much as I could for the mission. (Participant 7)

He described sitting in the aircraft before take-off and telling himself "okay, I'm here now, so I'm gonna do my best and make it happen. . . I need to focus on this, it'll be an hour and a half and then I'll be done, so get it done". Each of these pilots recognized their inability to control the weather delays. They accepted the situation and, while disappointed, did not become frustrated or lose focus completely. When the time finally came to fly, participants did what they needed to do to refocus on the flight and perform their best.

Participant 13 related an experience with weather delays during a multi-day return flight to 15 Wing Moose Jaw, after completing an exercise in the USA. He was aware of the imminent deterioration in flying conditions and adjusted his plans accordingly. When the flight was inevitably postponed, Participant 13 did not become frustrated, as he had already accepted this change of events as being beyond his control.

I think with time, I learned all the things that I can't do anything about. And I see that here. Like when the weather is bad for a week, we can't fly, I hear people like 'I wish the weather...'

There's nothing we can do about it. We're gonna fall behind the schedule, so what. There's nothing we can do about it. (Participant 13)

By planning ahead and acknowledging the futility of worrying about uncontrollable weather conditions, Participant 13 was able to maintain his focus and composure.

Stress Management

All pilots experienced some type of stress during their flying career, either as student pilots or full military pilots. Sources of stress and anxiety during the pre-flight phase were mainly cited as general workload (e.g., long hours, high task load) and upcoming tests (e.g., the thought of having an examiner watching their every move, the possibility of failure). 13 of the 15 pilots interviewed discussed their experiences with stress in pre-flight preparation and their personal management techniques.

Participants showed wide variation in the way that they perceived stress and in their coping methods, both at the time when the stress was first perceived and during their recovery afterwards.

Heavy Workload

Participants described different approaches to dealing with workload stress. Participant 4 recalled that being physically fit as a student enabled him to handle the workload, but that no matter how fit you are the effects of the stress will eventually catch up with you.

They have to find a way to be able to get a lot of rest in a very short amount of time. Because sometimes they will be asked to do as much as three events, and for us, three events would be like either flying or ground school for three hours. So you could be in ground school for three hours learning stuff or flying first in the morning, going to ground school for three hours and then flying again in the afternoon. And flying is very physically tiring, you get tired a lot, and then you still gotta be able to perform. . . Personally I remember as a student [it was important] to be extremely fit, which I'm not anymore, to be able to take that extra stress and the extra workload and be able to recover quickly from being physically and mentally exhausted. Most people hit the wall at one point. It doesn't matter how good you are, you will hit the wall because you are tired. (Participant 4)

A high level of physical fitness allowed him to perform the many tasks and handle the long hours without becoming exhausted.

Participant 5 explained that he simply accepted the feelings of stress as a condition of the job. He did not attempt to actively manage the symptoms of his stress but focused on completing his tasks, regardless of the cost.

You just have to deal with it. You have to. You have no other choice. And it did make it tough, for sure. But at the end of the day, if you have to go to war, war is tough. And the fighter pilot motto, which I find very different from the students coming through here now, was if you get a task you don't complain, you don't bitch, you just get it done. Whatever it takes, get it done.

And I find nowadays, not even with students here, just in general the younger generation, they don't go through that same stuff anymore. (Participant 5)

This pilot accepted these feelings of stress as preparation for the harsh conditions of war. He anticipated what would be required of him in a combat situation and approached his training as an opportunity to prepare for deployment. Participant 12 described that he would simply flush away any feelings of stress. This allowed him to maintain his focus on the task at hand and get his job done. He stated

You know how you kind of sit there and you try and rationalize it [i.e., determine the source of stress and rationality of stress response]? . . .I've never been able to rationalize it. So I just flush it and don't even think about it. . .It never helps me [to think things through]. . .I can deal with it all, it's all well and good, but it's just trying to rationalize it all the time sucks. So I just forget about it.

Participant 12 did not dwell on negative feelings or distractions that he experienced, preferring instead to simply forget them and refocus on something else if possible.

Two participants stated that they did not experience very much stress in general in the workplace. Participant 5 attributed this to his love of and commitment to military aviation. He

commented, “I don’t think I feel [stress] as much as somebody else who maybe doesn’t want it as bad as I do”. Participant 13 stated that he simply did not experience much stress in any aspect of his life. He explained as follows:

I don’t experience a lot of stress, first of all. And it’s funny because when I read comments [in magazines] about how to relax, they kind of made me smile because I thought that was very obvious. But I guess some people need help with how to relax. What I find is that physically and mentally how to relax...I guess it’s two different things, for me. But I never learned how to do it.

These two participants were the only pilots who described their day-to-day work and personal life as being relatively stress free.

Flight Test Stress

Many participants experienced anxiety in the preparation time before a test or check flight (airborne test). Known within the pilot community as “testitis”, pilots noted the pervasiveness of this experience on the base, particularly among student pilots. This anxiety stemmed mainly from negative thoughts and a fear of failing. Several pilots noted that their anxiety levels before a test often rose so high that their ability sleep was severely impaired.

I never sleep the night [before]. I’ll always remember my final instrument test upstairs on the Hawk. It was three and a half years ago and that’s always been the scary one for everyone, ‘don’t fuck it up. Don’t fuck it up’. Everyone is scared of that one. I remember, still, I did not sleep that night. Literally. And that’s the first time that ever happened to me. Couldn’t sleep, just stayed up. Then I went on my test and hadn’t slept, hadn’t eaten, and it went fine.

(Participant 12)

A lot of things can happen during a test and the examiner just sits in the back and doesn’t say a word. You know the profile [mission requirements], he will say a word if he needs to see something in particular. . . . If he needs to talk or take control, you’re done. As an example, you’re

coming back from the training area, you're joining the traffic pattern where all the aircrafts are. You don't see an airplane coming, which can happen. He sees the airplane, he takes control, boom. Even though your task was going extremely well, you're done. Test is over. He touches the controls, test is over. Because there's a lot of things that can happen, and knowing that, you're going on your test with a certain level of stress. (Participant 7)

Participant 15 described higher levels perceived levels of anxiety especially when faced with unfamiliar with the testing material: "I still worry before I do a ride that I'm gonna fail it, especially something that's foreign or new. So for me, it's the degree of newness I think that increases my stress".

Several participants noted that in the time leading up to a test they would think about the possibility of failure. Participant 14 admitted, "I got more stress with my tests than when I was in danger of like crashing, for example. That's how different my brain worked, I guess as a student". A number of participants indicated that their perceived levels of stress were elevated due to fears of negative peer evaluation.

I worry about assessment more than just going out and performing, because day-to-day I think I do very well. But when I have people watching me, and it's my peers, then I start going 'what are they gonna think if I screw something up?' and that affects me. (Participant 8)

The culture of the military environment would lead one to believe that this fear of negative peer evaluation is quite prevalent among student pilots and experienced military pilots.

Some participants discussed the use of a type of cognitive restructuring to manage their perceived stress and transform the thoughts that initially caused them to feel stressed. These pilots realized that their perceived anxiety was a hindrance to their performance and shifted to a more constructive perspective.

The fact is, rather than be nervous I almost would tell myself 'what do you have to lose?' And I find if I tell myself 'what do I have to lose' now, which kinda contravenes what I said as I was

going through here as a student, I don't care as much. And if I don't care as much, I find I'm more relaxed and I perform way better. So I'm actually telling myself 'who cares if you fail' kind of thing, but deep down inside I don't want to fail. Just if it happens, it happens. I guess as you get older you kind of realize if it's gonna happen, it's gonna happen. And don't worry about the future, because you have no control over it, well to an extent. (Participant 11)

Usually at the end of the day, the night before a test, usually I'm okay because I just kind of accept. I'm kind of happy that it's gonna happen. But it's kind of the few days before that when I get nervous. So then I just study more, try and cover all my bases. See if I can kind of nip it in the bud before I get in the plane. Do what I can do, and then at the end of the day I've done everything I can do and if it doesn't work out, it doesn't work out. And then I feel more relaxed. (Participant 12)

These participants recognized that their control over the situation was limited. By shifting their perspective and focusing on constructive elements that were under their control, these pilots were creating better conditions for success.

Participant 14 discussed the use of visualization to enhance his confidence before a test. He gained confidence by practicing the anticipation of events that is required during chair flying.

I found out that doing visualization helped, a lot. Imagining myself expecting those areas, chair flying, and then saying 'okay, now I just screwed this up, so what am I gonna do if I do this'. Okay well I gonna do this this way, this way, and this way. And in the end, I visualize that it's gonna go well, because I've been prepared mentally for these things. (Participant 14)

He included potential errors and his recovery from those errors in his chair flying preparation. In the end, he felt that he was more prepared for every possible event that could occur during the test.

A few participants mentioned exercise as a way to manage their stress or arousal before a test. Participant 8 stated, "If I find I am getting worried about something, I can literally, 15 minutes on a

treadmill and I feel good. And then I generally do better, so that helps me prepare". Participant 7 was the only pilot to specifically mention the use of relaxation and refocusing immediately prior to a test. He stated,

Once in a while I would just sit in a room for about five, 10 minutes just to think about the flight itself and just to try to relax a little bit. Five, 10 minutes. I would do that once in a while.

Especially before a test, an airborne test, because those are stressful. I would do that. Five, 10 minutes, that's all. . .It would help me relax and get more in control. Just think positive.

He also mentioned the use of breathing to achieve this relaxed focus: "There's a lot of things that can happen, and knowing that, you're going on your test with a certain level of stress so for me, again, taking that five, 10 minutes just to breathe in, breathe out was [important]". Taking time to relax and breathe allowed this pilot to refocus on the most important thing, which was the task at hand.

Recovery

The most commonly cited method for recovering from stress on a day-to-day basis was exercise; however, many participants found it difficult to find time for regular exercise or community sport involvement during their busy days.

I didn't have any issues stress-wise [on course]. Obviously the stress is there, but it's how you manage it. For me it's, like I said earlier, I run a lot so if I didn't run for a couple days in a row, I could feel it mentally; the stress would get a lot more to me. It's just something that I needed to do. Sometimes I just didn't have enough time, but I still took the time, 30 minutes or whatever to go to the gym, I had to do something else just to disconnect from everything and that was the only way for me. I had to do it. (Participant 7)

I would say I work a lot, and I take pride in my work, and at times [my wife] just sees that; she just sees that I'm here a lot and I'm here working and other guys get vacations and stuff like that. . . And definitely, I would say, taking time for yourself is important. It is absolutely

important. And this is where I find my sports comes in, because I have obviously a lot of commitment here and I have a lot of commitment at home, you know, and I work around the house and we build things in the backyards and my kids, I've got three daughters. . . And I know that when I get over busy here, and I start getting stressed, that's what I need. I know that if I just go for a run, a lot of the problems go away. (Participant 8)

Exercise and sport seemed to offer participants two things: (a) a time for complete dissociation from work or (b) an opportunity to work through and find solutions for various issues at work. Several participants indicated that they sometimes forced themselves to exercise because they knew they would benefit from the activity even if they did not feel motivated at the time.

Many participants mentioned partying or socializing at the mess, the communal dining hall, as an effective way to blow off steam during stressful times as a student.

Usually Friday nights there was no studying, there was no nothing, we would all go to the mess and blow off steam. And the Commanding Officer usually would always turn a blind eye to what we were doing because he knew that you had to blow off the steam and whether it was us wrestling and smashing tables and doing whatever, they generally let us do it. And then Saturday morning you'd be right back at it again. So that was generally quite important to releasing the tension. (Participant 5)

Participant 1 referred to this as an "excellent tool to get the stress out on Friday night in the protection of your own mess". Participants did not dissociate from work by gathering in the mess, on the contrary much of the evenings were spent discussing various issues related to their training.

Aside from these two main outlets for stress management, participants engaged in few additional activities to consciously relieve their perceived stress. Two participants, who were involved in music before entering the CAF, preferred to play instruments to help them relax. Two participants discussed the use of meditation:

When I was at Cold Lake [in the F-18 course] and I knew I was coming down here [Moose Jaw], I was waiting to come down, I was in a squadron and I wasn't nearly as busy as I am now. . . . But I made a point of, every morning or most mornings, going outside usually on the flight line [runway], just trying to clear my mind of everything, just focus on one thing, look at a tree off in the distance or whatever. And that was nice, I felt better after that. But here I haven't had the time to do that. (Participant 10)

Sometimes when I'm by myself I do sort of type of mediation that makes me feel really, really good. Not just an 'empty your brain' kind of, and breathe; it's something I can do almost any time. . . it's like emptying yourself of all stress, basically. Flushing everything down. . . I can experience it even if I go drive or anything, and I don't do it that often actually, but if I feel stressed, if I feel like something is not going like I want, then I use this as a tool and it makes me feel so good. . . It's the thought of feeling; it's almost self-initiated wellbeing. . . Let's say you think of something really sweet or really sour and you can almost taste it, right? Well if you think that you're really happy, you can almost taste it, then all of the sudden you start feeling it, and then with it, it just comes down basically, and the stress just goes away. Because you find that you are [happy]. When you think about it, being happy is all in your head. Whether you're sick, whether you're dying or you're gonna get executed or whatever, in the end it's all in your brain. It's all like that moment. (Participant 14)

These two participants engaged in a type of self-taught meditation, having received no instruction during their training in the UPTS. They were simple strategies that allowed the participants to clear their minds and refocus on positive things.

Some participants mentioned that taking time off allowed them to recover from their levels of perceived stress.

It's a long course, so you have to take at least one day where you don't do anything. To me it was Friday nights, Saturday all day, and then Sunday start studying again. But I needed that one day. You gotta get away from it for at least a day and that was the only way I could deal with all the stress, and during the week, like I said, going to the gym every day or going outside for a run was big. I needed that. (Participant 7)

For other participants, simply spending time at home with family was their preferred way to recover from a heavy workload. By relaxing on the couch in front of the TV, talking with a spouse while washing dishes, or playing with their children, participants were able to stop thinking about work and just relax. When engaged in these activities, their focus would shift naturally away from work. Other participants were able to simply leave the stresses of the day behind as soon as they walked out of the door.

When I go home on Friday, and on Monday morning it's like 'oh yeah, I have that thing due today' but all weekend, since Friday, I've never even thought about it. It's funny because sometimes I hear friends talk about how it takes them two weeks of vacation to do that. It's like 'no, no'. The minute I walk out the door, everything is behind me. (Participant 13)

For Participant 13, it was as though he could flick a switch when walking out of the building to turn off all of the negative thoughts.

Sleep was also an important consideration for some to ensure that they recovered well. A few participants mentioned that their sleep was affected when they felt higher levels of stress. Participant 5 recommended, "Sleep as much as possible. I mean, really because it is so stressful in the fighter weapons school it's important to blow off steam". Participant 3 commented, "I still [view] sleep as most important [for recovery]. I try to watch what I'm doing there". These participants recognized that sleep was important to their physical and mental health, and monitored their routines closely.

Mission Execution

The mission execution phase begins when the pilot arrives on the flight line to conduct the pre-flight checks and strap in to the aircraft. The procedures of a mission vary according to the nature of the flight (e.g., clearhood, low-level navigation, instrument flying, formation) and the overall objective of the mission. In addition to the standard exercises completed through training, participants discussed their engagement in missions that involved inserting troops in hazardous conditions, landing on aircraft carriers (i.e., warships) at night, search and rescue, simulating multi-aircraft attacks on enemy warships, and combat. Participants spoke about the importance of the following psychological skills in the successful achievement of their mission objectives: focus, distraction control, confidence, stress management and ongoing learning.

Focus

For all 15 participants, an effective focus was an integral component of successful performance. Many participants expressed that they found it relatively easy to focus in flight. Participant 1 stated, “I would argue that every time I’m in an airplane, I am fully focused on what we’re doing. It is a rare, rare day when something from the office comes into my mind when I’m flying. Rare”. He also mentioned, however, that he was finding it increasingly difficult to reach his peak focus as he aged. Participant 12 also felt that he was always focused when flying and that this focus was an automatic transition (i.e., did not require conscious effort). When he was instructing, however, he would consciously allow his mind to wander.

It just happens [being focused]. Flying is busy enough, it’s dangerous enough and scary enough at times that you can’t really [lose focus], especially when you have somebody in the front [a student] trying to kill you [laughs]. That being said, if I’m teaching someone and actually not physically flying the plane, thinking about it, just watching them, I go off into la-la land. . .it’s just kind of thinking about what’s for dinner. I can do that if I’m not flying. (Participant 12)

Like many others, Participant 12 made a conscious choice to be focused or, in some circumstances, to allow himself to become distracted. Participant 14 singled out focus as the most important element to achieving success:

I would say when I am very successful at something very challenging, I would say the focus, the mind focus is probably the biggest key element to me being successful in those particular things. And whether it's flying or writing a test, the focus and in most cases the preparation as well. But let's say it's something that doesn't need preparation but you're doing it and you excel it, it's the mind focus. Concentration.

Many participants made similar mention of the critical importance of focus in performing to their full capacity. Exceptional performances were often notable for the ease and flow of focus, whereas during less-than-best performances pilots often felt distracted or found it difficult to engage fully in a task oriented focus.

In the Moment

As noted in the pre-performance phase, participants characterized an effective mission execution focus as being in the moment. This involved shutting out all other irrelevant or unnecessary stimuli or distracting thoughts.

Your focus narrows and you're not thinking about other stuff. I can have outside stresses at home, or wherever, and it won't affect me. It'll affect me before I get in the plane, it'll affect me as I'm walking to the plane, and as soon as I get into the plane I don't think about it anymore until I'm on the ground because I'm busy enough with that. (Participant 12)

I would say – [it's hard to put into words] – totality of the mind. It's like 100% of your brain is focused on there. And that usually is prone to increasing your chances of success, my chances of success. (Participant 14)

A lot of other things are being ignored. An example in flying is when you're doing aerobatics, you're under G [gravitational force] the whole time but you totally put that aside, you don't focus on that, you focus on the maneuver which tends to actually increase your g tolerance even. Because that's just something you're not worried about right now. (Participant 2)

Participants described being able to leave other distractions behind as soon as they began the flight.

Participant 14 explained, "the rest doesn't exist"; the task at hand is the only thing that matters.

Being in the moment also involved an element of anticipation and a connection with the flow of tasks. Participants were thinking ahead to what would happen next and preparing themselves before they needed to act. In this way, participants were able to move fluidly from one task to the next, without hesitation.

When I'm in the airplane I don't think about anything else than what's coming up next. Not what I'm doing right now, but what's gonna happen in the next five minutes; I have to know. Because what I'm doing right now is dependant on what I'm gonna do in five minutes, so you always have to be five minutes ahead of that airplane so that you can plan according to that.

(Participant 7)

I think a big part of the flying game is that: What is next? To me that is the big focus. What am I doing now? What could I do? Rather than just sit there and 'oh we're here', and now you're looking in the past again. (Participant 9)

It feels like I calm down, and I just kind of go through the motions. I don't know the best way to phrase it. You just kind of sit down and start going through things and it kind of all just comes together. And you're not really searching for that next thing. (Participant 12)

Participants emphasized the importance of remaining ahead of the airplane at all times. Pilots felt that because things happen so quickly in military flying, if they are not ahead of the aircraft, they will be

behind it. Being behind the aircraft can present a major problem as the pilot then begins to react rather than act. Once the pilot is behind the airplane, it becomes very difficult to recover.

Participants also noted the importance of being able to broaden or narrow their focus, as required by the task. While flying, participants could attend to stimuli from a variety of sources (such as the horizon, radio calls, instruments and gauges). When executing a critical or difficult task, participants narrowed their focus to only those stimuli that were essential for the success of that task.

You're thinking about it [mission objective] all the way out, 'cause that insert [of troops] is fairly critical, but you're still running the mission. So you're busy, but I can still see when there's certain calls made in the airplane, sort of like five miles back. And then you'd start to get into a cadence as a group, and then everybody just goes [motions a coming together with hands] and all you're worrying about now is the exact point that you're gonna put those troops on. And as you come off that target you go [motions pulling apart with hands] right back out again and now you start hearing your boys talking at you again [over the radio]. (Participant 1)

I get very, very focused. . . If it's normal and I'm just flying along I have the ability to accept stimulus from a bunch of different places. But when it comes to a very focused task, then that stuff starts going out of my peripheral and I focus on just that one [task]. (Participant 2)

Participants also mentioned relying on ATC to let them know if any other aircraft were close by. Knowing that the tower was keeping watch over the air traffic allowed the participants to focus their resources on the task with less concern for their surroundings.

Situational Awareness

For the purposes of this investigation, situational awareness [SA] is defined as a pilot's working knowledge of his/her environment, including air traffic, weather conditions, aircraft status, task demands, etc. This awareness can be either temporal or spatial. A broad SA allows a pilot to direct

his/her focus appropriately and avoid being caught off guard by an unexpected situation (such as another aircraft flying close by).

You sort of need to multi-task but you need to focus at the same time. You need to be aware of the aircraft performance parameters – your altitude, your heading, your airspeed – and at the same time you need to be listening to the radio for your call sign, and at the same time you need to think about weather, you need to think about the mechanical state of your aircraft – how much gas you're burning – so you need to think about all these things. Not necessarily at the same time, but in series, very quickly. So you need to keep your, we call it a scan, you need to move your scan and you can't stop it; it's gotta always keep going. (Participant 10)

I think being able to cope in changing circumstances [is the most important skill for a pilot]. Because you can have a plan, but the plan can change very, very quickly. So situational awareness [SA] throughout changing environments would probably be the number one thing. Because the hands and feet are just basic, right? You know, everybody [can learn] hands and feet, but it's the thinking part that's the most important. (Participant 15)

I try to be aware as much as possible [of what the crew is focusing on], especially when I have people with less experience. I think the more experience they have, the more they worry about what to focus on, important things. So when they were less experienced, I had a flight engineer and co-pilot that were less experienced, I would monitor their focus and if I had to redirect I would do that, for sure. (Participant 13)

A pilot must be continually updating his/her SA in order to respond appropriately to stimuli and perform maneuvers safely. These participants described themselves as high in SA, meaning that they had excellent focusing skills and the ability to monitor all the relevant variables during a flight. Participants believed that their SA improved as they gained more experience flying.

It comes with experience. . .some guys are just better at it than others. But it also depends on your experience, because when you start flying, you don't really have a database on what can happen; you're just barely starting to fly, you don't know, you don't think about all the possibilities or what you can be confronted with while you're airborne. So your database is very small. As you get more experience, now you're able to think more about what can happen out there and make better decisions about it just based on your experience. It's certainly something that you can develop. (Participant 7)

As they became more experienced as pilots, participants became more familiar with the possible situations they could encounter and what they would need to be aware of to be successful in carrying out their mission. Participants also increased their skills in performing routine procedures without conscious thought, allowing them to focus more on their surroundings and other SA relevant stimuli.

Capacity

As described in the pre-performance phase, capacity can be seen as a pilot's ability to effectively attend to multiple, often dynamic, variables. Capacity, or the ability to focus on the right things at the right time, is essential to the safe and effective command of an aircraft. To develop a broad SA, a pilot must have a significant amount of relevant focusing capacity. The participants in this study possessed sufficient capacity to shift their focus as necessary and attend to multiple, relevant stimuli in their SA at various points throughout a flight or mission.

There's a certain percentage of the core of your focus that has to be [centered] on the task at hand, and then there are secondary rings that deal with other aspects [of the mission]. And our core focus, what we're trying to do, is we're trying to make that more and more automatic or second nature, such that we can begin to put the [other] tasks on. . .And we give [students] objective checklists in the beginning, hoping that it becomes fluid and natural at the end. That's

the balance between the two. And we, as seasoned aviators, simply just do those things naturally now. (Participant 6)

I find my brain keeps jumping from one [task] to the other, while prioritizing what's important. I catch myself doing that at home, or in anything I do, but I'd say when I'm flying it's going back and forth between the important tasks. . . .being able to watch what's going on, or fly and listen to the radio and think about what's ahead and what's going to happen next. I guess being able to go back and forth between those tasks. I find it just comes naturally. I don't think about it. I don't force myself to do that. (Participant 13)

Experienced pilots described having the ability to subconsciously monitor the automatic mechanics of flying while also consciously shifting from one task to another and anticipating upcoming events.

Connected Focus

When fully focused, participants were connected with their task and the mission in a natural, organic, or free flowing way. Participants described completing tasks without consciously thinking about them, by trusting in their abilities and simply allowing their bodies to perform the movements that they have trained them to do.

[Do I] get into a groove and do it? Yeah. Especially when you get very comfortable with it. . .The more time you have in the airplane, you know that feel of the aircraft – or muscle memory, brain memory or whatever it is – if something feels a little weird you'll just go 'okay something's off here' and you'll be able to anticipate or change. If the wind's moving you around you'll actually go 'wow, this is not normal so I'll fix it'. (Participant 8)

To be honest, I'm actually asking myself now 'do I even focus?' – now that you've asked me that question. And as ridiculous as it sounds, I think there's always going to be little items throughout the trip that you're going to do that you gotta focus on, but I'm not thinking about that as I'm doing it. I already thought about that in my chair flight. (Participant 11)

Each one of the airplanes I've [flown] has different checks, so I'm still sometimes thinking 'what do I need check-wise?' 'What do I need here?' But basically to take the airplane from this position downwind to this position on final, and what I need to do to maintain that, and what the winds are doing, I'm not thinking about it anywhere near as much as the students are, because it's just kind of like well there we are, we land. (Participant 9)

Participants described feeling connected to the airplane, as if it were an extension of themselves, similar to the way in which some people drive a car or ride a bike. This idea of doing without consciously thinking led some pilots to feel that they were maybe not focused after all, even though it is apparent from their statements that at the time of the experience, they were fully engaged. These pilots were not "trying" to focus but were simply freeing themselves from irrelevant thoughts and concerns to connect with what they were doing. Some of these participants seemed to interpret the word "focus" as something that required more conscious effort (as opposed to freedom from effort).

Many participants found that when they attempted to consciously think about familiar maneuvers or actions they inhibited their performance.

It's very equivalent to when I flew helicopters and hovering – if you're thinking about it, usually your brain's not thinking as fast as the aircraft is moving, so when you make an action you're already one step behind of where the opposite action needs to go in now. And so hovering, for some guys initially becomes. . .quite humorous anyways. They tend to move all over the place and they're reacting to what they see, physically, right now. Whereas later on, once you have a few hours on a helicopter, you don't ever think about hovering, you just physically look where you are and say 'okay I need to move over there'; you don't tell your hands or feet anything, you just start moving. So sometimes over-thinking things can get you into [trouble] – well it's just that when you start physically thinking about things, you usually can't think of them fast enough. In the case of formation, it's 'okay, I'm below, I'm going to move up', and as he's doing

that he could be getting closer to the [other] airplane but right now he's concentrating on moving up because that's what his brain is working on right this second. (Participant 2)

The ability to act in positive and appropriate ways without the hesitation or delay caused by conscious thought processing was viewed as very important for military pilots. Due to the high speeds at which these aircraft travel, if pilots are unable to carry out tasks and mechanics automatically they risk putting themselves and others in danger.

Positive Focus

It was evident that a positive focus was an important factor influencing performance for all participants. For some, this positive focus was found in their refusal to think about failing. Participant 10 stated, "You try and compartmentalize [block it out], because if you're thinking about failing then you're not thinking about succeeding. And you're not setting yourself up to do well, if that makes sense". Participant 7 commented, "I never really thought about that [consequences of failure]. To me there was only one outcome: I was going to be successful". For other participants, their focus was directed in positive ways in that they did not think about the risks they faced while flying. Participant 5 stated, "I never think about it [risks]. If you do, you couldn't do this job. It's like if you think about people shooting at you: if you're scared of that, then don't do this job. That's black and white". Participant 12 offered a similar thought: "[I] don't think about it [potential risks] that much, because there's no sense in losing sleep over it. When you're in the airplane you're just looking out as much as you possibly can". These participants recognized that thoughts of failure and potential risk would only hinder their ability to act positively and to perform with confidence and so they avoided any thoughts of that nature.

When asked to describe their best focus in flight, two participants referred to physiological or emotional reactions. Participant 10 stated, "I actually enjoy it. I feel more alive, I feel I'm good at [flying]; I feel like hey, I'm good at this, this is what I'm supposed to be doing. I like it". Participant 13 described feeling calm and relaxed when he was fully focused. Many participants spoke about an absence of

tension during flight and a strong positive desire to succeed in their mission. These may not be overt or deliberate expressions of a positive focus, however they are indicative of the presence of an overall positive mindset or focus in flight.

Focusing Through Emergencies

In emergency situations, pilots must be able to remain calm and focused to consider the best course of action within a limited time period. The majority of participants had experienced stressful situations while flying that required an emergency response. During these challenging times, all participants recalled that they were able to maintain a calm and effective focus.

The thought of "oh my god...Is this really happening" definitely crossed my mind. The thought of ejection is something that ejection seat pilots think of often and to be in the moment where it could possibly occur is kind of surreal. It is something that I wasn't worried about at the time as we were in a reasonably good position to land. After seeing that we had sufficient energy to make the runway I do recall a sense of relief coming over me. (Participant 8)

I've had an engine fire; it was starting to destroy itself on the ship [aircraft carrier]. It was a challenge, but I find, myself, when I'm under pressure more I find I'm able to actually calm myself more. And you have to. (Participant 11)

I mean your whole body is reacting, even your physical like your breathing rate goes up, your heartbeat goes up, you get tense, and now you have to fight that. You have to deal with your own composure before you start dealing with the airplane, really. That's about how I remember it and how I dealt with it. (Participant 4)

Some participants expressed an awareness of their autonomic response to the stressful situation (e.g., increased heart rate, respiration rate, perspiration, etc.), however their conscious response was to maintain control of their focus and their actions. Some participants regained their composure by first focusing on their breathing. Participant 11 described how he achieved this control:

With my co-pilot [during the engine fire], the switches were there [i.e., the co-pilot was flicking the correct switches] but probably weren't in the right order, because of the nervousness, the adrenaline or whatever. I don't know what kicks in, but you don't think right. And I've always stressed to, well myself to begin with, and my students, I say 'guys, unless we explode in midair, take the two seconds to breathe. You need to breathe at least once and then you'll see your mind will relax a bit'. Your mind will de-clutter. . .I know [in that situation] it took a few seconds for me just to think 'okay, emergency engine shut down, go: SSL off, T handle pull' [and so on].

Several participants discussed the importance of the cockpit environment. For these pilots, the cockpit was a place where they had trained to remain calm and connected. They felt that this learned association between the cockpit and a physical absence of tension allowed them to maintain their composure in emergency situations.

Well I think that everybody was concerned [when the landing gear did not come down], but I think as well the whole methodology of training that we do in the simulators is all kind of like 'pilots are really calm people'; it's just really kind of based around that, like here are the things you need to do and these are your tools. Here's a checklist, here's some knowledge, here's some experience. And I think that all kind of leads towards a certain amount of calmness built into the cockpit environment. . .I'm sure there is a level of pressure in a tense moment, even in the simulator because they're so realistic, it's like a real plane, but we don't like failure, you know we won't accept it we just keep fighting it. So I think that maintains a level of calmness with most of the pilots I've flown with. (Participant 9)

All participants seemed to approach their emergency situations in a relatively calm and logical manner, maintaining their "in the moment" focus and drawing upon their capacity to attend to various stimuli as necessary.

Automatic actions

When faced with an emergency situation, many participants noted that their responses seemed to occur almost automatically. They recalled not having to think about what they were doing, but simply allowing their training and instinct to take over.

We were just doing aerobatics, he was showing me some of the stuff they do in Greece. And back then we were having some issues with a prop-sleeve touchdown, so something inside the engine was touching, metal against metal, and it was shedding metal everywhere. So you would lose thrust on the engine and you would know right away there was a problem. Everything changed at that point. Everything we'd been training for, because we always simulate those instances, and at that time I knew it wasn't simulated. So I just took control from him and brought the airplane back. I just did my drill. (Participant 4)

They train you so much that if you get into these difficult situations your training takes back over, so you don't have to think. You just do what you practiced a couple hundred times. Like with weapons training, it's how to load a weapon, how to fire it, and you practice it a few hundred times so if all of the sudden we were moving from one base to another base and got in a fire fight, it was just reactive at that point. You just went along with it because you knew what was going on. Your hands and mind do their own thing and it's not one of the things you were task concentrating on at all. (Participant 2)

There was certainly an element of trust during these challenging times. Participants did not second-guess their automatic reactions, but simply allowed their bodies to react according to instinct.

Participant 6 described a formation flight during which he expected the formation leader to perform a maneuver in a specific way, but became disoriented when the leader maneuvered in a different way. Luckily, he was able to recover his aircraft and narrowly avoid hitting the ground.

I would say the closest that I ever came to killing myself in an airplane . . . was carrying a photographer. . . . It was a formation of six airplanes that we were trying to photograph, us being the seventh. . . . It was only like my sixth sense that caused me to realize that I was about to fly into the ground, and I maneuvered. So if I was to analyze that, the distraction of . . . trying to get into position for him to get a photograph was one [factor]. But analytically, expectation probably played the biggest role. . . my expectation was that the boss was going to do [the maneuver] the way that I did, and he didn't, he did it a different way. And there was nothing wrong with what he did. . . . But what saved me is difficult to say. I say it was my sixth sense because something just didn't seem right. . . . There was something that triggered me [to look forward]. And I was able to react, there wasn't panic, there weren't those things. I was able to react and then safely recover the aircraft. (Participant 6)

Had Participant 6 not trusted his intuition that something was amiss, he likely would not have had sufficient time to recover the aircraft safely.

Pilots also reported experiencing a feeling of suspended time in emergency contexts. Participant 11 recalled his experience with an engine fire in a grounded aircraft:

As soon as someone said 'fire' the two people behind me were out of the cockpit and I was stuck with my co-pilot. And I remember my co-pilot, we were doing the emergency engine shut-down, and my co-pilot was just flicking switches and everything and I brought it down to kind of a slow time, and you have to...in the aircraft, unless it explodes you do have time to think for most emergencies. Was it a challenge, that episode? It could have been, I guess. It tested me a bit, too. Because when it really does happen, there's always that two or three seconds that you're just going to sit there and you're going to be like 'okay what the hell is happening?'. . . there's usually that two seconds where it takes for your brain to absorb 'what do I need to do?'

Because you know it's not a training scenario now, and maybe it's that part where you hear people come back and they say time stands still for that bit, and it does feel longer than it is.

Participants felt that time stood still as they took a moment to absorb what was going on around them, recall their procedures and priorities, and formulate a plan of action.

Participants explained that before ever going up in an aircraft they were well aware of what their priorities were in an emergency; thus, they knew which tasks needed to be completed first. By having pre-established priorities, participants always appeared to have somewhere constructive to direct their focus in an emergency.

There are different stages [of response] and there are different emergencies, and that is for all aircraft, the red pages, yellow pages [standard emergency response procedures]. So yes, the immediate actions are bang, bang, bang. But aircraft control is always the primary thing: don't do anything if you can't fly the thing, right? (Participant 14)

Knowing or establishing priorities in an emergency was a key factor in decisive action. If a pilot ever felt overwhelmed or unsure in an emergency, he/she would rely on the CAF's standard priority system: aviate, navigate, communicate. When in doubt, a pilot's first priority is always to fly the plane [i.e., to not hit the ground]. Once the plane is flying level, the pilot can navigate or determine where he/she is heading. After navigating, a pilot will then attend to the radios and communicate with ATC or other aircraft if necessary. With these three priorities as a foundation, the pilot would then evaluate the situation and determine the order of subsequent tasks.

Task oriented focus

Participants maintained a focus on problem solving throughout their responses to emergency situations. They did not become distracted by irrelevant stimuli or physical reactions to the stressful circumstances. When pilots were flying with a crew, they made a concerted effort to communicate with the crew and demonstrate their own composure so as to reassure others and maintain control of crew

actions. Participants described maintaining a task focus, concentrating on what they could control and blocking out other unimportant stimuli.

I focus right away. . .as soon as you panic you're not thinking anymore, judgment is out the window. So that's when I force myself, if I catch myself, to take one step back, calm down, and then focus. What do I have to do here, what's important, and it comes back to focus. And I prioritize what I need to do. (Participant 13)

[In the emergency, communication] was like a constant, while those guys were working in the back of the airplane and updating us once in a while, it was a constant between the two pilots: here's the plan, here's how long we're gonna fly for, here's how much fuel we're gonna burn before we absolutely will land – because you can't eject, so basically you're staying in the airplane, there's no parachutes on board or anything else. So we just worked it through. But I think the whole looking ahead helps with the 'oh well, you over torqued the engines, this is really not important right now'. (Participant 9)

Participants did not spend time worrying about how they managed to find themselves in an emergency situation; they simply focused on what was required to resolve the situation in a safe and effective manner.

Adaptation

An important skill when responding to emergencies was the ability to adapt to new situations and make appropriate decisions, sometimes with very little time. Participants emphasized that when faced with a novel situation, they must refer to what they already know (from past experience) and adapt that knowledge to the new circumstances.

I think in flying, especially fighter flying, every situation is different and you can't explain to a guy what's gonna happen on the ground. But once you see it, something similar, you can apply

that same visual reference to something else and get it done. So maybe visual learners are a little better at this flying business than the other types. (Participant 5)

The training is fairly straightforward and there's just not enough time to see every situation that you can encounter, it's impossible. As a pilot, you start learning the first day you start flying, and you will stop learning after you're done your career. You will learn something every single time. So you can't learn everything while you're on training. . .So you make your decision based on what you're learned, as best you can, I mean you will make that decision based on your experience. You always try to make the best decision based on what you know, and being able to adapt or take skills that you've learned and adapt it to a new situation is a must. You need to be able to do that. If you can't do that, you're not gonna go very far. (Participant 7)

Participant 13 discussed his practice of continuously thinking about his options. If he suspected that a hazardous situation might arise in flight, he would prepare himself by considering ways to adapt his mission plans:

We have another ability that I think students need: to be able to adapt all the time. They can't walk to the aircraft thinking that everything will happen exactly as they expect or planned. And so while flying like that [exercise] up north, the weather was worse than what we expected, but as I see it getting worse I'm already thinking about plan A, B, C, D, E, if it keeps getting worse.

Pilots were flexible and extremely attentive to any changes in their circumstances. When their situation changed unexpectedly, pilots attempted to adjust their plans according to their requisite knowledge. Pilots rarely decided on a course of action that was not related in some way to a prior experience or known procedure.

Of note is the fact that there was some slight variation related to the ease with which participants felt that they could enter a focused state during flight. One participant in particular struggled with his focus.

I didn't dream about being a pilot growing up, so I had a really hard time here, just trying to not daydream. When I'm in the plane half the time I'm picturing my next renovation. . . I just have so many things on my mind. . . I found that I was worried about not even making it through as a student because I daydreamed so much in the plane that I'd make mistakes. And I still have a hard time, you know, maintaining my focus on that. I think that's probably the thing I've grown with most in flying aircraft with the military is that I've been forced to focus on something for more than like 10 seconds. (Participant 3)

Upon completion of his pilot training, Participant 3 found that his focusing abilities improved. With less perceived pressure and increased experience, he taught himself to focus at important points when instructing students. He was also able to focus during important flights, such as check rides. He attributed this ability to the relative magnitude of these tasks:

Priority of the task. It has an effect. The consequence is large, if I screw a check ride up.

Whereas, all it would be is me missing a little thing on a student like I didn't hear that he did two minor checks in reverse order, you know. So at the end of the day that certainly isn't earth shattering. (Participant 3)

It was interesting that this pilot felt that he was able to focus with very little difficulty when playing hockey. He felt that this was due to the fast-paced and exciting nature of the game. One participant mentioned having difficulty maintaining his "scan", or his situational awareness. Other participants indicated that they became bored quickly or that they needed to force themselves to focus. This was often due, it seemed, to the nature of their roles as instructors. When flying with students, participants were not physically engaged in the flight mechanics and were observing routines that they had observed many times before.

Distraction Control

Military pilots are constantly barraged with information in flight, especially during complex missions or difficult conditions. 13 of the 15 pilots interviewed discussed their personal experiences with distractors in flight and how they maintain or regain their focus despite these competing elements. For some participants, these potential distractors never posed a problem. These pilots let go of irrelevant distractors and maintained focus on the task at hand. For others, human elements such as fatigue, workload, prior mistakes, and various environmental elements competed for their attention on a more regular basis. To ensure that they were able to maintain or regain (if necessary) an appropriate task focus, participants discussed the use of distraction control techniques. The most effective techniques used by these pilots were verbal cues and refocusing.

Verbal Cues

When participants were aware that they could become distracted when completing a flight task, they often used verbal cues to prevent their focus from shifting. For example, when attempting to complete a multi-step procedure, or a maneuver that had been difficult for them in the past, participants sometimes spoke aloud the various steps, walking themselves along, as they progressed through the procedure.

I'll verbalize it, like 'gear down, flaps, power'. I'll say all those words. And it's probably a fairly high percentage, probably 80 to 90% of the pilots out there do it; they verbalize things. And that works for some maneuvers. Slow flight, for instance, it does work because it's slow enough. But other things, like some of the fighter maneuvers or more of the advanced maneuvers, things happen very rapidly and if you talk through them, you'll be behind. So [some] guys will try to talk through them, but they're behind. (Participant 2)

On one trip, I was just all over the place. I wasn't settling in. And I was flying with this guy, [name removed], he told me 'just talk yourself through it'. And I started to do that, and I'd say 'plane,

line, hinge’, and those are the three references that we use, ‘plane, line, hinge’, and I was forcing myself, as I said it, to look at those different spots on the airplane. And it finally started to click for me on that flight. (Participant 10)

As stated by Participant 2, these cues are only appropriate for use in slower maneuvers or when a pilot is beginning to learn certain maneuvers or sequences. Participants found this strategy useful to ensure that they did not overlook anything and to guide their focus to the appropriate steps in the sequence.

Refocusing

As soon as a pilot found that he/she was distracted, the immediate response was to attempt to refocus on the task at hand as quickly as possible. For these participants, refocusing generally involved three components: compartmentalization of the distractor, prioritization of the remaining tasks, and shifting focus to the new priority. Many participants used verbal cues to prompt or support this process.

You do think about [your mistakes in flight]; if something happened I would think about it quickly and go ‘shit, that sucks’ but then – because I know the repercussions of what happens if you don’t do it, just from flying for so long – you have to just go ‘okay, what’s next?’” And maybe I might even say that out loud ‘what’s next’, and that forces me to carry on. (Participant 5)

You just have to slow down. . .the other misconception, I guess, is [that there is] always a sense of urgency. And I guess just slowing it down, and if you’re not in a position to slow it down, buying [time]. Doing something to buy yourself time to slow down. And then taking a step backwards and saying ‘okay’, like refocusing ‘aviate, navigate, communicate’, going back to what you know. (Participant 15)

Some participants used the phrase ‘Aviate, navigate, communicate’ as a verbal cue to refocus on the appropriate task. This phrase comes from the UPTS (Undergraduate Pilot Training System) and is taught to all students as a tool for prioritizing. As previously discussed, a pilot’s top three priorities will always be first to fly the aircraft (aviate), second to orient themselves (navigate), and third to talk to ATC or

others on the radio (communicate). Participants also asked themselves what was important right now, or whether they were doing the right thing.

I try to get [students] to develop that skill of always asking themselves if what they are doing is the right thing. . .I've seen that many times where I was in Quebec City. I flew out of Cartier, we were three crewmembers in the aircraft and every time we flew out over the city or too far from the airport, the control tower would always say 'okay, I have traffic for you in this direction, so many miles'. Many, many times I saw three heads turn. As soon as I see that, I bring my head back to something else. I already have two people looking for that one. I don't care about it. And then I focus on other things. Or, if I'm the one who should be looking for that aircraft because I'm not flying, the other pilot's flying, I would tell him 'I will take care of it, you should have your attention somewhere else'. (Participant 13)

For some pilots, usually those with more experience, the three components of the refocusing process (compartmentalization of the distractor, prioritization of remaining tasks, and shifting focus to the new priority) happened almost instantaneously, while for others, at times, it required more deliberate effort or prompting at one or more stages of the process.

Compartmentalization

The most common distractors from which participants struggled to recover were their own mistakes during the flight. The generally fast pace of military missions requires that pilots maintain their 'in the moment' focus and continue to anticipate upcoming events. As such, it is dangerous for a pilot to be caught dwelling on a past mistake. To avoid this hazard, participants would compartmentalize the distractor, or simply block it out of their minds and move forward to the next task or step.

We obviously are flyers here and instructors, but we also have secondary duties; that's one big thing. I find I get pulled in a lot of different directions. Everybody wants me to make a lot of decisions, so as I come down from a flight, I'm thinking about debriefing a student, maybe I have

another event that day that I've gotta do or I'm working on something in my office and then I'll get all these other instructors and schedulers and Deputy Flight Commanders and they're all coming to me, saying 'what about this?' and 'what about that?' and 'how are we doing this?' and 'can you do this?' And so there's a lot of distractions for me [on the ground]. And do I take it airborne? I can, yeah I can, definitely. I try not to. Once I walk [onto the flight line] I try to just leave it all behind me, but there are definitely distractions there, for sure. (Participant 8)

Another thing I think is really important for student pilots, that I've had to use and I've used with some success, is compartmentalization. When you screw something up on a flight, I'm actually gonna give you two examples of compartmentalization: one is when you screw something up on a flight, you need to kind of box that up and put it behind you because if you think about it while you're trying to do something else, you're taking attention away from the task at hand, and that's not gonna help you at all, that's gonna hurt; and then another example of compartmentalization is if you've got something in your life that's going on that's not related to flying, maybe you had a fight with your boss, maybe your dog died or your dad's sick or something like this, and you choose to go flying, again you need to box that up and not worry about it. Because whatever thoughts you're giving to your dog or your boss or your wife or your dad at that point, they're not helping you fly an airplane. And it's making you less safe. So that's something that, you know, in training if you make a mistake you need to put that behind you. And then in the real world, same thing: if you make a mistake you have to put that behind you. But also, if you do decide to go flying and you've got some external stressors, you need to put those away, out of your mind. (Participant 10)

A pilot's decision and ability to compartmentalize was bolstered with the recognition of his/her inability to control the distractor. For example, a pilot could not control a mistake that was in the past or a distractor that was a personal issue, unrelated to flying.

I just tell myself, or the rest of the crew, 'okay, that happened. We can't fix it now; it's too late. We now have to concentrate on the next thing'. And it's either tell them or tell myself that too bad, that's either a fail point if it was a test or it's a thing that we're gonna have to talk about later. (Participant 9)

When I was in the Marines, guys talked about it. They talked about kind of boxing stuff up and putting it out of your mind for the time being. Because, you know, there's not a damn thing you can do for your dying mom when you're flying an airplane. That fight with your wife – you can't call her, you can't talk to her, you can't buy her flowers while you're flying. You just need to focus on the task at hand. (Participant 10)

Having made the decision to put the distractor out of their minds, participants could then decide where their focus should be using their prioritization skills. Once pilots had prioritized, they could shift focus to an appropriate task that would be most beneficial for themselves and their mission.

Prioritization

For the majority of pilots, prioritization was simply a matter of returning to procedure as this directed them to the most important tasks. Many participants referred to the phrase from their training 'Aviate, navigate, communicate'. This prioritization component was especially important when participants were being distracted by an overload of tasks. When faced with a large number of tasks, pilots may reach a point of task saturation where the task requirements exceed the pilot's available processing capacity. At this time, pilots must stop attempting to manage all the tasks at once and start prioritizing or focusing only on what is most essential at that moment. If task saturation is not attended to immediately, a pilot can quickly lose control of the situation and wind up behind the aircraft.

That took personal training to tell myself if that's happening to me [task saturation], I need figure out if there's a red ball that's the most important ball. And if you see four balls coming at you, I don't care about the other ones, just catch that red ball. And just use that as the how

[concept] to get yourself out [of the task saturation]. This is where we've given the students this idea of Aviate-Navigate-Communicate; it's the way out of task saturation, it's 'fly the airplane first'. And it's everything we do, in all phases of flight. Anytime I see a student struggling with something, I'll say 'okay what's the most important thing right now?' And sometimes they'll say 'doing this' and you're like 'no, what's going to keep you alive right now? Flying the airplane. So just fly it'. (Participant 2)

Well, on purpose [the CAF] will task saturate you [in the fighter weapons course]. Because everyone who's a fighter weapons instructor, if there's a war, those guys will be the war. Not the generals, not the politicians, it's the guys that are the fighter weapons guys that lead the packages into war. So on purpose, they'll task saturate you. They'll make sure you don't have enough sleep, they'll change things on you at the very last minute, they'll give you stuff that you're not expecting. And the trips are all very dynamic and as big as they can possibly be, for every trip, for three months. So I imagine that that first course helped me out in my later flying situations that I handled, because it really teaches you that you have to prioritize. You have to. And there's actually some things that you need to do that you can't get done, but you have to say 'even if I don't get that done, it's not going to affect the end result. It'd be nice to do, but we don't have to do it'. (Participant 5)

Once the pilot had determined what the priorities were, he/she focused on the top priority first, eventually working through most or all of the remaining tasks on the list. Once the pilot was attending to the most urgent priority, he/she was refocused and re-engaged in the flight, having controlled the distractor successfully.

Some pilots found instantaneous motivation to refocus in the potential consequences of becoming distracted. The knowledge of the potentially negative outcomes encouraged pilots to actively refocus on the task at hand.

If I screw something up, I've gotten better at knowing that I must continue into the next task at hand because I know the result is often that the entire ride will be failed, as a result of me fixating on something back there. (Participant 3)

I actually don't know how I do it. You just tell yourself to stay focused if you find your mind's drifting and you just have to tell yourself to get your shit in gear and get back to work. I guess maybe you know the repercussions if you don't stay focused, especially if you're flying in close formation: you could hit the guy. I mean the repercussions are horrible if you get it wrong, so maybe that's a good motivator to stay focused. (Participant 5)

Participant 2 explained the critical importance of refocusing skills for military pilots in future deployments to high-risk or combat zones:

When something bad happens [some students] just physically shut down. And I've had a few of those students where they shut down, and you're doing everything – trying to pep talk them in the airplane, trying to rally the troops – and they're like 'sir, can we just go home' and you're like 'no'. If I were a civilian flight instructor, yeah sure let's go home, but because we're military it's different, because I can't have him doing that in Afghanistan. He's going to endanger the lives of himself and potentially other people. So in that case, it's not an acceptable answer.

In a combat zone, a pilot's ability to refocus could mean the difference between life and death, not just for him/herself, but also for others both on the ground and in the air.

Confidence

Of the 15 participants interviewed for this study, 13 pilots discussed the importance of confidence as a contributor to a successful flight. Participants described three major sources of confidence: personal abilities, fellow pilots, and safety precautions. Many participants felt that a general confidence in their abilities was part of their personality. Others required a series of past successes, relevant learning experiences, or specific preparatory measures (e.g., knowledge of procedures, safety

measures) from which to build and grow their confidence. Participants also described instances in which they felt unconfident, and the detrimental effect that this had on their performance.

Confidence in Abilities

Participants used various psychological skills to strengthen or enhance their personal confidence. Participant 11 discussed the use of positive self-talk when he was unsure or hesitant in a flight situation:

I was pretty nervous going through this course [UPTS], the reason being I did not have my degree yet, so I had nothing, I guess, left back home. I.e., if I were to fail this course, there was no job. . .And I think the nervousness hampered me a bit because as I progressed on through the helo [helicopter] school, little bit nervous there too but little more confidence, and as I progressed onto the Sea King [operational helicopter fleet] and I got my qualifications, I began to learn that this nervousness was hampering me. And if I just told myself that I knew what I was doing, I found I calmed down a little more and I was able to see a little more; the horse blinders kind of came off a bit. (Participant 11)

If he was feeling slightly nervous, reminding himself that he was a capable pilot and that he had trained extensively for these flights allowed Participant 11 to feel calm and confident. Participant 15 also attempted to approach all flights and missions with a positive, confident attitude:

If I go into a flight saying I'm gonna do really, really well, guess what I do. I do really, really well. If I go in there with some seed of doubt in my mind, I perform really badly. And that's one thing I've learned along the way is you need to have that 'I can do it' attitude.

These participants, and many others, found that they could make a conscious choice to shift their perspective and elevate their levels of confidence. This almost always resulted in an increase in performance quality and consistency.

Many participants also discussed the use of past experiences in the development and maintenance of their confidence.

I think it [confidence] increased with age. I probably had a lot less self-confidence when I was 20 than when I was 30, and now it's even higher than it was when I was 30. . .It keeps getting better. I'm going to be very cocky by the time I get to 60 [laughs]. I think probably in the late 20s was when I gained a lot of self-confidence. And I think, professionally, it made a big difference. Just the fact, all the things that I had accomplished in my career, has probably boosted my self-confidence quite a bit. (Participant 13)

I've always been relatively successful in what I did, so that certainly helped. I didn't have any reason to believe that I wouldn't be successful until what happened later [failing to complete the fighter jet course]. Until that point, it was like normal for me, like 'I'm gonna get through this'. (Participant 7)

Some participants felt that if they simply put forth the effort, they would be successful. Others described never having failed before in their lives. Many participants took stock of all of their experiences, realized that failure was acceptable, and focused on the successes. These pilots used their less-than-best performances as learning experiences, but did not dwell on them for an extended period of time. A small number of participants discussed their resilience following a high-stress incident; these participants felt no hesitation or internal distractions when they flew again. Whatever their experiences, participants seemed to find a way to use their past successes to grow in their confidence. Participant 10 noted that he also drew confidence from the respect of other pilots.

I think [confidence] is grown over the years, I'm comfortable with myself. Like I'm not the most self-confident guy in the world, but I know that I feel better this year than I did last year.

Because last year I was in Cold Lake and I was failing the program and I was having a really rough year. It was, I mean, it was a kick in the nuts. Sorry. To put it bluntly. But I'm good at flying here.

There are guys around here that respect me, which is nice. I seem to have a good rapport with fellow instructors and students, so here in this job, it's good for me, for my self-confidence.

(Participant 10)

Even though he had experienced a disappointing year in the fighter jet program, Participant 10 was able to maintain his confidence by finding support from those around him.

Many participants felt that their confidence was also affected by their pre-flight preparation. These participants recalled the huge investment that they had made in training, and drew confidence from their knowledge of the flight procedures and their familiarity with the training drills.

It comes right back down to the basis that we teach the students here: just maintain control, number one, as best as you can, and then these are the things that you can try. . . .It's a big confidence thing I suppose. And okay, we have some confidence and we've been trained to do these things and we can try them. (Participant 9)

It's almost like you worry about it up until the moment [of the flight], but then when the moment's there you kind of go 'you know what, I just have to go and do what I've been taught to do' or 'do what I've trained to do'. (Participant 8)

These pilots trusted that the CAF instructors and training program had given them all the tools that they would require to fly safely and perform at the highest level. As long as the participants felt that they had prepared adequately, given the flight requirements and training material, they had no reason to believe that they would not succeed. Their trust in this training combined with the projections of belief from instructors and peers set the conditions for student pilot success.

Two participants noted that their confidence was affected by their physical health, including rest. One participant had recently trained for an Iron Man race, while another paid special attention to his sleeping and eating habits.

If I didn't have a proper night's sleep or whatever, I found it was super critical for my success. And for my confidence, because if I came in feeling tired, I was scared that I was about to screw it up. And of course that just begins that whole nasty cycle – you're worried about it, the more you worry, the more likely you are to sort of self-manifest these problems, issues in the plane. And then you make one issue, then you think about it, and you make two...I found it was really important to maintain [take care of] yourself. My diet too, I started watching what I ate super closely to make sure I slept well. (Participant 3)

For these two participants, having healthy bodies allowed them to feel confident that they could manage the more physical aspects of flying as well as the mental requirements.

A certain level of confidence in their abilities allowed participants to act in a positive manner by making decisions without hesitation, being assertive, managing crew members, and taking on difficult or challenging tasks.

I just had the self-confidence in my abilities that, you know, 'hey I can do this; it's not a big deal'. When you start to doubt yourself, then you become more hesitant to make decisions and if you don't make a decision, it's gonna be too damn late. (Participant 10)

You have to go in with that mindset 'I can do it, I can land this plane'. . . just put the airplane where you want it to go, make it do it. It's not that hard; just make it happen. (Participant 15)

At first I was a bit overwhelmed...kind of 'I need more time [to prepare]', 'I feel safer and I feel safer for [the co-pilot] if I have more time'. But then I said 'fuck it, just give it a shot' so I just grabbed all the information I possibly could. And it didn't end up being as daunting as I thought it would be. Everything always seems more overwhelming. (Participant 12)

When participants felt confident in their abilities, they acted decisively and committed fully to those actions, simply focusing on getting the job done. This is extremely important in flight, as any amount of hesitation at a critical time can result in a loss of control of the aircraft. Confident pilots acted in a timely

manner, but knew that if their initial actions were not ideal there would most likely be an opportunity to fix them in the next maneuver.

Confidence in Fellow Pilots

The importance of having a high level of trust in one's fellow pilots was implicit in many of the comments made by participants. Every time a pilot flies, whether it is solo, with a crew, or flying in formation, he/she must have confidence that the others in the aircraft and in the airspace are competent aviators.

Trust is very important. I have flown with people I didn't trust. You pay closer attention to what the individual is doing and double check all his/her switch selections. I would even ask questions to clarify their intentions prior to doing a maneuver. The trust is initiated in the training environment but must be continuously maintained throughout your flying career. We have a saying in the Air Force: "You are only as good as your last flight". (Participant 5)

Participant 4 made the following comment in reference to formation flying: "I'm doing the best I can do, I don't want to miss anything I was told that I have to do, and I'm trusting the next guy is doing the same thing. So that's basically how you do it". When a pilot is able to trust his/her fellow pilots, it becomes easier to focus on the task at hand and all the other important elements in his/her broad situational awareness.

Confidence in Safety

Due to the high risks involved in military flying, personal safety was a top priority for all participants. Some participants noted that they gained confidence from the knowledge that they had taken precautions to ensure their safety. Aside from the pre-flight preparation, which involved planning for unplanned events and reviewing emergency procedures, participants also maintained their mission confidence by avoiding unnecessary risks. Participant 3 recalled a mission when he was flying solo through the Rocky Mountains at night. After being given clearance to land, he accidentally turned the

aircraft the wrong way, putting himself on a collision course with the mountain range. As was his habit, he double checked his maneuvers, quickly realized his error, and was able to correct his course without incident. This experience, however, was a valuable lesson in avoiding unnecessary risks:

That's a lot more pressure [when flying alone] and I purposefully don't fly alone anymore. I mean I was purposefully flying alone there [in the Rocky Mountains]. Because at the end of the day, what's the point? There's a huge risk factor in being alone, which is that all people make errors. So single pilot IFR [instrument flying] at night, in cloud, in the winter, you know; it's probably just not the best decision. . . . I just won't do that anymore.

Participant 13 took a more general approach to avoiding unnecessary risks. He stated, "I'm always thinking about what if this happens, what will I do. And the minute I don't have any more options, I'd rather be on the ground". Many participants adopted this approach prior to the mission of carefully considering their options should various emergencies arise.

Participants also maintained their confidence through the knowledge that they were aware of their own personal limits (i.e., at what point they could not recover the aircraft safely). These limits were different for every pilot, and also changed slightly as the participants aged.

It's the comfort zone. If I'm outside my comfort zone, I'm not sure I can get out of there. It's a little bit like driving in the snow or in a snowstorm: you reach a speed at one point where it's like 'I don't feel like I can drive safely faster than that' and so you slow down a little bit, keep it just a little bit below that limit. [In the] comfort zone. (Participant 13)

At a certain point, being old, you don't have the same hands and feet and reaction time that are required to run flights like D Flight. And I know that. So I always relied more on my experience near the end because that's what I had, but I knew my reaction times weren't as fast as the boys. So if I knew that there was a certain insert and I needed it quick, and I had one of my stars,

I would fly with him. I'd run the mission, because he didn't have that mental piece, but I'd have him do the insert. So at some point you have to understand your limitations. (Participant 1)

Participants described building their knowledge of their personal limits gradually, through years of flight experience. Once they had pieced together a firm understanding of their limits, pilots respected these boundaries as absolutes.

Stress Management

Stress management during a mission execution was most evident when participants were in a test situation or completing a new or unfamiliar maneuver. All 15 pilots discussed personal experiences in flight involving stressful situations and their responses to those situations. Some participants noted experiencing an increase in stress or arousal levels during the pre-flight preparation; for most, however, any feelings of stress dissipated at the beginning of the mission execution.

I find that I'll get super nervous [until] the point where I actually strap in, and then once we're starting everything up it kind of just goes away, because you have too much to think about.

Before that all you can think about is what can go wrong. (Participant 12)

When you're sitting in the airplane there's so [many] things that you have to do that automatically it kind of brings all your attention to the task at hand. And that works, for me, when I'm more stressed on certain missions than others, it will be before the flight. The minute I sit down in the airplane, start strapping in and everything, it's like it's gone. Because now, the minute I sit in the airplane, it's like 'okay I got something to do' and I just automatically start focusing on what I need to do. (Participant 7)

The shift in focus from perceived stress and worries to mission requirements and task completion was one of necessity. In order to proceed with the mission, participants were forced to focus on multiple flight-related inputs, allowing no time or space for irrelevant, negative thoughts.

Flight Test Stress

For many pilots, flight tests created the highest levels of perceived stress, both during student training and now as professional pilots. In test situations, a pilot flies with an examiner who evaluates everything the pilot does and does not do; this examiner is not the same instructor that the pilot trains with. Usually, the only time the examiner will speak during the test is to ask for specific maneuvers or to make a critical comment. Student pilots are allowed only to fail two flight tests. If a student pilot fails a third test, he/she is expelled from the training program. With this scenario in mind, it is understandable that during tests many participants found it difficult to allow themselves to focus and act automatically, as they had been able to do during their regular training flights.

Sometimes I can block it out [the examiner], but I find that I've never done as well, like on tests, as I do when I'm not being assessed. . . I will handle stress on an operational mission much better – because it's mainly self-imposed when I'm being assessed, because I wanna do so well. It's a little bit like if I play squash and I try so much that I will lose. (Participant 13)

I don't remember everything that I did when I was young, but I remember going into those tests and being like 'oh jeez, what if this happens and what if that happens', and you probably over think it sometimes instead of just going back to your 'okay, you have the basic mechanics. Just do it the way you need to do it'. But that's where some of them will make an error and they just...it leads to the next [error] because they're using up brainpower thinking 'oh, how can I fix that?' You can't. You already did it. (Participant 9)

Participant 7 stated, "As a student you have more pressure, because you're always trying to find out what the guy in the back [the examiner] is looking for". The desire to do well led some pilots to try too hard, to think too much, or to try to fly in a way that would please the examiner but that was not necessarily the way they felt would be best for themselves. Several participants noted the fact that

there is more than one way to fly most maneuvers, so if a student flew in an unconventional manner, but still completed the maneuver satisfactorily, this was allowable.

Participants also described a heightened level of perceived stress during tests because of their desire to do well. For some, the arousal triggered by a test experience was far greater than that of an emergency situation in flight.

I would say that's by far my biggest distraction. . .the pressure. Like the bigger the ride is, the more I am distracted by the fact that I must do good on this ride. And if I do something bad, knowing that there's so much pressure on the ride, of course one little mistake that on a normal flight I'd just say 'shit happens' or whatever you want to say and I keep rolling on, well if there's a ton of pressure on the flight I'll end up analyzing that thing that I just did wrong. . .during the flight, like as I'm trying to fly through the rest of the maneuver. (Participant 3)

I remember here [15 Wing Moose Jaw], doing a test, instructor school test, because I wanted this so much that even when I came here as an instructor. . .I found myself more stressed, coming back into the training system here as opposed to the training system on my earlier aircraft, just because of how much I want this and how much I am harder on myself. And it's a bit of a snowball effect, that okay you do a small mistake and now you're frustrated about that one, so it becomes even bigger and so on and so on. So I would say that out of everything that I've lived, with regards to stress, including things like warning shots, a real thing that happened in the real world which should be way more stressful than just a simple, stupid test. But to me, the stress level was like that, different [much higher]. And it's just got to do with, I guess, ambition. Like self-ambition and being harder on yourself. And unfortunately I found that it wasn't helping at all, it was quite the opposite actually. (Participant 14)

These participants put pressure on themselves to perform well in tests, often creating their own internal distractions, which interfered with their free flowing performance during the test. Some pilots became

caught up in overanalyzing the flight (e.g., their mistakes, mechanics of the maneuver) and had trouble looking forward to the next maneuver or simply allowing themselves to execute the mechanics that they knew so well.

Participants described trying various approaches to deal with their feelings of stress in test flights. For some, approaching the flight with the mentality that there was nothing to lose helped to alleviate the symptoms of anxiety. Participant 14 discussed an approach whereby he began with a deep breath to relax, then tried put the test in perspective by considering the possible consequences of a failed flight, and finally asked himself whether he could accept and live with those outcomes. Once he had accepted the worst possible outcome, he resolved to simply do his best:

The way that I was dealing with it was to force myself to relax. I'd take a deep breath, 'okay'. Let's say I found myself stressed out, or just found out I did a mistake which I would never do otherwise. . . then I would just take a deep breath and tell myself 'okay, what's the worst that can happen?' It's this. Okay. Can I accept that? Then guess what, it's like the rest of the stress goes away because I've sort of accepted either way. As opposed to 'you can't do this, you can't do that mistake', you know what I mean? I've never really heard anybody dealing with it this way, but to me it was always like 'okay, what's the worst that can happen? Are you okay? Are you gonna be healthy and have a nice life?' 'Yeah, yeah. Okay, so what's the big deal?' Now let's put things in perspective. So that was the big thing, put things in perspective as opposed to building that monster which I built in my own brain. And the other thing is physical, 'okay let's just breathe'. . . The health is always the biggest thing. (Participant 14)

By situating himself within a larger context (i.e., general quality of life), Participant 14 recognized that should he fail this test, there were still positive aspects to his life that would remain and lessons that he could use to improve his abilities as a pilot. Participant 13 stated, "I have to force myself to forget about [the examiner], just treat it like a normal trip, and then performance increases". Several pilots described

putting aside or compartmentalizing their thoughts of the examiner and refocusing their attention on the task at hand, as they would do in a routine flight.

A few participants did not experience this challenging decline in performance during a test. Participant 15 reported a preference for flying with others which allowed for enhanced performance in test situations:

I think I just think 'oh I better get it right'. There's no other thing to do but get it right, you have to. So maybe, perhaps my level of focus goes up, you know? Like I always say I prefer to fly with somebody else because it makes your level of focus go up because you know you've got the pressure of somebody else watching you, right? As opposed to if I just went out and flew by myself, I think my level of focus would be less. Not necessarily focus on the job at hand, but my focus or care of how the maneuvers turn out would be less than if I had somebody watching.

These participants who performed better in test situations did not appear to try to actively manage their stress; they simply shifted their focus to relevant and appropriate tasks. For Participant 15, the knowledge that somebody was observing the mission was a positive aspect and a motivator to remain focused. Going into a re-test after having recently failed his first attempt, Participant 10 stated that his level of perceived stress was much higher than usual. When asked how he dealt with these feelings (as he performed well in the test), he simply stated, "I don't know what I did, I just flew the flight".

Interestingly, prior to Participant 10's experience, he recalled high levels of perceived stress throughout his training:

It's performance anxiety. Actually I had to deal with that a lot last year. I had a really hard time with it. When I was going through here, I remember there were times on the course where I had more problems with it than other times. I put stress on myself to get good grades, because I wanted jets, I wanted to be the best I could be, and I did fairly well. There are other guys going

through who put the stress on themselves because they don't want to fail, which I think is the wrong kind of stress. Now your focus is 'what if I screw up?' instead of 'I can do the best I can'. He felt that he performed better because the focus of his feelings of stress was his desire to do as well as possible, as opposed to a fear of failure.

Ongoing Learning

For all participants, ongoing learning was an extremely important facet of optimal performance. Seven pilots specifically discussed the concept of ongoing learning and analysis in relation to mission execution. Flying was often described as a continuous adjustment to the ideal. Participant 12 stated, "Flying is just a constant correction of errors, that's all it is. You're always fixing something that's going wrong". Because pilots have many decisions to make and little time in which to consider them, they accepted the fact that a portion of these decisions would be incorrect, or not ideal. What was important was not the correctness or incorrectness of their decisions, but rather their ability to analyze those decisions, recognize the errors, and adjust if necessary.

The more important thing is that you see your own errors and you know how to fix your own errors. Because when you're a Snowbird, you're gonna be by yourself in the airplane; you're not gonna have somebody there to tell you you're too wide or too tight. (Participant 2)

[The most important mental skill is] the ability to make a decision and to rationally think out different options – not just making a decision and sticking with it, but being able to continually assess that decision and to update it and to make the proper decision at the end of the day.

(Participant 1)

During flight, participants constantly analyzed their decisions to determine whether they had selected the most ideal course of action. In flight analysis was a time sensitive procedure and was completed as quickly as possible. If the pilot recognized an error in his/her decision or realized there was an alternate, preferable course of action, there could be no hesitation before the new plan was implemented.

Post-Flight

Ongoing Learning

Following every flight, pilots engage in a detailed debrief in which the various segments of the flight are analyzed, mistakes are pinpointed, and corrective measures are suggested. 12 of the pilots interviewed specifically discussed the importance of debriefs and ongoing learning. Many participants noted that the tools or strategies for making corrections were the most valuable product of the debrief, as they were frequently well aware of their mistakes as soon as they had made them.

As a student I tried to focus on the "how to improve" portions of the debrief. It is normally pretty clear when you make a mistake or could have done something better. The most important part in being critiqued is to own it and find ways to improve or the methods on how to improve. (Participant 8)

The idea of owning one's mistakes was important to all participants, as the CAF demands accountability from its pilots. Many described an impressive level of honesty in their debrief:

And that's one thing I'd say is probably very important, is to learn from our mistakes. And I realize with experience that some people I work with don't learn from their mistakes. And I find that sometimes they are more in denial than anything else; they don't want to face their own mistakes. So I guess the first step is you have to admit you're making mistakes, then you learn from them. (Participant 13)

But at the end of the day it's my fault: I let him [student pilot] get a little bit too tight and I should have realized that [the student pilot] in the other plane maybe wasn't quite experienced enough. And he proved that pretty quick. It was my fault, I let him get too close, and I haven't let it happen again. (Participant 12)

Participants knew that they must hold themselves accountable for their mistakes; without this accountability, they would not improve as pilots. One participant discussed this ownership of his actions within the context of his circumstances during a given flight:

I look at what happened, what I did, what could I have done better so that I can learn something. But I also take into consideration that it's always easier after the fact to analyze because I also think about what I had, the information that I had at the time, and the time that I had. And sometimes I will say 'okay, I shouldn't have done that, however, at that time that's all I could think of and because I didn't have all the information, I did the best that I could'. It will happen that way sometimes. (Participant 13)

Participant 13 still accepted responsibility for his actions, however he also recognized that he was acting within certain confinements at the time. Had he been operating in different circumstances, he may have been able to take a different or more ideal action.

During the standard debrief, participants discussed mainly the mechanics of the flight (i.e., the procedures, the pilot's physical actions). When asked if they would ever discuss how one felt during a flight or a particular portion of a flight, Participant 5 responded:

We would never talk about feelings, never [laughs]. You would talk about maybe what the guy was thinking, so if he saw a certain thing on his radar scope or if he looked out and saw something and he made a decision based on that, then of course you would take that and go 'I understand why you did it, it's still wrong, this is what you would do to fix it'. But you would always find out why he did something, and that way you can understand better how to fix it.

Psychological aspects of the debrief were confined mostly to discussions of SA [situational awareness] and the pilot's sequential reasoning leading up to certain decisions. Only one participant noted the inclusion of mission execution focus in the debrief:

I'll land and I'll say 'I should have been a lot more focused on that trip' or 'okay, I just missed that. Now let's stop, let's get back and focus here'. Because I think that's human nature that your focus drifts and you have to catch yourself. (Participant 15)

While this pilot did include a reflection on the mission execution focus, the debrief did not appear to advance further towards the consideration of a specific focus plan or focused action for improvement.

Participants approached their debriefs from the perspective that they were constantly striving for perfection. Their commitment to achieving excellence drove them to analyze almost every detail of their actions (with the exception of psychological or emotional elements), never settling for anything that they felt was less than their best.

I've taught [military student pilots in] probably 10 different countries now, and I even taught instructors from Greece about five years ago, and the way those guys fly airplanes is completely different from us. They absolutely don't care. They make mistakes and as long as it's not too bad, they're happy with it. And we're like 'no, you need to do better next time, so how are you gonna do better?' 'No, no, that was good enough'. No, there's no good enough in our system. That doesn't exist. You have to strive to do it better and better all the time. (Participant 4)

The focus (during the debrief) is on what was done incorrect and the way to improve or fix the mistake. I would take notes so I could review the issues later by myself and chair fly the maneuver until I could do it in my sleep. Nothing, not even the smallest detail is just 'good enough'. We always strive to execute the maneuver perfectly. (Participant 5)

Participants also noted that aside from the standard debrief with the flight instructor or leader, they would often engage in a personal debrief and, sometimes, a group debrief. Participants emphasized the critical importance of a debrief especially following a less-than-best performance.

Personal Debrief

Many participants engaged in personal debriefs following their flights, most often when there was some inaccuracy or flaw in their performances. For most pilots, this debrief simply involved thinking through the events of the flight and analyzing their personal performance in an honest and open way.

I usually just take them [errors] on board and make sure that I sort of analyze them; I'll always analyze errors and then try to come up with a solution. I do the same with my [competitive equestrian] riding too: whenever there's a mistake I always take it home and analyze it. Or if I'm not doing something quite right I always take it home and analyze it in my brain. (Participant 15)

I do my own debrief after I fly, personally. Like when I actually fly the plane I'll come back and say, 'I could have done this better, that better, that better'. . . The next time I actually think about doing it – I'll usually write it down. I usually write all the tricks and tips down and then I put it somewhere. And then if I'm gonna do it again, I'll look at it [to prepare for the flight].

(Participant 12)

Participant 5 described using video of his flights for these personal debriefs when he was flying the Hornet in Cold Lake:

You carry tapes with [you] on every trip that record your communications and there's a heads-up display in front of you, it's like a camera that points out the front of the airplane, and it records information. In the Hawk [training aircraft] here, it's like your airspeed, altitude, where you are. In the Hornet, it records a bunch of other things. So after you debrief with your peers, then you can actually go later on and watch this tape. You'll watch the tape with your peers as well, but you can also go back and look at things and try and find out what went wrong, where it went wrong, and fix it that way. So I think the debrief is incredibly important to carry on and get better for the next trip that you do...very important.

Most often, a personal debrief allowed the participants the opportunity to analyze their performance in a more relaxed atmosphere. Participants were able to analyze the flight in their own words, with an emphasis on those areas that they felt were most important. At times, the personal debrief was simply an opportunity to resolve never to make a certain error again and think about how to live that lesson in future flights. Participants made sure that there was a lesson to take away from every flight debrief, regardless of how perfect or imperfect the flight may have been.

Group Debrief

Occasionally, participants would engage in group debriefs following their flights. Group debriefs are standard procedure when the flight is a formation flight or involves aircraft with crewmembers, or when there is an important incident that could potentially affect other pilots.

We just did all the paperwork [following the incident], and then we talk about it to everybody.

That's part of the process, so that everybody learns. We talk about it in the big group, tell them what we saw, what we did. That's how we deal with it. (Participant 4)

Participants also described engaging in informal group debriefs of their own volition. Participant 15 shared the lessons from post-flight debriefs with others: "There's always lessons that you learn from it . . . I usually share them, because everyone can always learn from other peoples' experiences". Group debriefs presented pilots with a valuable opportunity to learn from others, as they were prompted to consider possible events and responses that they may not have previously regarded as important, or even plausible. For example, pilots may learn of potential problems with an aircraft that they had not previously studied or visualized in their pre-flight preparation. They may also learn of steps that were taken to resolve a problem, which were innovative and unusual.

Less-than-best Performances

Participants were especially concerned with and committed to learning from their debrief following a less-than-best performance. Many participants took this opportunity to recognize their

fallibility or imperfections and accept that making mistakes and growing from them are part of the learning process.

You don't want to be afraid of failure; it may happen from time to time, none of us are perfect, so the guys who can bounce back from that, actually use that to feed on, they tend to be quite successful. (Participant 2)

We all get caught off [i.e., have an off day]. We're not perfect. I'll react the wrong way from time to time, but I'll learn from it and I won't do it again. And that's one of the other big things: learning from mistakes. You can make mistakes; you just can't make them twice. (Participant 15)

Participants accepted their mistakes and drew lessons from them, but they did not let those mistakes affect their progress or their next flight. Participants also conducted analyses of their own actions, as they always do during debriefs, to determine the exact cause of any errors.

If [things went wrong], and say if this was me doing something and I'm being self-analytical, I would ensure that all of the environmental factors haven't changed and I would look at it analytically from that perspective so that I can exclude that as the case. (Participant 6)

On a formation flight once, here, I remember letting a student get tighter than the normal position. And he was going in and out of position. And at one point I took controls, but I thought about it after, I was like 'maybe I shouldn't have let him go that far'. Because the risk was too high. That's one example that I can think of, but I'm sure there's other examples. . . I guess I still felt in my comfort zone. But looking at it after, I thought my comfort zone was probably a little too stretched. . . because I still need a little bit of time to react, if she does something, and because it was so tight I didn't have that reaction time anymore. But I only realized that afterwards, so I learned something. (Participant 13)

Participants analyzed their actions, the information they used to arrive at those actions, the environmental factors, and their frame of reference (i.e., what they believe to be true) going into that flight or maneuver.

Stress Management

Following a flight or mission, most participants seemed able to refocus without difficulty, provided they had engaged in a meaningful debrief. At times, however, a debrief in itself was insufficient to eliminate post-flight feelings of stress. In these instances, participants turned to stress management or reduction techniques to help alleviate these negative feelings. Five pilots discussed the use of stress management techniques in the post-flight phase. Their use of stress management techniques following a flight seemed to mostly target the criticism associated with flight debriefs and recovery and refocusing following a major challenge or setback.

Dealing with Criticism

Pilots discussed the importance of dealing with criticism, as it remains a large part of the pilot training system. A pilot must face critical comments and evaluation from superiors throughout his/her student training in the UPTS and when flying missions or training exercises as full pilots. The only time a pilot does not face direct criticism is when he/she is in the role of the instructor or when he/she executes the task or mission to perfection. To deal with criticism in a constructive way, participants attempted to extract the most useful information from the comments and disregard the negative aspects (for example, something that may be perceived as a personal put down).

Some guys just like to destroy you, so you just kind of sit there and suck it up. And then you have to be strong mentally when you go out the door, and take everything he said and put that in perspective and say 'whatever. Yeah, I agree with this, this, but I don't agree with that. And I'll show you next time, I can do it'. So you gotta be strong mentally. If you're borderline, between

being strong and [not], you're gonna have a hard time to deal with that, especially if you get an instructor who's like that. But we're all different. (Participant 7)

[When I received criticism] I did use the tips, because I really didn't wanna make the same mistakes again. I really wanted to do better. . . I stayed positive and maintained focus because I had that aim, I wanted to succeed, and that was the main drive. (Participant 13)

Participants tried to prevent any internalization of the critical remarks, reminding themselves that the instructors were not attacking who they were as people but trying to help them to become better pilots.

Recovery

A small number of participants recounted very challenging setback experiences from which they had to recover. Participant 7 described his recovery after he was selected to advance through F-18 training, but then failed to complete the course:

I just took some time off; I went on vacation. And then I thought about the whole thing. You know, you try to explain every possible situation but you realize that you just can't because there's too many factors, there's too many variables, there's too many things involved to explain it; however, you kind of understand the general [picture]. And then you try to get yourself away from it a little bit and just be rational, to understand the big picture. And then you're like 'well, you know, it kinda makes sense that that happened' because now with a little bit of time away from all that I think it was something, the lifestyle didn't suit me, it was not for me.

Similarly, Participant 10 attempted to complete the training to fly the F-18, but was unsuccessful on two occasions.

I actually asked a buddy of mine, [name removed], who went through the same thing. He was a little farther along in the training and, you know, got booted. And what I asked him specifically was how you get your mojo back [laughs]. He didn't have an answer. His best answer was time, and I think time is part of it. I mean it still bugs me; like the other day, I taxied by a Hornet, I was

just like [motions displeasure/feeling down]. But I think as I got into the Flight Instructor course and I got busy with that, because it's a fairly demanding course, I was flying pretty much twice a day, and they expect more of you than just a student downstairs, rightfully so. So I was busy and I was focused on that. And it took my focus away from my failure of last year, and it just allowed me to build on what I was doing. And the Harvard, it is a fun little airplane, so I enjoy my job; I enjoy what I do. So I had this fun, enjoyable thing to do, some stress upstairs, because you know performance anxiety, you wanna do well, and that kind of shifted my focus. And now I've just kind of built on it. (Participant 10)

For both participants (who fell short of the very high F-18 training standards), simply allowing themselves time to accept the disappointment and to refocus was an essential part of their recovery.

Participant 10 did make a conscious effort to refocus his attention on more positive aspects of his life:

I knew I didn't want to be one of these guys who comes here [15 Wing Moose Jaw] and is pissed off that he's not an F-18 pilot. Because there are eight or 10 of those guys here at this school. I didn't want to be one of them. Because all that's gonna do is make me miserable, and I'm gonna have less fun doing what I'm doing now. Maybe it was a conscious decision as opposed to a conscious shift. I do remember there was one time a buddy of mine put on a video, it was just a bunch of fighters taking pictures, flying and doing cool stuff. And I left the room; I didn't wanna watch it. It was bugging me. But that was probably back in April or May, when he put that video on. So I've had a few months since then to kind of get past it.

Knowing that they would not live their F-18 dream was initially an extremely difficult reality for both of these accomplished pilots to accept. However, by allowing themselves to take some time and by refocusing on other positive aspects (i.e., their current flying role), they were eventually able to move forward in positive ways and take on other challenges.

Deployment

Four participants had experienced one or more deployments into combat zones such as Afghanistan, Bosnia, Somalia, Pakistan and Iraq. These participants shared their stories and recollections of what were almost surreal experiences, completely different from everything they had known to be reality. Many of the psychological skills these pilots relied on during their deployment were the same skills or variations of the same skills they had used with success during training and standard exercises.

For participants with deployment experience, psychological preparation (for the new realities they would face) before their deployment was difficult, if not impossible. Participant 2 stated:

Bosnia definitely didn't prepare me for Afghanistan. I had been on tour, so I'd seen overseas and I had seen some things in Bosnia that were a little brutal, but in Afghanistan, nothing could prepare me for that one. That was a whole different experience, completely.

In some instances, these participants were the first troops deployed from the CAF to a specific combat location. This meant that there were no returning pilots from whose experiences they could learn. Most of the time, however, regardless of their efforts, it was simply impossible to imagine the physical and emotional reality that awaited them.

As in training, participants took great care to prepare thoroughly (both physically and mentally) before executing their deployment missions. Participants spoke mainly of the importance of communication in strengthening their mental readiness prior to missions or flights while on deployment. Preparation seemed to shift from a solitary exercise to a group experience, possibly due to the fact that participants were now engaged in a group effort. For Participant 14, a thorough briefing was the most important preparation before a flight:

It's a very different environment: we work with a crew and a co-pilot and people in the back, and we have a specific mission. And in that case, the key is more amongst the crew. Because the flying abilities, we have. The hours and the experience, we have. Therefore we can almost – it's

like everything else when you do it so many times, it's really easy. But now the focus is more amongst the people because now you deal with un-experienced crew, potentially, and you may deal with people that don't work well together. And [as the pilot] you're going to be the [catalyst] into the positive environment otherwise the performance will decrease.

Participant 14 noted that while he still practiced chair flying during his deployments, this was not as important because he was already so familiar with the aircraft. Participant 10 communicated with other pilots on the deployment and learned from their experiences. He described one experience in which he sought information from friends after they were targeted by ground-to-air weapons:

You could tell they were a little, kind of excited, and a little bit stressed out from it. And I wanted to know, I mean I was curious, 'hey, how did it go, what did you do? What happened?' . . . It was easy to put myself in that position, you know, what would I have done? . . . I'd maybe go back and look at the maneuvers that they did to – they actually weren't dodging the bullets, they were defeating the radar that was guiding the bullets going to them – but to the specific maneuver that they did, I would maybe go back and look at that.

The preparation for missions during deployment was essentially the same as any other training exercise, including elements such as chair flying and studying procedures. In this context, however, the communication between pilots and the building of a cohesive team took on a new significance. In these cases, participants were truly putting their lives on the line and in the hands of their fellow pilots and crewmembers.

Participants emphasized the importance of an effective focus during deployment. Their focus during deployment was similar to the everyday best performance focus, rooted in the present moment, however this deployment focus differed in its increased intensity. Participants described staying focused every day on every task, and were careful not to let their focus wander to the calendar (i.e., how many days were left in their deployment) or become preoccupied with thoughts of home.

I think, mentally, I just stayed focused on every day. I never looked at a calendar, I never played that calendar game – guys mark off the calendar and as [they] get closer to the end they get more cautious. Very deadly game, you can't do that. You actually gotta go more aggressive near the end. I still remember the day they said 'you're leaving today'. I said 'Jesus, really?' Packed up, and off I went. . .If you get cautious, you'll make mistakes; you'll get killed. So you just gotta push right to the end and eventually somebody will tell you to go home. (Participant 1)

It tends to be a lot of task focus. You focus on what you've been tasked to do. The first few weeks I was there, we had the camp get rocket attacked probably almost every night. And for the first few weeks, you know, it was just like 'holy smokes'. Like I had a bomb explode right in front of me, about 50 meters away maybe, when I was on my way to the gym. Here I'm just going to do a pretty mundane thing, and boom! Right in front of me. (Participant 2)

It was actually easier [to focus] because I didn't have the distractions that I would at home. I didn't have friends calling to go out, I wasn't trying to go play sports, I didn't have a lot of usual work stuff. We didn't have all the emails for meetings and all that stuff. So we were able to focus more just on the mission, and for me, learning how to plan the missions. (Participant 1)

In combat zones, these participants seemed to make a conscious choice to focus on their tasks, knowing that the potential for harm was great if they did not. Participants were also aware that there was very little in their environment that they could control, other than their daily tasks or mission tasks. As a result, they became very absorbed in their tasks, to the extent that the dangerous realities of the deployment and their life outside of the deployment seemed to be put aside or forgotten:

The fear actually goes away. Probably within two to three months of the tour I was not afraid at all. Ever. Like that time when the bomb hit in front of me, I was not afraid. When I hit the ground, I was actually kind of like 'what, I'm trying to go to the gym here'. I was more mad at the guy who launched the bomb because I was trying to go to the gym than because he was trying

to kill me. So yeah, try to stay focused on what you're there to do would probably be my biggest [advice] for anybody going there. (Participant 2)

For these pilots living under these extreme conditions, their only reality was staying focused on the task that they were attempting to complete at that moment.

Participants described a noticeable increase in the intensity of their focus during their deployment. They seemed to be in a constant state of alertness, always ready to engage. Participants flew missions that could extend for long periods of time, required precise action, and could involve very real consequences such as loss of life.

You just go into fight mode and it just becomes something that...like my brain over there never stopped. I slept over there, like I said four to six hours there was enough for me to stay completely active all day long. And when I slept, I slept. I slept through a firefight one time, you know, it was going on and you're just [motions sleeping] until my alarm went off. [Laughing]

That's the only thing that seemed to be able to wake me up. (Participant 2)

Participant 14 described his deployment focus as "immensely more intense". His daily missions while on tour involved identifying suspicious ships and providing air support for troops who boarded the ships, in the event that the ship was transporting terrorists (who could suddenly mount an armed attack on the troops). These missions, he recalled, could easily last 45 minutes to an hour, leaving him completely exhausted from the intensity of focus required.

As some deployment contexts involved heavier combat than others, participants reported that the extent to which they experienced stress while deployed was dependant on the level of risk present in their location.

Bosnia wasn't that stressful, you weren't worried about getting shot at very much. In the case of a helicopter, landmines [were] the biggest thing. If you all of the sudden had an engine failure or something like that and you had to put your helicopter down, you wanted to make sure you put

it down in the right spot because there's landmines all over that country. More or less, the people were very friendly; you know, you're in their country, but more or less they're pretty friendly. And it wasn't that violent at the time. Afghanistan on the other hand, there was a lot more [possibility] of being shot at. (Participant 2)

It was an interesting feeling flying over a country that would love to shoot you down and kill you. And it was, you know, just the knowledge there that if you did end up on the ground, it wasn't going to be pretty. (Participant 10)

For Participant 2, the most stressful events initially seemed to be the repatriation ceremonies (for soldiers who had been killed on the deployment). With some ceremonies honoring as many as six fallen soldiers who were returning home, these were emotional events for many.

To manage their levels of perceived stress and arousal during deployment, participants relied primarily on compartmentalization, communication with other pilots, and exercise. Participant 2 described using compartmentalization such that he attempted to block his human connection with the environment around him:

Probably the 'heat of battle' stuff was most challenging [with the] loss of life going on. There's a sense of urgency there that's for sure. And trying to maintain a calm. . . ability to do your job while under strain is probably the more challenging thing. It's a little different though [flying unmanned aerial vehicles]; it's almost like watching it on TV or on Fox News or something where you're actually seeing the battle going on, and it is live and it's real. So that took a little bit of getting used to. Just trying to make sure things are happening while casualties are being taken is kind of tough. So the mental requirements on that one are kind of harder. For the first couple of times it was a bit much, but once you've kind of seen it a few times . . . you just start doing your job [almost like a robot], not so much [without] care and emotion, but you do it trying to extract as much emotion out of it as you possibly can. So you're just very directive.

He found that he was also able to compartmentalize or box up his emotions during the repatriation ceremonies as well, which had been so difficult at first.

So at the beginning you're standing at attention, saluting, crying, the whole human condition thing going on; midway through [the tour] till kind of the end, it was like an inconvenience. It was like 'oh come on, I've got two more hours of this, then I gotta go back and do this and do this'. And there's people getting sent home and you're just totally loose. (Participant 2)

Participant 1 seemed to compartmentalize his entire life at home, separating it from his deployment completely. He recalled:

Anytime I've had to deploy, I kind of go into a mindset that is probably unhealthy when I first get home. I know home's there but I'll kind of just put a wall. And I'll talk every week if I have to, but I'm just focusing on where I am to, not even stay alive, as much as do whatever the job is over there. Because it's not real, this is not the real world: it's a deployment. Real world is when you get back home and then you take this boundary down. (Participant 1)

By compartmentalizing or putting on hold these other aspects of their lives, pilots enabled themselves to focus fully on the task at hand. Participants mitigated their risk of personal injury or harm by ensuring that the preoccupations of home or the distraction of their emotional responses would not compromise their ability to perform in the combat zone.

For Participant 2, the apparent gradual loss of emotion during the repatriation ceremonies seemed to be an unintentional by-product of his attempt to remove the emotion from his mission tasks.

As a result, he was troubled by his newfound indifference to the ceremonies:

I actually started talking to guys who had gone with me and asking them if they were feeling the same way I was, to make sure I wasn't some sort of freak or something. And they said the same things. We did notice that. Like what I told you earlier. . . that I wasn't feeling sad at rep ceremonies later, that one actually bugged me when I was there, that one kind of troubled me

and I was just like 'okay, I'm some real big jerk now, I don't think that life's important or something'. And actually when I was there, I went and talked to a couple of my friends and just kind of put it out there and said 'anybody else feel like this?' And we all did. So it wasn't just me.

That made me feel a lot better, made me feel like I wasn't some insensitive jerk. (Participant 2)

Participant 2 spoke with his fellow pilots in an attempt to validate the normalcy of his experiences when he discovered that he was neither afraid of dying nor emotionally engaged in the repatriations of his fallen comrades. The support and common experiences of his peers allowed him to accept this new development and refocus on other important matters.

As at home, participants found exercise to be helpful in the management of their feelings of stress. While on deployment, however, participants were much more focused on the regularity of their exercise as it became even more important for alleviating the newly elevated stress levels of daily life in a combat zone.

Because you were living in the environment [Somalia] for six months and you couldn't really leave it, I would run every day. And, mentally, the deal was, because you had to just run in your own compound, because I was [in a command position] over there, I said to my guys 'if I'm running, unless somebody crashes, do not stop me'. So that was the deal. If somebody crashes and, maybe dies, stop me. So that was a ritual that we had. . . I would run probably an hour.

Well, you're there 24 hours a day! So even after an hour you're like 'okay, now I've got 23 more hours'. There was no getting away. So an hour a day, and then I'd probably work out a bit – we had a tent gym set up. (Participant 1)

The gym was an incredible way to get rid of stress, and a lot of people used the gym there. It was just a way to burn off steam. And I would be in there two to three hours, which, for somebody who's not an athlete, was a lot of time to spend in the gym. I came back here in probably the best shape of my life. (Participant 2)

For Participant 1, exercise seemed to be an escape from his environment, a chance to mentally be somewhere other than in Somalia. For Participant 2, exercise seemed to provide more of an opportunity to channel his intense focus and release some pent up energy or emotion. Both participants relied heavily on exercise to manage their stress and calm or free their minds (as much as possible) for a period of time. Exercise was a critically important part of life during deployment; it was something that pilots looked forward to doing each day and it was also one small activity in their daily lives over which they could exert almost full control.

Once their deployment was complete, some participants found that they had trouble reintegrating into their previous home lives. They found it difficult to leave behind not only the memories of war but also the mentality of feeling perpetually hunted.

It took me quite a while after Somalia to get that [nobody is trying to kill you anymore]...you know, you'd hear a car backfire and [finally] you wouldn't want to hit the ground; that type of weird acuteness to sound. That took a while after Somalia and that's when I realized these are tough on the body, and mentally. I remember that. (Participant 1)

To evade these constant reminders of his recent experiences, Participant 2 refocused his attention on his life at home:

That was probably the hardest thing actually was coming back into the normal, day-to-day world. I needed to refocus when I came home, and I took on a bunch of different hobbies, I kept going to the gym, to try to kind of keep my brain active – because it was, all the time. A lot of insomnia, a lot of sleeping issues after [Afghanistan]. And it wasn't just because of what happened, but more just because I was working 20 hours a day most days [in Afghanistan], you know, four to six hours sleep was the norm. And I never felt tired over there. So it was like nine months of adrenaline basically. So when I came home that was probably the biggest thing. . .The military gives you a bunch of leave when you come back, so I didn't work for a month and a half.

So instead I took on a bunch of home improvement projects at home. I went and tore apart a bathroom. I just needed to keep myself busy; that was the big thing for me was just keeping myself busy all the time. . . there were some bad things from [Afghanistan] that I didn't want to focus on, so I focused on remodeling the house. I kept myself busy, big time.

While Participant 2 was eventually able to re-establish his presence in his previous lifestyle, it required consistent effort and discipline on his part. Participant 1 also mentioned that this attempt to return to "normal" life is not an easy task:

Some guys, they're not mentally strong enough to actually realize that [they're] home from it, and nobody's trying to snipe at [them] anymore. That's a hard one to walk away from, I think.

Some guys will never recover.

Arguably the most challenging time in a pilot's life may be this return home from deployment; this also seems to be the challenge or mission for which he/she has been least prepared.

CHAPTER 5

Discussion

The purpose of this investigation was to explore the use of psychological skills by elite Canadian military pilots. Three questions were addressed through the course of the study: (a) what psychological skills are used by elite Canadian military pilots and how are these skills used throughout their highly demanding aviation careers? (b) What does the term 'focus' mean for pilots who live, train, and perform in the military context? And (c) how do pilots contend with the risks and stresses implicit in this unique profession? Results were presented according to the three temporal phases of flight: pre-flight, mission execution, and post-flight. An additional deployment phase was included to highlight the extreme conditions and unique skills necessary for success in these challenging situations.

This investigation was conducted within the framework of Orlick's (2008) *Wheel of Excellence*. Orlick's model contains seven elements of success developed from his extensive work with high-level performers of many domains. The elements of the *Wheel of Excellence* are: focus, commitment, mental readiness, positive images, confidence, distraction control, and ongoing learning. The results of this research reveal that Canada's elite military pilots incorporate each element of Orlick's *Wheel of Excellence* into one or more of the three flight phases (pre-flight, mission execution, post-flight). These findings are consistent with the conclusions of previous investigations in elite sport such as Mahoney et al. (1987); Orlick and Partington (1988); and Gould, Eklund and Jackson (1992). This research is also consistent with findings with high-risk activity performers such as successful Mount Everest climbers (Burke & Orlick, 2003) and big mountain freeskiers (Coleman & Orlick, 2006). The present study has helped to validate the relevance and applicability of Orlick's *Wheel of Excellence* within the context of elite military aviation.

One important concept identified within this population was the use of psychological skills to effectively manage stress and arousal. Stress management is not identified as a distinct element in

Orlick's (2008) *Wheel of Excellence*, however the mental skills presented in the *Wheel of Excellence* can be directly applied to the management of stress and arousal. A discussion of stress management in the context of military aviation will follow an overview of the *Wheel of Excellence* in relation to the use of psychological skills by CAF pilots.

Focus is the central component of Orlick's (2008) *Wheel of Excellence* and has been identified as a critical element of successful high-level performance in previous research (e.g., McDonald et al., 1995; Werthner, 2002). This theme was also overwhelmingly present in the current research. The explicit discussion of focus as a psychological skill occurred mainly in relation to the pre-flight and mission execution phases; however, focus was an implicit component of all other psychological skills and all three phases of flight. The presentation of focus in the research results is an accurate representation of the comments and opinions provided in the interviews with elite pilots. Focus is also presented in the discussion as an explicit component of the psychological skills of military pilots and its presence within other psychological skills is highlighted.

Focus

The first minitour question of this research was: What does the term 'focus' mean for pilots who live, train and perform in the military context? Orlick (2008) stated that excellence evolves from a total connection with each step and in each moment of a performance pursuit. All pilots relied on a connected focus to excel in their flights and missions. Similarly, Toong and Koh (2005) found that an MST program involving focus training resulted in improved performance on a jump task by novice military parachutists. The importance of a fully connected focus was especially evident in relation to mission execution. Pilots described their best focus as one in which they were in the moment, connected to their tasks, thinking positively, maintaining a broad SA, and using their capacity effectively. When focused in flight, pilots were able to anticipate upcoming events, move through their tasks in a fluid manner, and manage or prioritize multiple tasks and inputs. Many pilots specified that this type of

connected focus (on the right things at the right time) was the difference between a best performance and a less-than-best performance.

Trust in one's abilities is a key component of excellent performance (Cohn, 1991; Orlick, 2008). Werthner (2002) identified trust as a specific component of an effective 'in the moment' focus. Werthner's research with elite athletes indicated that athletes looked to balance the cognitive aspect of monitoring performance with the more instinctual or trusting aspect of simply allowing one's body to perform what it has done many times before. The pilots in this study also seemed to maintain such a balance as most of the routine mechanics of flight were performed without deliberate or conscious thought. The countless hours spent engaged in missions, chair flying, and other preparatory activities allowed pilots to carry out these actions with minimal attention while simultaneously processing other inputs and prioritizing tasks. Many pilots seemed to view the aircraft as an extension of themselves (similar to how one feels when driving a car or riding a bike), stating that to move the aircraft they only had to decide where they wanted to go and their bodies would react appropriately. A thorough preparation seemed to empower pilots to trust themselves and simply focus on doing what they could. When facing an exceptionally challenging task, pilots attempted to first put the situation in perspective and then trust in their abilities to perform as required. This trust freed them to perform their best.

Moore and Stevenson (1994) stated that trust is a specific mental skill that involves "freeing oneself of expectations, fears, or other conscious activity and maintaining a clear and present focus necessary to attend to higher aspects of sports competition such as cue utilization and strategy" (p. 3). It was evident from the pilots' descriptions of their best focus experiences that trust was an integral component of their success. Some pilots did note that they experienced some difficulty in this area when faced with important test flights, however every pilot seemed able to fully trust in his/her abilities during emergency response situations; in these situations, there was quite simply no time to begin questioning those abilities.

Moore and Stevenson (1994) proposed a hierarchical model of the psychological skills required to achieve trust in one's abilities. According to this model, one begins with concentration. An appropriate concentration leads to self-confidence, which is then expressed through composure. Composure enhances the likelihood of trusting oneself during execution of the skill. The experiences related by pilots seem to support this model of trust. Those pilots who found it difficult to trust in their abilities reported focusing on task-irrelevant cues, such as the presence of the examiner or the outcome of the test. They also expressed feeling a slight decrease in self-confidence as well as elevated symptoms of anxiety. For those pilots who were able to overcome their test worries, the process began with a shift in focus to task-relevant cues. When responding to emergency situations, pilots reported focusing fully on problem solving and maintaining their composure, with no hesitation as to their ability to handle the situation. Pilots drew confidence from analyzing their situation and determining either that they were in a reasonable position to succeed or that there were several courses of action from which they could choose. As a result, pilots were able to free themselves to trust their decisions and proceed without hesitation in whatever way they felt was best.

During these challenging situations or emergencies, pilots often reported experiencing a state of fully connected or optimal focus, similar to flow. Jackson (1995) defined flow as "a state of optimal experiencing involving total absorption in a task, and creating a state of consciousness where optimal levels of functioning often occur" (p. 138). Pilots seemed to experience a fully connected focus or sense of Flow during emergency responses; their state during this time was characterized by automaticity, an understanding of priorities, total focus on the task at hand, a sense of control, and loss of time awareness. These experiences seemed to be prompted by the pilots' abilities to free themselves through trust to connect fully with the task at hand. As first defined by Csikszentimichalyi (1990), however, flow is essentially an experience of intrinsic enjoyment. While pilots did experience a sense of connectedness, they did not (understandably) seem to experience enjoyment during emergency

responses. Participants did not experience negative or debilitating thoughts, nor did they report experiencing joyful thoughts. One could argue that their focus was positive in that they concentrated on moving forward, finding solutions, and taking action to create a more favorable outcome. Also, many pilots pursued a flying career for purely intrinsic reasons, so perhaps when considered on a more global scale the concept of flow (or certainly a fully connected focus) could be applied.

Cohn (1991) noted an absence of fear when golfers experienced flow during play. The pilots interviewed for this study also reported an absence of fear during their responses to emergencies. Some pilots felt a physical response, such as accelerated breathing and heart rates, but all were able to compose themselves and refocus quickly without trouble. One pilot recalled a fleeting thought of having to eject from an aircraft when it was struck by a bird, but did not dwell on this possibility. Whether or not the experiences of these pilots can be classified as flow experiences, this research does highlight the importance of trust in reaching such a state of optimal performance. Perhaps trust may be included as an essential component in future investigations of optimal performance or flow experiences.

Commitment

Mahoney et al. (1987) reported that compared to non-elite athletes, elite athletes invest “more *motivation* and personal meaning in doing well in their sport” (p. 197). The pilots interviewed for this study demonstrated a very high level of commitment to their dream (of being a military pilot) and to personal excellence, equal to that expressed by elite athletes and performers in other domains. For many pilots interviewed, this commitment was evident at a young age and remained steady over many years through various obstacles and challenges. Chris Hadfield, one of Canada’s most prolific astronauts, referred to this unwavering commitment to a goal as retention of purpose (Orlick, 2008). Hadfield described making choices every day, from a very young age, that aligned with his goal of one day becoming an astronaut. Several pilots described this same internalization of their goals. Many encountered major obstacles, such as failing to gain entry into the UPTS (Undergraduate Pilot Training

System) or not being selected for the unit or position they desired, but they all kept working towards their dream goal.

For those who did not dream of becoming a pilot as a young child, this same high level of commitment to the process of achieving their goal was readily apparent. Once the goal of military aviation was targeted, these pilots approached their objective with the very same persistent commitment as those who had always dreamed of flying. Orlick (2008) suggested that commitment grows naturally from engagement in an activity that one loves or enjoys. Every participant in this study enjoyed flying and for many, their love or passion for flying was almost indescribable. One participant spoke of his unwillingness to try any activity at which he thought he might fail. Flying was the only exception to this rule: He had no idea if he would succeed as a pilot; he simply wanted to have fun.

Barbour and Orlick (1999) measured the perceived importance of various mental skills through a questionnaire in their research with National Hockey League players. The researchers reported that the hockey players rated commitment highest in terms of importance and the players' own perceived proficiency. Pilots also identified commitment as an important component of success in military aviation, however they did not specify that it was the most important element. Barbour and Orlick further stated, "Fun and enjoyment were an important medium for enhancing players' commitment and longevity in professional hockey" (p. 33). The present study supports this finding, with every pilot indicating some aspect of flying that brought him/her enjoyment or positive, uplifting feelings. Most often, the positive feeling was related to the freedom of being in the air, a feeling that could not be attained anywhere else. For others, enjoyment was related to such elements as the challenge of the occupation, the camaraderie of the CAF or their roles as instructor pilots. Barbour and Orlick suggested that fun and enjoyment be recognized as a distinct element of success in the pursuit of excellence. The results of the present study seem to indicate that fun and enjoyment are a component of commitment, serving to strengthen a pilot's focus on achieving his/her high level goals.

Orlick (2008) more recently stated that a positive and connected focus is required to enhance long term development of commitment. Pilots described various focus points that enhanced their commitment, including short-term goals (safety, mission objectives, and mission preparation) and long-term goals (ongoing learning, personal excellence, desirable job/certification). Participants demonstrated a clear understanding of what was required to achieve their dream goal, whether that was a certain rank/position in the CAF or a chance to fly the F-18s, and committed to each step of the process. Participant 5 summarized the pilots' general consensus on the importance of commitment as advice to incoming student pilots: "[You must] want this job. If you don't want this job really badly, then go do something else. . . I think it's actually quite simple. You just can't be lazy and do this job".

Mental Readiness

High performance military pilots in this study engaged themselves in specific activities to achieve mental readiness prior to flights. These activities included committing relevant information to memory, planning ahead for expected and unexpected events, building capacity (i.e., improving their ability to multitask), and using mental imagery to rehearse the flight or important segments of the flight. Orlick (2008) stated, "To excel in any pursuit, you need to become mentally ready to think, focus, and act in positive ways" (p. 15). Through the use of effective mental preparation techniques, participants were able to enter their missions feeling ready to perform to the best of their abilities. Military aviation is a unique performance domain in that performers are required to learn vast amounts of information ranging from complex, technical procedures to the innermost workings of a highly advanced piece of machinery that they must control while moving at extreme speeds. A pilot's ability to commit large amounts of information to memory (and retrieve it quickly when necessary) is therefore essential to safe and excellent performance.

In their investigation of mental readiness in elite surgeons, McDonald et al. (1995) reported that 91% of the surgeons interviewed used aids such as books and models during their preparation for

surgery. For military pilots, the use of books and models for preparation seemed to be most important during their student training or prior to an especially important mission or test. Many pilots reported that they would break down relevant information into smaller segments or “proceduralize” (i.e., turn it into a step by step process) more complicated material or maneuvers; this process enabled participants to memorize important information quickly. Pilots demonstrated a high level of self-awareness in terms of their preferred learning style and most beneficial learning environment. Once an effective study routine was established, pilots seemed to maintain this routine throughout their training. Pilots also upheld effective routines for their mental imagery and other areas of preparation.

Participants felt that an extremely critical component of their mental readiness was the extent to which they had prepared for potential incidents or other unforeseen events. Pilots accomplished this task by anticipating possible circumstances drawn from their own knowledge and experience, as well as by engaging other pilots in discussions of their past experiences. The discussion of mission details with peers, when combined with the review of relevant written material, seemed to enable pilots to envision what would take place during the flight and how they could best respond. This technique of collective mental preparation with peers seems somewhat unique to the pilot community. Coleman and Orlick (2006) reported that elite big mountain freeskiers drew on their own previous experiences and inspection of the challenge when preparing for a competition, but this process was not undertaken in collaboration with other skiers. Burke and Orlick (2003) found that Mount Everest climbers relied on detailed planning in their pre-performance phase, however it was not specifically mentioned whether this planning included communication with others. While it was impossible for pilots to plan for every possible circumstance, it was important for them to enter each mission feeling prepared and knowing that they had predetermined options to focus on in the event of an unplanned incident.

In order to utilize their pre-flight preparation to respond appropriately to stimuli in flight, a pilot must first have the ability to monitor these stimuli and shift his/her attention to those that are most

important. Pilots attempted to build their capacity, or their ability to attend to multiple stimuli, during their pre-flight preparation. To build capacity, pilots attempted to replicate the multi-input, dynamic environment of the cockpit when studying or chair flying. Some pilots believed they could create a similar effect on the ground by engaging in a secondary activity, such as juggling or bouncing a ball, while focusing on their flight-related preparation (mental imagery or reviewing written material). Some pilots felt that by using this technique they increased their ability to monitor multiple variables (some subconsciously) without becoming overwhelmed or losing focus on the most important task. This strategy of intentionally incorporating multiple stimuli into preparatory activities is a simple one, however it is not specifically addressed in aviation research to date. As such, this technique might provide a valuable contribution to the field of sport and performance psychology. The effectiveness of such a practical activity is worthy of further exploration for performers engaged in fast paced, multifaceted performance environments.

Positive Images

Roth and Andre (2004) suggested that chair flying could be equally effective as simulator based training in preparation for a simulator flying task, but that further research was required to determine whether chair flying is effective in relation to preparation for real missions. For the elite military pilots involved in this study, chair flying was an essential and effective component of preparation for real missions. Mental imagery, or chair flying, was an integral component of the pre-flight preparation phase for every pilot in this study. Orlick (2008) stated that the world's top performers use mental imagery every day to prepare themselves for training, to perfect or make corrections to technical skills, to overcome challenges, to see themselves achieving their best, and to improve their confidence in their abilities. Pilots utilized imagery in a similar way, with an emphasis placed on skill acquisition, skill refinement and error correction. Pilots incorporated visual and kinesthetic (i.e., physical movements) modalities into their chair flying practice. Some pilots also included auditory elements, such as hearing

radio calls, and one participant reported that he could feel the sensations of being under G (the force of gravity). Munroe, Giacobbi, Hall, and Weinberg (2000) found similar results in their investigation with 14 varsity athletes. Results showed that athletes incorporated visual, auditory, olfactory and kinesthetic elements into their mental imagery. The pilots in this study reported using mainly visual and kinesthetic components in their imagery preparation. There was limited mention of auditory elements and no mention of olfactory elements. This presents a possible avenue for improvement by enhancing both the quality and diversity of this part of current preparatory routines. A mental skills training program developed specifically for this context could see benefits in the inclusion of specific training for imagery content (i.e., use of new or different modalities) with student pilots.

Munroe et al. (2000) also noted the importance of speed in mental imagery, stating, "The speed at which one images is an area of research that has received little attention" (p. 133). Munroe et al. suggested that the speed of the athletes' images varied with the time available. For example, during a break in competition an athlete would have faster images (i.e., the skill is performed faster), as time is very limited. However, it was concluded that further investigation in this area is needed. Most pilots felt that images were most effective when performed in real time. This is consistent with previous research conclusions that accurate representations of performance demands are important in imagery (e.g., Munroe et al.; Orlick & Partington, 1988). When time is limited, pilots noted that they adapt their imagery as necessary, focusing more on key components that are essential to success in the flight. One pilot reported using faster images for more familiar portions of the flight, and then slowing the imagery during new or important portions. This may be an effective way to maintain the flow of the overall mission experience while appealing to the need for time-effective preparation techniques.

Durand-Bush and Salmela (2002) investigated the development and maintenance of expert athletic performance with 10 multiple gold medal winners from Olympic or World Championship events. The researchers stated, "The athletes engaged in deliberate practice in both the investment and

maintenance years”; however further research was required to determine whether this deliberate practice is necessary once the athletes have reached the peak of their sport performance. The majority of the pilots’ chair flying was performed during their training in the UPTS when they were learning new procedures and techniques. As they became increasingly familiar with the aircraft and the various maneuvers, they appeared to decrease the amount of time spent chair flying. Later in their careers, pilots would return to chair flying when preparing for important tests or missions, when transferring to a new aircraft, when on deployment, or when returning after time away from flying. Krampe and Ericsson (1996) similarly found that once a pianist attains an expert level of performance, regular deliberate practice is required to maintain these levels however the amount of practice required is reduced.

Many pilots felt that chair flying was highly effective for more static maneuvers (i.e., maneuvers with clearly delineated steps) but that it may not be as effective or easily applicable for use with dynamic maneuvers that involve reacting to environmental cues and gauging progress by distinct feelings rather than step-by-step procedures. However, when a student pilot attempts a maneuver or a portion of a maneuver successfully in flight (or even when the instructor demonstrates the maneuver), he/she will experience the feeling of a correct execution. Once the student has experienced this feeling, that element may be incorporated into chair flying the dynamic maneuver. The use of imagery for dynamic scenarios is an area that could gain from further research and investigation. Mahoney et al. (1987) briefly described a significant difference in elite athletes’ use of psychological skills in open (dynamic challenge) and closed (fixed challenge) sports; however, the researchers stated that further investigation was required. High performance athletes who are involved in more dynamic activities, such as Mount Everest climbers and big mountain freeskiers, made no mention of such limitations to their use of imagery (Burke & Orlick, 2003; Coleman & Orlick, 2006). Furthermore, Orlick and Partington (1988) interviewed Canadian Olympic athletes from a wide variety of Winter and Summer Olympic Game sports and reported no differences in the imagery use between open and closed sports. In future

research, therefore, it may be worthwhile to further investigate the best use of imagery in activities requiring more static maneuvers compared to those with more dynamic maneuvers.

Confidence

Pilots drew on the acknowledgement of their own abilities, the abilities of their fellow pilots, and their pre-flight safety routines (i.e., precautionary measures) as sources of confidence. Durand-Bush and Salmela (2002) reported that confidence was one of two main personal characteristics embodied by high-level athletes. Confidence allowed the participants to act positively and without hesitation during flight. Orlick (2008) suggested that confidence is variable, depending on the quality of one's preparation and the direction of one's focus, as well as self-belief in one's capacity. Many participants felt that they had carried a level of confidence with them throughout their lives, believing that they could succeed at anything that they chose to pursue in a committed and focused way. Others made a conscious effort to build their confidence through the challenges of the UPTS. When confident in flight however, all pilots felt that they could commit to their decisions and act without reservation.

In their work with big mountain freeskiers, Coleman and Orlick (2006) reported that confidence was linked to sufficient and effective preparation. The present research involving military pilots supports this finding. One pilot stated that the only instances in which she felt a lack of confidence were those for which she felt that she was insufficiently prepared. For many pilots, a feeling of uncertainty before a test or flight motivated them to increase their preparatory efforts. Coleman and Orlick further reported that big mountain freeskiers drew confidence from such safety measures as knowing the line they would ski, having back-up exit plans in case of an avalanche, and knowing where their safe zones were. CAF pilots also placed a great emphasis on personal safety measures, as they were aware that many preventative steps could be taken to execute the mission in the safest way possible. Pilots drew upon their quality preparation, excellent physical health, trust in fellow pilots, and pre-flight safety routines to build and sustain high levels of confidence.

McDonald et al. (1995) reported that elite surgeons enhanced their own self-confidence by “devising ways to set controls on their environment” (p. 693). These controls included positive thinking, selecting their own team members, and postponing surgery if necessary. Similarly, pilots devised methods of influencing their physical selves and the environment to enhance their self-confidence. The methods used by pilots included positive thinking, positive self-talk, maintenance of physical health and fitness, and planning flights according to weather conditions. Pilots recognized the aspects of the environment and of themselves that they could control, and actively attempted to manipulate those variables in positive ways. In their efforts to build and maintain self-confidence, pilots also deliberately cultivated a keen awareness of their own abilities and limitations. If their abilities to successfully complete a mission or a maneuver were in any way compromised or questionable, pilots would simply not fly. Research has suggested that disproportionately difficult goals can lead to increased cognitive anxiety and degraded performance (Earley, Connolly & Ekegren, 1989; Jones, Swain & Cale, 1990). When presented with an exceedingly difficult mission goal (generally due to bad weather conditions), pilots recognized the limits of their capabilities and chose to stay within them, avoiding this risk of degraded performance altogether. Elite pilots did not take unnecessary risks or continually push themselves to the limit, but were honest with themselves and others about their abilities. These pilots went to great lengths to avoid unnecessary risks, knowing that the potential repercussions were simply not worth it.

Distraction Control

Pilots relied heavily on distraction control strategies during mission execution. Due to the nature of military flight (e.g., often multiple aircraft in the airspace, many instruments to monitor, multi-step maneuvers), a pilot’s attention is almost always shifting between multiple demands. Add to this the distractors of every day life, such as family related issues, physical health, or workload demands, and the task of maintaining a best focus is now potentially much more challenging. While the majority of pilots did not bring personal distractions into their missions, most felt that they were often bombarded by

flight-related distractors. Orlick (2008) stated that elite performers rely on cue words, images, or focal points to initiate “positive shifts in focus” to a controllable element (p. 20). This is consistent with the refocusing technique reported by pilots that involved compartmentalizing and prioritizing. The typical refocusing process for these elite pilots seemed to follow a distinct set of steps: (1) identification of distractor, (2) recognition of lack of control over distractor (if applicable), (3) compartmentalization of distractor, (4) reprioritization of tasks, and (5) execution of top priority task. Many pilots used cue words or phrases such as “what is next?” to prompt their rapid refocusing. This entire process was usually completed within a matter of seconds, as necessitated by the high speed at which the aircraft travel.

Performers in other domains have reported using compartmentalization or similar strategies to block out unwanted or harmful distractions (e.g., Orlick & Partington, 1988). For example, athletes have discussed the use of thought stopping to prevent themselves from becoming distracted by irrelevant or negative thoughts (Zinsser, Bunker & Williams, 2001). One aspect that does not appear to have been addressed in sport psychology literature, however, is the conscious thought process of task prioritization that often follows a pilot’s compartmentalization. This may be due in part to unique nature of a military pilot’s performance (i.e., there are many more tasks to attend to within a very short period of time). The complexities of flying an aircraft in a busy or dangerous airspace require that a pilot must be prepared to organize a multitude of tasks before attempting to complete them. As students, pilots often relied on a pre-planned prioritization scheme of *aviate, navigate, communicate*. In any situation, pilots knew that their first priority was always to *aviate* (i.e., keep the aircraft from hitting the ground). As simple as this may seem, such a plan gave pilots a starting point on which to focus. From here, they could refocus and determine the steps required to gain control of a complicated or overwhelming situation.

One of the more challenging distractions for pilots was the delay of flights due to weather conditions. In these situations, flights could be delayed multiple times, resulting in a day or more spent ready and waiting to fly. At times, pilots found themselves hoping that the flight would not go at all that

day simply because they were mentally exhausted after so many hours of uncertainty, gearing up for flights only to gear down when they were delayed further. Pilots accepted their situation however, as they understood well that weather conditions were beyond their personal control. This recognition of one's control over various situations was an important part of distraction control and stress management. Orlick (2008) stated, "You best serve yourself, your teammates, your goals, and the people closest to you when you focus on positive things within your potential control" (p. 157). When the time finally arrived for take-off, pilots shifted their attention to their pre-flight checks and used positive self-talk to re-engage themselves in the process of doing what they love to do: flying.

Ongoing Learning

Orlick (2008) stated that personal excellence arises from stretching one's limits, engaging in thorough post-performance evaluations, looking for positive elements as well as areas for improvement, and acting on the lessons learned from one's experiences. These elements of ongoing learning and self-reflection were a consistent component of excellence for all pilots interviewed. This finding was expected given two factors: (a) all pilots are required to attend a post-flight debrief where the flight is thoroughly deconstructed and evaluated for possible learning opportunities; and (b) ongoing learning skills are prevalent in research with high level performers across many high performance domains (e.g., Coleman & Orlick, 2006; Orlick & Partington, 1988). Upon the conclusion of every mission, pilots analyzed all elements of the flight, both good and bad. Specific learning opportunities and lessons for ongoing improvement were drawn out of each flight so that the pilot could act on them immediately.

Student pilots and experienced pilots focused on finding the tools to address any mistakes that had been made. In the training process, these tools were often identified or clarified by the flight instructor. Pilots often referred to their toolboxes, which they continually stocked with tips and bits of information gathered from debriefs, personal studies or experiences, and discussion with peers. Once the appropriate tool or lesson was discovered for a respective error, pilots immediately attempted to

put that tool into use, careful to focus on performing that maneuver correctly during the next flight.

Hogg (2002) suggested that when debriefing, an athlete's attributions can differ according to the success of the competition. The athlete who experienced a positive result will attribute the success to stable and internal factors while the athlete who experienced a negative result will attribute the failure to unstable and external factors. Hogg's attribution contention was not supported by the experiences of elite military pilots. Pilots displayed no discernible bias in their attributions of successful and unsuccessful performances. All pilots stressed the importance of being honest with themselves and taking responsibility for their own actions. Pilots also expressed a desire to continue learning throughout their careers in order to continually improve their abilities as aviators. There was an overwhelming sense of a constant drive for perfection, the notion being that there was no such thing as "good enough"; there is always some way to be better.

Many pilots reported that they engaged in personal debriefs during their own time, following the formal flight debrief. Orlick and Partington (1988) found that Olympic athletes used reflection and personal debriefs to continue to improve their mental skills. The pilots in this study seemed to focus almost exclusively on mechanical aspects of the flight during debriefs without directly addressing the role of their own psychological skills. Only occasionally did a pilot mention reflecting on his/her own focus, for example if the flight was an exceptionally poor one or if an error was made needlessly. Any emotions that were experienced during the flight would not be discussed. Hogg (2002) stated that a successful debrief requires "a desire to reflect on all aspects of performance with the intention to make changes" (p. 184). As this research has shown, psychological skills are a critical aspect of optimal performance in military aviation, but these skills are not a structured component of debriefs. Because these mental elements play such an integral role in performance quality, it would be of immense value in the future for military pilots to include psychological skills in both formal and personal debriefs.

A very interesting and unique aspect of ongoing learning discussed by military pilots was the extension of this learning throughout flights and missions. Many pilots discussed the importance of ongoing analysis of one's decisions and actions during flight. In order to continue moving forward with the mission in an effective manner, pilots must understand the full impact of their last decision on the flight and consider solutions to any resulting challenges or undesirable effects. Military pilots appear to be the first performers to specifically report an active engagement in ongoing learning and analysis during the course of their performances. Previous research seems to focus on debriefs and ongoing learning as important elements prior to and following a performance, but the process seems to be suspended during the course of the performance (e.g., Burke & Orlick, 2003; Coleman & Orlick 2006; Hogg, 2002). It is possible that ongoing learning is used during performance in other high level domains and has simply not surfaced in previous investigations. Another possible explanation for this divergence may lie in the unique nature of aviation performance: a pilot's actions in the immediate past and present will have a direct impact on his/her future circumstances. Therefore, learning the lesson immediately may be required to direct his/her actions in the immediate future.

In an interview with Terry Orlick (1999), Canadian astronaut Chris Hadfield recalled using debriefs to provide ground support to in-progress space flights: If a problem was reported, ground crews conducted simulations followed by debriefs to identify the best course of action for the space crew. Should a problem arise in a military aircraft, the pilot will receive support from ATC and other crew (if onboard), however, it is the pilot who must direct and act on all problem solving activities. There is simply not enough time to wait for a solution from ground crew. Without the ability to analyze and immediately learn from his/her past actions and decisions, a pilot may be unable to formulate an appropriate plan to move forward with the mission. This type of rapid, in-flight personal debrief warrants further investigation, as it may be applicable to other fluid performance contexts in which performers must analyze, learn, and act on what they are learning during performance.

Stress Management

The second main question of this study was: How do pilots contend with the risks and stresses implicit in this unique profession? An important aspect of successful performance for all pilots was effective stress management or activation control. Orlick (2008) discussed stress control and positive recovery from setbacks as a component of distraction control. In the context of military aviation, two factors seem to warrant the discussion of stress management as a separate psychological skill: (a) the presence of potentially life-threatening risks in both training and deployment; and (b) the intentional introduction of stressors into the CAF training environment (to help developing pilots learn how to manage stressors effectively). Stress management was utilized in all phases of flight (pre-flight, mission execution, and post-flight). Pilots reported widely varying strategies for stress management or reduction such as exercise, positive self-talk, meditation, time off, compartmentalizing, and partying. Some pilots felt that stress was simply a part of the job and should be accepted as such. When stressed, these pilots reported simply focusing on the task and doing whatever was required to complete their goal. While it is possible that the considerable variation in stress management tactics may be the result of a lack of formal training in such techniques, research in sport has indicated that the use of diverse arousal management techniques is common among elite performers (e.g., Gould, Finch, & Jackson, 1993; Lazarus & Folkman, 1984; Nicholls & Polman, 2007). Different performers prefer different strategies, depending on the nature of the stressor.

Lazarus and Folkman (1984) suggested that coping is a dynamic activity that involves interaction between an individual's internal and external environments: Individuals will respond with coping strategies specific to the nature of the internal or external stressor. This model is known as the "process" approach to coping with stress. The process model has been supported in sport psychology research such as that of Gould, Finch and Jackson (1993). Nicholls and Polman (2007) conducted a review of coping literature in sport. Having analyzed 64 studies (both qualitative and quantitative), the

authors concluded that coping is, as Lazarus and Folkman suggested, recursive and dynamic. Nicholls and Polman stated that the coping attempts used by athletes “fluctuate based upon their appraisal of the situation and previous coping attempts” (p. 16). The present investigation also supports the process model, with some pilots reporting the use of up to six different coping strategies in different circumstances. Given that most pilots mentioned the negative effects of perceived stress during training, however, it is likely that an MST program with an activation management component could be of benefit in this context, especially for student pilots.

In their research with U.S. National Champion figure skaters, Gould, Finch, and Jackson (1993) noted the presence of “vast individual differences in coping responses” between skaters (p. 463). Such diversity was also evident in the present study with military pilots. Some pilots reported using as many as six different coping strategies while others noted the use of only two. It should be noted here that by no means did the interviewers compile exhaustive accounts of the pilots’ available coping strategies. It is possible that those pilots who reported fewer coping strategies possessed in reality a broader skill set which they did not discuss. An interesting component of the research conducted by Gould et al. was the linking of specific coping strategies to specific sources of stress. The authors reported that skaters clearly implemented certain coping strategies depending on the type of stressor encountered. Such links, the authors suggested, may be of use in the creation and implementation of MST programs. Moreover, Pensgaard and Duda (2003) stated that athletes may differ in their perceptions of emotions as facilitative or debilitating; thus one cannot assume that negative emotional responses are always detrimental and positive emotional responses always beneficial to performance. This research brings to light several important considerations for moving forward with a training program for student pilots: the understanding of the diversity of stressors encountered by pilots so as to link the stressors with possible effective coping techniques; the recognition of possible differences in perceptions of facilitative or

debilitative emotions; and the necessity for time efficient coping or refocusing strategies (schedules and demands may not allow for prolonged activities such as deep relaxation or exercise).

Most pilots utilized stress management techniques prior to flight, especially before a test or when training as a student. For many, exercise or sport was the preferred method to dispel anxiety on a regular basis outside of the flight mission context, however most lamented the fact that they had little free time to engage in these pursuits. Others preferred to attend social gatherings at the mess or to disassociate from work by spending time with family or taking time off. Two pilots discussed the use of meditation and breathing techniques to control stress or activation in their pre-flight preparation. Interestingly, past research has consistently focused on the use of stress management techniques during or immediately prior to performance, with limited acknowledgement of usage in the extended preparation phase (e.g., Fletcher & Hanton, 2001; Neil et al., 2006). Clearly this is an important consideration, as without the proper tools to manage feelings of stress in the time prior to performance, a performer's preparation (and subsequent performance) may suffer.

Gould et al. (1993) noted that 65% of the athletes interviewed for their study cited pre-competitive mental preparation and anxiety management as a coping strategy. In comparison, almost every pilot interviewed for the present investigation reported using stress and anxiety management as a pre-performance coping tool. It is possible that military pilots utilize stress management to a greater degree prior to performance because they experience an exceptional elevation in the level of perceived anxiety or activation (especially as students); this may be due to the heavy workload, technical material and additional duties they are required to complete. This research has demonstrated ways in which sport and aviation are very similar, however in some ways, the preparation required for an important flight can be quite different from the preparation required for a sporting competition. Regardless of the pre-performance requirements or task demands, however, ongoing stress management before a performance remains very important.

As Gould et al. (1993) identified coping strategies employed by Senior U.S. National Champion figure skaters, Park (2000) also investigated this same theme with Korean national athletes. Both investigations encompassed coping strategies used through the participants' entire athletic careers. Athletes in both investigations revealed an impressive array of coping strategies, the most common being psychological training (e.g., self-talk, positive focus), training/strategies (e.g., training hard and smart), somatic relaxation, social support, and in certain cases, substance use. Military pilots in the current study referred to each of these coping strategies, to varying degrees, in reference to their pre-flight preparation. Park also noted the use of prayer and hobby activities as coping strategies by Korean national athletes. The pilots interviewed for this investigation relied heavily on hobby activities (e.g., sport), but the use of prayer in this capacity was not reported at any phase of flight.

During routine flights, pilots generally did not experience anxiety or fear. In the rare event that a pilot felt anxious in the time leading up to a flight, these feelings were dispelled in the moments prior to take-off when the pilot narrowed his/her attention to the necessary checks and routines. Similar patterns of activation have been identified in Olympic gymnasts (Mahoney & Avener, 1977) and sport parachutists (Fenz & Jones, 1972): The elite performers recorded elevated levels of anxiety (physiological indicators) up to some trigger point at the commencement of the performance (e.g., for sport parachutists, this trigger was the starting of the plane engine). After the trigger point, anxiety levels decreased substantially and remained so for the duration of the performance. For many pilots, this trigger point appeared to be the act of strapping in or taking their seat in the cockpit. Researchers seem to agree that in these performance circumstances athletes exert some type of control over their arousal levels prior to performance; however, the nature of this control has been relatively unexplored.

Fenz and Jones (1972) argued that the decrease in arousal prior to performance execution was due to anticipatory control by jumpers, but no elaboration was offered regarding the proposed control mechanisms. Coleman and Orlick (2006) offered some insight into this occurrence with big mountain

freeskiers, reporting that the skiers attempted to control their pre-performance activation by deliberately calming themselves and clearing their minds before executing the run. Mahoney and Avenier (1977) suggested that athletes used their elevated anxiety levels as a stimulant to enhance performance, but also refrained from offering any explanation as to how this was achieved. Pilots did not report any purposeful use of their activation levels to enhance performance, however some did acknowledge that a certain level of activation was good for optimal performance. Pilots controlled their activation and achieved a calm and fully connected focus before a flight by immersing themselves in their take-off routines. For most pilots, this shift in focus occurred naturally, without effort. Some also took time to recall the many hours they had dedicated to their preparation. The only instances when distracting thoughts or unwanted anxiety remained with the pilots during flight was when they felt they had not prepared sufficiently (an extremely rare occurrence) or, at times, while being tested.

A test can be an intimidating experience in any performance domain. While pilots generally found flight test experiences to be much more stressful as students, many still experienced elevated levels of anxiety during important tests (such as for advanced instructor qualifications). Keogh and French (2001) stated that test anxiety is a trait tendency “which is associated with an increased anxiety and stress specifically related to test taking” (p. 124). Research in this area has demonstrated that individuals high in test anxiety are more susceptible to threat-related distractors than individuals low in test anxiety, when being evaluated (Eysenck et al., 2007). Pilots in the present study who expressed higher levels of perceived anxiety in flight test situations were also more likely to report a tendency to become distracted by the examiner, by personal errors made during the flight, or by their own attempts to control automatic skill executions. To cope with feelings of increased arousal and stress during tests, some pilots had learned to control and shift their focus to something more constructive that was within their control. By shifting their focus to something positive, such as increasing their preparation efforts, these pilots were able to control their arousal and perform to their capabilities. Pilots also reported

using self-talk to refocus or reframe the situation, telling themselves that this was just another normal flight or that a failure or small setback would not be the end of the world. It is worth noting that pilots varied widely in their psychological skill usage when coping with test anxiety. In the end, refocusing on the task at hand – something that was within their control – seemed to work well for most pilots.

Pilots cited three main sources of their test related anxiety: a desire to do as well as possible, a fear of failure, and a fear of negative peer evaluation or loss of face. Fear of loss of face is a universally recognized phenomenon, however some researchers believe that its negative consequences may be especially critical within the aviation community (Murray, 1999). Murray (1999) suggested that fear of loss of face be incorporated into aviation's five hazardous attitudes concept. This concept was originally developed at the Embry-Riddle Aeronautical University in an effort to reduce accidents associated with poor pilot decision-making (Diehl, 1990). The five hazardous attitudes currently consist of the following: antiauthority (resistance to commands or orders); impulsivity (a need to do things immediately); invulnerability (the belief that accidents happen only to others); macho (trying to demonstrate superior ability); and resignation (no feeling of control over one's own fate). Murray suggested that fear of loss of face be included in the future as a component of the macho attitude.

The present study does not support Murray's (1999) proposed adjustment to the five hazardous attitudes concept. In the present study, military pilots who expressed a fear of loss of face did not necessarily exhibit other identifying characteristics of the macho attitude, such as a reluctance to seek assistance or admit shortcomings. In emergency situations involving crew aircraft, some pilots felt that it was necessary to demonstrate to the crew that they were composed and in control. On the surface this may seem to be an attempt to save face, however such displays of confidence functioned also as a safety measure to ensure that the crew remained calm and confident as well. It is possible, however, that fear of negative peer evaluation is a widespread concern among student and professional pilots. If this is the case, an MST program that helps pilots learn to focus on what they control (in the present, in

and around the aircraft) and to let go of distracting thoughts (such as worries of evaluation and failure) would be of value in enhancing the quality and consistency of performance.

The pilots interviewed for this study demonstrated an ability to take responsibility for their errors and to seek assistance in the post-flight debriefs. During a debrief, any errors made during the flight are reviewed and analyzed, with the instructor providing tools or suggestions to fix the issues and improve performance for future flights. This can be a humbling experience for many pilots. Due to the danger that even a small mistake in flight can sometimes bring, student pilots receive frequent and sometimes ruthless critiques of their actions. The experienced pilots interviewed for this study received this type of criticism mostly during tests, important missions, or when flying with the Snowbirds (formation aerobatic flying). Anshel and Gregory (1990) suggested that skilled athletes cope with acute stress (e.g., criticism) by blocking out negative or harmful elements and assimilating and implementing information that will benefit future performances. The present research supports this finding: To cope with the potential negative effects of receiving criticism (e.g., distraction, decreased self-confidence) many pilots made a conscious effort to adopt a positive perspective. Pilots reported taking ownership of their mistakes, looking for tips they could use, blocking the negative components, staying focused on their goal (of becoming an excellent pilot), and putting the experience in perspective.

Anshel and Gregory (1990) conducted an intervention-based study to examine the effectiveness of the COPE model (Anshel, 1986) for dealing with criticism in the context of intercollegiate athletics. The COPE model consists of four steps: (1) control emotions and acknowledge responsibility and cause of performance; (2) organize input by selecting and filtering out unimportant messages from important messages; (3) plan response (the objective is to attend to subsequent task demands and avoid self-reflection) and; (4) execute response and eliminate unpleasant thoughts (Anshel & Gregory). Results showed that in comparison to control and placebo groups, athletes who received training in the COPE program generally showed a decreased reactivity to negative feedback and sustained self-confidence

and self-esteem. Such a program may be useful in the development of pilots' psychological skills, especially for dealing with criticism from an instructor during a training flight.

It is evident that pilots are subjected to a variety of stressors during the pre-flight, mission execution, and post-flight phases of performance. Similar to many elite athletes, most pilots command a wide range of coping resources, which generally allow them to respond effectively to various stressors. In the CAF, however, there is no such thing as good enough and there are certainly opportunities for growth and improvement of stress management strategies, informed by research. Research has demonstrated the effectiveness of such arousal management techniques as the COPE model (Anshel & Gregory, 1990) as well as suggested the importance of linking specific stressors to coping techniques (Gould et al., 1993). This last consideration may prove to be especially valuable for military pilots who can abruptly find themselves in the midst of a war zone feeling anxious and unprepared. In addition to the coping techniques they have learned and relied on at home, pilots could benefit greatly from additional coping strategies specific to deployment contexts. Such strategies may help pilots cope and perform to their capacity when they are suddenly facing new and extreme stressors.

Thompson and McCreary (2006) suggested that stress management techniques should not be taught as unique or dissimilar from other typical responses to military situations (i.e., to be used only in special circumstances involving stress). Rather, these mental skills should be thoroughly "integrated into all relevant training opportunities so that they become reflexive in the same way that technical proficiencies are reflexive" (p. 3). Interestingly, the pilots who reported experiencing little or no stress on a day-to-day basis were those who saw stress management techniques as natural and automatic. While others might consider these techniques to be specific tools to cope with stress, these pilots saw them as normal reactions to normal (stress enhancing) situations. Thus, the strategy proposed by Thompson and McCreary is supported by this research and may be an effective way for the CAF to begin introducing and sustaining stress management training.

Deployment

Every aspect of a pilot's training is meant to prepare him/her for possible deployment. All of the nights spent studying, every hour spent chair flying, the endless flow of tasks, and every single critical remark has the potential to empower and enable pilots to realize their full aviation capabilities so they will be ready to serve well when called upon. No amount of training, however, can fully prepare a pilot for his/her first experiences in regions of severe international conflict. For those pilots who had been deployed to areas of heavy fighting, such as Afghanistan, the deployment seemed to constitute a type of parallel existence, a temporary departure from real life in Canada. The use of psychological skills in relation to deployment is an issue that deserves far greater attention than what was feasible through this investigation. The challenges and atrocities these individuals may face are extreme. Some may enter the deployment reality (or their return home) unprepared to deal with the psychological ramifications of their experiences. A mental skills training program could at least contribute some positive psychological skills to help pilots manage the stressors of deployment in a healthier, more adaptive manner.

While on deployment, pilots described their focus as being in the moment and task oriented, similar to their best focus used in training, tests, and simulations. However, they also noted a distinct increase in the intensity of their focus during deployment. The exact nature of this intensity was not fully explored in this study, however some pilots described their experiences as if they were living in a bubble or were impervious to distractions during much of their deployment. This may have been related to a heightened salience or awareness of task consequences. Interestingly, the connectedness of their focus did not appear to be disturbed by the elevated levels of anxiety induced by the combat environment.

Eysenck et al. (2007) stated that research has shown anxiety to be adversely related to attention:

Anxiety disrupts the functioning of the goal-directed attentional system, producing several effects including the following: (a) reduced ability to inhibit incorrect prepotent [i.e., dominant]

responses, (b) increased susceptibility to distraction, (c) impaired performance on secondary tasks in dual-task situations, and (d) impaired task-switching performance. (p. 348)

While pilots clearly described experiencing symptoms of heightened feelings of intensity or anxiety during deployment, they did not report any associated deficiencies in their focus or performance. In fact, pilots seemed to experience the opposite of a performance decrement, noting the higher perceived intensity and connectedness of their focus. This contrasts with the increased distractibility some of these pilots experienced during test flights, which were also a source of elevated stress. This ability to maintain a very high quality focus during deployment may be facilitated by a number of factors, such as further development of focusing, refocusing, or coping skills; further training with an emphasis on calmness in the cockpit; an increased level of trust in their capabilities; or even the absence of an examiner who evaluates their every move. These pilots were simply doing what they had been trained to do, without allowing any interfering thoughts to cloud their minds or disrupt their focus.

Mahoney and Avenier (1977) suggested that some athletes utilize their anxiety symptoms to fuel performance improvements. Pilots did not report any conscious attempts to utilize their heightened activation or feelings of anxiety in this way during deployment. Instead, their focus seemed to intensify naturally in accordance with the increased intensity of their environment. What makes an elite pilot's ability to focus during deployment so interesting is that the focus is maintained despite prolonged exposure to stressors. During deployment, pilots cannot remove themselves from the stressful environment, nor can they exert control over their surroundings. *During deployment, pilots displayed an incredible ability to maintain a high level of focus, under stress, for a protracted length of time.* Due to the natural elevation of focus levels and constant sources of potential stressors in this context, it would be valuable to explore more thoroughly how pilots maintain this focus without becoming emotionally and physically exhausted.

Solberg, Laberg, Johnsen, and Eid (2005) stated that high levels of self-efficacy are associated with “reduced levels of anxiety and arousal [when] confronted with stressful situations and increased ability to adapt to changing circumstances”. Pilots demonstrated high levels of self-confidence and belief in their capacities, which seemed to be maintained throughout deployment experiences. The anxiety experienced by these pilots during deployment, while noticeable, did not appear to induce any catastrophic detriments in their psychological state or physical abilities. Thus, the current research would seem to support the claim that self-efficacy is associated with reduced arousal in stressful conditions. Self-efficacy and trust in one’s abilities are integral components of a pilot’s success during deployment, but are not the only means by which levels of perceived anxiety can be reduced.

The German Air Force (GAF) employs a psychological training program in an attempt to prevent severe posttraumatic stress reactions; this program is delivered prior to, during, and after deployment (Willkomm, 2006). Prior to deployment, flying units receive a 16-hour training course every four years that focuses on aviation psychology and stress management. Shortly before deployment, an additional 20-hour psychological deployment training course is provided. Once the flying unit has deployed, an aviation psychologist remains on standby. Should this psychologist be requested to deploy, he/she will provide services such as advising commanding officers, mental preparation for changing conditions, and preventative counseling on stress. The unit commander, flight surgeon, and psychologist will also identify suitable personnel to be trained as “peers” to assist in the delivery of Critical Incident Stress Management (CISM) following critical incidents. Once the deployment has ended, flight unit leaders and flight surgeons evaluate any persisting symptoms of acute stress responses for referral to professional care (e.g., neurological/psychiatric diagnostics). As stress is an unavoidable component of any deployment, it may be worthwhile for the CAF to investigate the effects of a similar preparatory program for Canadian military aviators. Currently, pilots seem to rely mostly on self-taught coping strategies or informal sharing with peers and instructors.

Participants reported using similar stress management strategies during deployment as they had used throughout training. These strategies included compartmentalizing or blocking out maladaptive emotions and thoughts, exercising, and seeking social support. While these strategies seemed effective and sustainable for some pilots during the deployment, some participants experienced great difficulty reintegrating into their former lives once the deployment had ended. Solberg et al. (2005) stated that studies with Norwegian military and civilian populations have demonstrated that an avoidant coping style predicts posttraumatic stress disorder severity and is negatively related to well being. Conversely, emotion-focused and task-focused coping styles seem to buffer stress reactions (Emotion-focused would involve regulating emotions while task-focused would be acting on the stressor). Pensgaard and Duda (2003) also noted that emotion-focused strategies are often labeled in literature as maladaptive, however studies of coping with acute stress in competitive sport have shown otherwise. By relying primarily on an avoidance based stress management style, participants returned home with unanswered questions and unresolved emotions. In the instances when pilots utilized emotion-focused coping, such as seeking social support, they seemed to experience significant relief from their anxiety symptoms.

Through consultation with pilots before, during, and after deployments, it is possible that more viable skills and strategies may be identified to reduce the after-effects of these difficult deployment experiences. Pilots commented that during their deployments any strong emotional experiences (e.g., fear, sadness) were eventually compartmentalized or blocked out. Thus it may be a challenge to strike a balance between the inclusion of more emotion-focused coping skills and the maintenance of this seemingly adaptive, emotionally detached mindset used during deployment. For this reason, the development of appropriate, practical strategies might require considerable amounts of communication before, during, and after the deployment. Pensgaard and Duda (2003) stated, "whether or not a coping strategy is deemed adaptive or maladaptive must always be considered in relation to the context and in terms of its perceived effectiveness" (p. 255). As such, any attempts to modify or improve the current

coping strategies of pilots must consider the context-specific factors and the perceptions of pilots themselves. Deployment can be a life changing experience, exerting a toll on pilots both physically and mentally. A balanced preparation addressing both physical and psychological elements relevant to the deployment context is therefore required, to meet the challenges of the chaos that may lie ahead.

Limitations

This study explored the psychological skills utilized by military pilots in their pursuit of performance excellence. The interview data collected relied on retrospective descriptions of flight related experiences. In some instances, a significant amount of time had lapsed since a particular incident had occurred while in other instances the time lapse was very small. Retrospective descriptions of lived experiences have been utilized extensively in sport psychology literature to provide personal accounts of important events and patterns related to optimal performance (e.g., Cohn, 1991; Gould et al., 1992; Orlick & Partington, 1988; Werthner, 2002). The reliance on such descriptions assumes that participants are capable of accurate recall of important events even after a significant passage of time.

Nicholls and Polman (2007) suggested that with retrospective descriptions have been unreliable in sport coping literature; some individuals provide less accurate descriptions as time passes and others show evidence of bias (i.e., their knowledge of the outcome has affected their recall). Miller, Cardinal and Glick (1997) investigated the use of retrospective reports within organizational research and concluded that retrospective data may be used when “reasonable efforts to demonstrate reliability and validity can be reported” (p. 200). Miller et al. suggested several measures to enhance validity: use of free reports (i.e., participants encouraged to state when they do not remember); use of multiple knowledgeable informants; focus on facts and concrete evidence (rather than opinions and beliefs); and motivation of participants to provide accurate reports (e.g., ensure confidentiality, discuss value of the research). Most of these strategies were included in the methodology of the current study. The nature and purpose of this research, however, required the investigation of personal aviation

experiences and opinions related to preparation routines, execution of complex missions, and post-flight reflections. This study moved far beyond simple “facts and concrete evidence” to the sharing of personal challenges and lessons learned about what it takes to excel in this highly demanding context. These pilots provided clear and precise accounts of important events. At this point in time, there seems to be no better way to understand an individual’s experience than for that person to share the details.

Another possible limitation of this study may be the composition of the population sample. The sample consisted of 14 male pilots and one female pilot (and one additional male pilot whose interview was not fully analyzed). In many populations such a sample would be grossly misrepresentative, however, this disproportion seems to represent the current demographics of the CAF pilot population fairly accurately. While it may have been beneficial to include more women in the sample, this was simply not possible given the criteria for participation and the small pool of participants from which to draw on. Moreover, only four of the participants in this study had been deployed to combat zones. While the aim of this study was not specific to exploring psychological skills used in deployment, in future studies it may be beneficial to include more participants with deployment experience. Once again, however, the nature of the elite military aviation population does impose some limitations in this regard (e.g., pilots can be stationed across the country and overseas). This focus on deployment experience is therefore suggested as a consideration for future research.

Directions for Future Research

Several possibilities for future research have been suggested throughout the results and discussion sections of this work. An important possibility for future inquiry is to further explore the strategies used by pilots to build their mental capacity, or their ability to attend to multiple stimuli, prior to flight. Many pilots discussed engaging in a secondary activity, such as throwing a ball, while reviewing flight checks or chair flying (mentally running through) a maneuver. The pilots felt that this strategy enhanced their mental capacity and their skills related to multitasking. This is a simple concept,

however, such a strategy has yet to be assessed in performance psychology research. Further research might be conducted in this area to determine whether there is a more effective way to build capacity (e.g., modification to the secondary task, inclusion of background noise) and to determine if this strategy shows real results in new aviation populations tested. This strategy may be more relevant in domains outside of sport, such as space flight, surgery, or other military occupations where performers are constantly attending to and integrating multiple sources of information.

A future investigation with the pilots of the CAF might also limit the parameters to psychological skill usage in deployment contexts only. From a practical standpoint one can appreciate the value of an investigation that focuses specifically on deployment performance issues: The fundamental aim of every class, test, and training mission is preparation for the possibility of deployment. The use of psychological skills during deployment was addressed briefly in the present examination, however the aim of this research was to examine the use of psychological skills in general; thus, pilots' experiences in deployment comprised a relatively small portion of the research data. A more thorough investigation of psychological skills in deployment may reveal subtle differences in the skills used and possible areas for improvement. For example, many pilots in this investigation discussed the importance of informal communication with fellow pilots when training and preparing for tests and missions. On deployment, communication seemed to take on a new importance with pre-flight briefs being of the utmost importance. Peer discussion and social support were also deemed essential to coping effectively with the psychological effects of war. Similar subtleties may surface with regards to skills such as focus (noted as more intense in combat zones) and stress management (perhaps more avoidance based).

The present study provides a solid foundation on which to move forward with a mental skills training program for CAF student pilots. This research has identified areas of importance for skilled pilots, such as focusing and refocusing abilities as well as detailed debriefs from which one can draw lessons and tools for ongoing improvement. This research has also identified areas that could see

improvement from structured training, such as mental imagery and stress or activation management. It would be worthwhile to investigate the use of a more formalized training program, such as the one in use by the German Air Force (Willkomm, 2006) as well as the integration of performance psychology principles into the every day language and training of the UPTS, as recommended by Thompson and McCreary (2006). An MST program within the CAF may find it beneficial to develop and implement a hybrid approach of these two training proposals while also incorporating the best practices from elite high-performance athletes. By ensuring that stress management is part of the normal training routine, pilots may be better equipped to perform in a variety of contexts and more open to a pre-deployment specific stress management briefing.

Psychological skills research should also continue to move forward in novel domains such as high-risk sport and other occupational groups such as police, firefighters and air traffic controllers. These groups face unique challenges and performance requirements, and may therefore have developed novel applications of psychological skills or strategies to elevate their performance on a consistent basis. Taking into consideration the findings of the present study, future research in high-risk or high-stress sport and occupation could focus on arousal management for new and innovative techniques.

Conclusion

The principles of sport psychology have been validated over decades of research and practical application (e.g., Gould, Eklund and Jackson, 1992; Mahoney, Gabriel, and Perkins, 1987; Orlick & Partington, 1988). As our world constantly changes and evolves, so too must our attempts to understand and adapt through applied research, in order to keep pace with what is relevant and meaningful now. Leaders in applied sport psychology research have already begun to broaden the scope of investigation, which now encompasses performance domains such as music (Talbot-Honeck & Orlick, 1998), surgery (McDonald et al., 1995; Yule et al., 2006), space flight (Manzey & Schiewe, 1992; Orlick, 2008), and high-risk sport (Burke & Orlick, 2003; Coleman & Orlick, 2006). Each successive expansion of

knowledge, contributed by a different high performance domain, signaled a further advancement in our understanding of sport psychology and its applications for performers in other domains. Given the fragile state of the global economic and political environment, it seems that now, more than ever, there is a need for the application of sport and performance psychology principles in other uncharted domains, including Canada's Department of National Defense.

The purpose of this investigation was to gain an understanding of how elite Canadian military pilots use psychological skills to perform successfully in this highly demanding occupation. Throughout this research, the objective was and continues to be the contribution of new and valuable information to the field of sport and performance psychology, but also to lay the groundwork for the creation of an MST program, specific to the CAF's needs. Through the use of semi-structured, in depth interviews, the psychological skills of elite military pilots were explored and investigated within the framework of Orlick's (2008) *Wheel of Excellence*. Interviews were analyzed inductively and deductively to allow for the emergence of any new or unique data.

Results showed that Orlick's (2008) *Wheel of Excellence* is applicable as a model of performance psychology for military pilots. Pilots used elements of the model in three temporal phases of flight: pre-flight, mission execution, and post-flight. Commitment was an integral element of successful performance for all pilots and was evident through all stages of flight and, in many cases, prior to enrollment in the UPTS. The pre-flight phase was characterized by the following psychological skills: mental readiness, mental imagery, focus, distraction control, and stress management. The mission execution phase was comprised of focus, distraction control, confidence, ongoing learning, and stress management. Finally, the post-flight phase involved ongoing learning and stress management. During deployment, pilots specifically noted the use of mental readiness, focus, and stress management.

A noteworthy finding from this research was the use of chair flying, or mental imagery, by all pilots and student pilots. Chair flying was regarded as an important part of the training process, however

no formal instruction appeared to be provided for student pilots. Pilots interviewed described a range of imagery techniques, with some employing simple visual images and others incorporating the complete sensation of gravitational (G) forces or audio cues. Another area of interest that was discussed was the use of “capacity building” techniques. Some pilots believed that by engaging in a secondary activity, such as bouncing a tennis ball, while studying flight related materials or performing mental imagery, they could enhance their ability to attend to multiple inputs in flight. This finding is deserving of further inquiry to determine the effectiveness of the technique as well as its potential applicability in other performance domains. Moreover, pilots made frequent mention of the stressors involved in this occupation and their attempts to cope with, manage, or reduce stress responses in flight and on the ground. Pilots described making use of a wide range of coping strategies, such as exercise, meditation, compartmentalization, and cognitive restructuring techniques or refocusing techniques. In deployment experiences, however, these coping techniques seemed to be mostly avoidance based. Thus, the present investigation has identified areas of strength, areas for further research, and areas for improvement within the CAF environment.

Looking towards the future, this research has highlighted several important elements that could be effective in an MST program within the CAF. Participant 16, a pilot in a top command position, expressed his thoughts on the value that such a program could bring to the CAF:

I don't want to be doing selection here. We've already put a lot of effort into selecting the best candidates. When they get here, I want to put wings on them. So if I get 130 folks coming through the door next year, I want to pin 130 wings on those guys. And the reason we're gonna push them here is not to affect their self-confidence or anything like that, it's actually to show them how capable they are at doing things and build their self-confidence. So if, out of this project, I can salvage two pilots, three, five, one, I don't care, it will have been worth it to me. And I want the kids to take it seriously because it works.

Within such a program, a focus on stress management could provide pilots with alternative, time-effective strategies for relaxation and recovery during busy days. The deployment experiences of pilots could also be useful to train student pilots and those preparing for deployment with respect to the types of stress management skills they may require when overseas. A visualization component could build on the strengths already evident (e.g., consistent practice, use of props, realistic detail) by supporting pilots as they work to enhance the realistic detail of their images and the variety of modalities employed (e.g., visual, auditory, kinesthetic). Also, even though the pilots interviewed demonstrated a keen self-awareness and exceptional analytical abilities, it is likely that many pilots, both current and future, could benefit from the inclusion of relevant psychological skills (such as focus and refocusing) and related emotional experiences or thoughts as content of personal performance debriefs. The goal always remains to focus and perform to one's capacity on a consistent basis.

The pilots of Canada's Air Force who participated in this research are a unique group of men and women who possess incredible talents and an inspiring level of commitment. These pilots train with a level of focus and commitment that, to many, may seem unsustainable. Driven by a love of flying and a desire to achieve personal excellence, pilots know that high quality training leads to high quality performances, and when these pilots are called to truly perform, there are no second tries. As we move forward, negotiating our position in the global community and learning to work together with those with whom we share our earthly resources, we will continue to rely on the security and sovereignty protected by our CAF. The elite performers of the CAF possess many psychological skills that enable them to perform consistently in their highly demanding roles. In an environment where circumstances can change at a moment's notice, where decisions must be made instantly, and where every action has a consequence, effective psychological skills can empower pilots to gain their wings, execute missions, recover aircraft, and save lives.

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Appendix A

Information Letter

Dear Participant,

I am a professor in sport psychology and performance enhancement consultant at the University of Ottawa. As part of my ongoing research and interest in the field of performance excellence, I will be conducting an in-depth interview study within the Canadian Air Force. The purpose of this study is to examine the mental strategies used by Canada's top military pilots, specifically including the characteristics of a best focus experience, the meaning of focus, and the emotional experiences associated with this occupation.

You have been identified as a recognized, respected, and accomplished high-level performer in your field. I would like to provide you with the opportunity to participate in this study because your insights and experiences related to military aviation are highly relevant to this study and can provide valuable information.

If you are interested in taking part in this study, you will be asked to participate in the following activities:

- A one-on-one face-to-face interview, lasting approximately 60 minutes.
- Potentially a follow-up interview (via phone or email), lasting between 15 and 30 minutes
- An individual review of your interview transcript to verify that the information you provided is accurate and to make any necessary changes, clarifications, or corrections.

I will be traveling to your Base in the coming weeks, with my research assistant and graduate student Maya Hohmann, to begin conducting interviews. Interviews will be audio taped and transcribed. The audiotapes and transcripts will be stored in a locked filing cabinet in my office for a period of five years upon completion of the study. If you choose to participate in this study, the information you share may be used for the purpose of publication in academic journals and/or a Master's thesis. You may be quoted in presentations or publications provided your consent is given, but I will take all possible steps to ensure your anonymity. The anonymity of all participants will be protected through the use of pseudonyms and the modification of identifying information in the publication of findings. However, if you prefer to have your name associated with your comments, you will be given the option of refusing a pseudonym; this would allow the linking of your name with your interview responses. I will ask you to provide a personal mailing address so that I can send you a copy of your interview transcript for verification. As a participant, it is a requirement that you are able to read and speak English, as each interview will be conducted in English only, and transcripts will be provided in English only. There will be no compensation for your participation in this study.

The risks associated with participation in this study are minimal. Risks may include feelings of discomfort when discussing certain aspects of your experiences as a military pilot. As a participant, you are free to discuss only as much as you are comfortable with. You are free to refuse to answer questions or to withdraw from the study completely at any point without consequence.

Upon completion of this research project, the following will be submitted to the Social Science Research Review Board of DND: electronic copies of the research report(s) arising from this project and electronic copies of the data used to produce the reported results. Due to the small scale of this research project, the researchers cannot fully guarantee anonymity and confidentiality in this process.

If, having read the above information, you are interested in participating in this study or have any questions regarding the research, please contact me at the email address or the telephone number below. You will be asked to provide a personal (i.e., not DND) email address for possible future communication. Thank-you in advance for your time and consideration.

Sincerely,

Dr. Terry Orlick
School of Human Kinetics
Faculty of Health Sciences
University of Ottawa

Appendix B

Consent Form

INTERVIEW CONSENT FORM

Psychological Experiences of Canadian Military Pilots

Principal Researcher:

Terry Orlick, Ph.D.
Faculty of Health Sciences
University of Ottawa

Research Assistant:

Maya Hohmann, MA Candidate
Faculty of Health Sciences
University of Ottawa

I, _____, am invited to participate in the abovementioned research project conducted by Dr. Terry Orlick and research assistant Maya Hohmann of the Faculty of Health Sciences in the University of Ottawa.

I understand that the purpose of this study is to explore the mental strategies used by Canadian military pilots to ensure successful performance in a high-risk occupation. The attainment of this objective will entail exploration of the following related issues: (a) how successful pilots manage the challenges and stresses of the occupation; (b) the meaning of the term 'focus' in this context and for these individuals; and (c) the comparison of best and less than best flight experiences.

My participation will consist of (1) taking part in an interview/conversation to discuss personal performance enhancement techniques as well as ideas and experiences relating to performance excellence. The interview will last approximately one hour. (2) If necessary, my participation will also consist of taking part in a follow-up interview/conversation. This follow-up session will take place if additional information and/or clarification is required. The session will take place via email or telephone; via telephone this session will last approximately 20 minutes. (3) I understand that I will have the opportunity to verify and/or make alterations to any part of my interview transcripts and if I wish to receive a summary of the final results they will be sent to my personal mailing address. (4) I also understand that the overall results generated from this research may be presented at conferences and/or published in academic journals and Master's thesis documents.

I grant permission for digital audio recording devices to be used during the course of the interview(s)/conversation(s) for the purpose of this study.

I understand that the risks involved in participation in this study are minimal. Due to the nature of the research, my participation in this study will require that I volunteer or share personal experiences and information related to my pursuit of excellence in my profession as a military pilot; in rare circumstances this may cause some slight discomfort. I have received assurance from the researcher that all possible measures will be taken to minimize any discomfort. I will not be required to respond to any question that I feel may cause discomfort and, should I choose not to respond to any questions, there will be absolutely no negative consequences for me.

I understand that while the researcher will take every step possible to ensure that any information that I share will remain confidential, this confidentiality cannot be absolutely guaranteed. The contents will be used strictly for research purposes, and they will be available only to Dr. Terry Orlick and Maya Hohmann. My confidentiality will be protected by the use of a pseudonym, which the researcher will assign to me; this fake name will be used in the interview transcripts. Should the researcher decide to cite my interview in his study, my pseudonym will be used and any information that may reveal my identity will be deleted. I am aware that in order to ensure my anonymity, the master list linking participants to pseudonyms will be kept in a separate locked filing cabinet (separate from the data) in Dr. Orlick's office so that no association between a participant's identity and pseudonym will be possible. If I choose to have my name associated with my interview comments, I will be given the option of refusing a pseudonym; this decision will be respected by the researcher.

I have been informed that upon completion of this research project, electronic copies of the data used to produce the reported results will be forwarded to the Social Science Research Review Board of DND. I understand that the researchers cannot fully guarantee anonymity in this process.

I understand that the data collected (electronic data, interview transcripts, interview notes) will be kept in a secure manner. The digital audio tape and interview transcripts will be stored in a locked filing cabinet in the office of Dr. Orlick at the University of Ottawa. Audiotapes, transcripts, and other papers or electronic files (e.g., email correspondence, electronic copies of interview transcripts) will be kept for five years, as required by ethical standards, after which time they will be destroyed.

I understand that I am free to withdraw from the study at any time, before or during the interview, without consequence. Should I choose to withdraw my participation from the study, all recordings of my participation to date will be erased without any negative consequence.

I understand that I will receive no monetary compensation for my participation in this study. I am aware that I may benefit from discussing my experiences and success elements in military aviation, as participants in similar studies have experienced positive benefits. I may also benefit from viewing the research conclusions, which will present success elements used by other military pilots. My participation in this study will also enhance the research body concerning excellence in military aviation.

I, _____, freely and voluntarily agree to participate in the above research study conducted by Dr. Terry Orlick and Maya Hohmann of the Faculty of Health Sciences of the University of Ottawa.

Should I have any questions or require any additional information regarding the study, I have been informed that I may contact Dr. Terry Orlick or Maya Hohmann at any time. Should I have any questions regarding the ethical conduct of this study, I may contact the Protocol Officer for Ethics in Research.

There are two copies of the consent form, one of which is mine to keep (the other will be kept in a locked filing cabinet in the office of Dr. Terry Orlick).

Participant:		
	Signature	Date
Researcher:		
	Signature	Date

Please initial below if you would like your name to be associated with your interview comments:

Please send a summary of the results to:

Appendix C

Pilot Interview Guide

Life Experiences

A. General

- a. What was it that made you decide to pursue this particular career (as a military pilot)?
- b. When did you first want to become a military pilot? How important was this goal for you?
- c. Thinking back to the time when you decided to pursue this career, what was your journey like getting to where you are now?
- d. Did you ever doubt that you could achieve your goals?
- e. What were some of the major challenges and obstacles you faced in this journey and what kept you going through those obstacles?

Being a Military Pilot

A. General

- a. What do you love about being a military pilot?
- b. How do you feel when you are flying? What are you aware of or connected to when you are flying? Do you experience this feeling at any other time or during any other activities?
- c. How do you think you developed your confidence in your skills and abilities to fly (or perform) as well as you do right now?

B. Psychological Skills

- a. What do you do mentally that allows you to be a successful military pilot?
- b. How do you prepare yourself each time before you go on a flight or mission?
- c. Can you tell me about one of your best ever experiences or performances as a military pilot, a time that you feel you performed to the best of your ability?
- d. During your best flights or best performances, what do you think about or connect to? Are you consciously thinking or do you rely more on instinct and automatic reactions?
- e. Can you tell me about a less than best flying experience or performance you have had as a military pilot when you feel you performed below your ability or capacity?
- f. What does the term situational awareness mean to you? What role does it play in your performance as a pilot? (What kinds of things do you need to be aware of when flying?)
- g. Do you often have to make decisions in flight with very little time to think? If yes, how do you make those split second decisions? What goes through your mind at these times?
- h. How often do you do computerized simulations? How much practice or preparation do you do outside of actually flying? Is this different now from when you were learning to be a pilot or were a rookie or less experienced pilot?
- i. Can you share some of your thoughts and feelings about chair flying? Can tell us about some of your earlier experiences with chair flying? Do you continue to do or practice chair flying now? Can you explain a bit about how you use this technique and what you feel makes it most effective?
- j. Do you debrief after every mission/training flight? Can you give a specific example of a recent debrief or debrief earlier in your career. What do you debrief and about how long does the debrief take? How useful do you feel these debriefs are?
- k. Do you (and others) actually act on what comes out of the debrief on your next flight or mission? Do you, yourself, ever debrief on your focus or the effectiveness or connectedness of your focus

during a flight debrief? If yes, explore details. If no, explore whether you think this might be of value for you or younger pilots. [Effective post-debrief habits]

Risks and Challenges

A. Challenges

- a. This occupation has a relatively high attrition rate both during and, more recently, after training. What do you feel has helped you to remain in this occupation for as long as you have when many others have not done so? [Explore possibilities both during training and after training]
- b. What has been your biggest challenge in this occupation over the course of your career?
- c. In what ways, positive or negative, do you feel that the military environment has influenced your flying (or your flying career)? Do you have any thoughts on how the military environment for pilots might be improved to enhance performance or retain pilots for longer periods of time?

B. Risks

- a. How do you feel (emotionally and physically) in the time leading up to flights and during flights, for training/combat/competition?
- b. How did you learn to adapt to or cope with fear/anxiety or turn fear or excitement into focus in your occupation?
- c. Can you give an example of a situation when an unexpected issue or challenge arose during a flight?
- d. Have you ever been in an adverse situation that involved flying? Can you describe this experience? [Explore any debriefing/repercussions, thoughts/actions in the moment, plans for future improvement/change]

Training

A. General

- a. What were the most important specific skills/lessons you learned in your training and flying experiences that have helped you to become an accomplished (successful) military pilot?
- b. What was the pilot training experience like for you? [Explore specifics of pilot background – QFI, fighter, rotary wing, multi-engine] What do you feel helped you most and least in achieving your wings as a military pilot? What sorts of challenges did you face at that time?
- c. Is there anything that you believe could help you to continue to improve or enhance the quality and/or consistency of your performances?
- d. What advice would you give to new trainees with regard to becoming a successful military pilot?

Conclusion

- a. Is there anything you would like to add that you feel is important to this study? How did you feel when you were contacted to participate in this study? Do you feel that this type of research could provide a valuable contribution to the training programs in the CAF?