

EMOTIONAL INTELLIGENCE, SAFETY BEHAVIOR, AND PEER-ASSESSED PILOT
PERFORMANCE

by

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DEDICATION

This thesis is dedicated to the many pilots I have served with over the past decade. You provided me with the inspiration and motivation to begin this project. May you always have blue skies, strong tailwinds, and soft landings.

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Researching and writing a thesis is a long and involved process that requires the input and assistance of many individuals.

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ABSTRACT

Flying is a stressful and demanding profession that requires both technical and nontechnical skills. Traditionally, technical skills such as aircraft knowledge and flight control-handling took precedence over nontechnical skills such as interpersonal skills, stress management, and leadership. However, over the past four decades increased emphasis has been placed on pilots' abilities to work together as a cohesive team. The purpose of this thesis was to explore the relationship between trait emotional intelligence, safety attitude, and safety citizenship to identify which constructs play the most prominent role in affecting peer-assessed pilot crew resource management. Using a web-based survey composed of validated instruments, information was gathered from pilots (n=44) from both military and civilian backgrounds. Results indicated a significant association between safety citizenship and trait emotional intelligence and between safety citizenship and peer assessed crew resource management performance. Only a marginal association was identified between trait emotional intelligence and safety attitude. Additionally, comparison of the trait emotional intelligence profiles of the pilots with the general population indicated that pilots have muted emotion-related tendencies with lower scores than their non-pilot peers. Finally, research was conducted to evaluate principal component analysis, a statistical method, as a pilot selection tool using pilot trait emotional intelligence and safety tendencies as selection criteria. Results demonstrated strong potential for the implementation of principal component analysis as a less-subjective method to select pilots during the hiring or crew-matching process. Pilots, therefore, seem to differ from the general population with unique trait emotional intelligence profiles. When assessing peer performance, pilots tend to most value peers with high safety citizenship tendencies, which also closely associates with high trait emotional intelligence.

CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

Background

Aviation crewmembers require mental fortitude and adaptability in order to operate as a cohesive team over prolonged timeframes, working together to accomplish tasks in complex and stressful environments (Albuquerque & Fonseca, 2016). According to the Federal Aviation Administration (FAA), effective aircrew coordination is the difference between a safe flight and an aviation incident (FAA, 2001). The stress and pressure of the aviation environment requires constant evaluation as crewmembers assess each other's actions during flight as a means of maintaining safety (*UH-60 Series Aircrew Training Module*, 2018). "The operation of a complex aircraft is a group endeavor," (Chidester, Helmreich, Gregorich, & Geis, 1991) and as such, effective pilots must be able to manage emotions, effectively assess risk, and work together with other crewmembers to accomplish the mission. Therefore, a pilot's Emotional Intelligence (EI) and Safety Attitude (SA) likely play a large role in his/her ability to effectively operate as a crewmember. Though only a small fraction of total flights, aviation incidents often lead to catastrophic loss of life (Ropeik, 2006), understanding how EI affects aircrew coordination and SA would lead improved selection and training and reduced incidents.

Emotional Intelligence

First identified by Peter Salovey and John D. Mayer, EI has been the subject of much research over the past three decades. As a form of social perception, EI involves,

“the verbal and nonverbal appraisal and expression of emotion, the regulation of emotion in the self and others, and the utilization of emotional content in problem solving” (J. D. Mayer & Salovey, 1993). EI encompasses an array of individual traits that relate to a person’s ability to engage others socially. Trait EI is evaluated based upon four individual factors composed of 15 different facets (K. Petrides, 2009). These facets may be individually analyzed to determine individual relation to performance in certain tasks or situations. Of note, two facets, adaptability and self-motivation, are not specifically linked with a parent factor but are nevertheless seen as essential facets of a person’s EI (Figure 1). These factors/facets combine to create the person’s unique “global” EI score, which is the sum of a person’s EI traits. EI has been researched in numerous areas including job satisfaction (Jorfi, Bin Yacco, & Shah, 2012), mental toughness (Cowden, 2016), and even stroke recovery (Hoffman, Cases, Hoffman, & Chen, 2010). However, only limited research has been conducted to evaluate the cross-section of EI and aircrew performance (Dai, Wang, Yang, & Wen, 2019; Geetu & Rycroft, 2009; Hokeness, 2012). In this thesis, Primary emphasis will be placed upon understanding which of the individual factors/facets are significantly more related to positive crewmember performance.

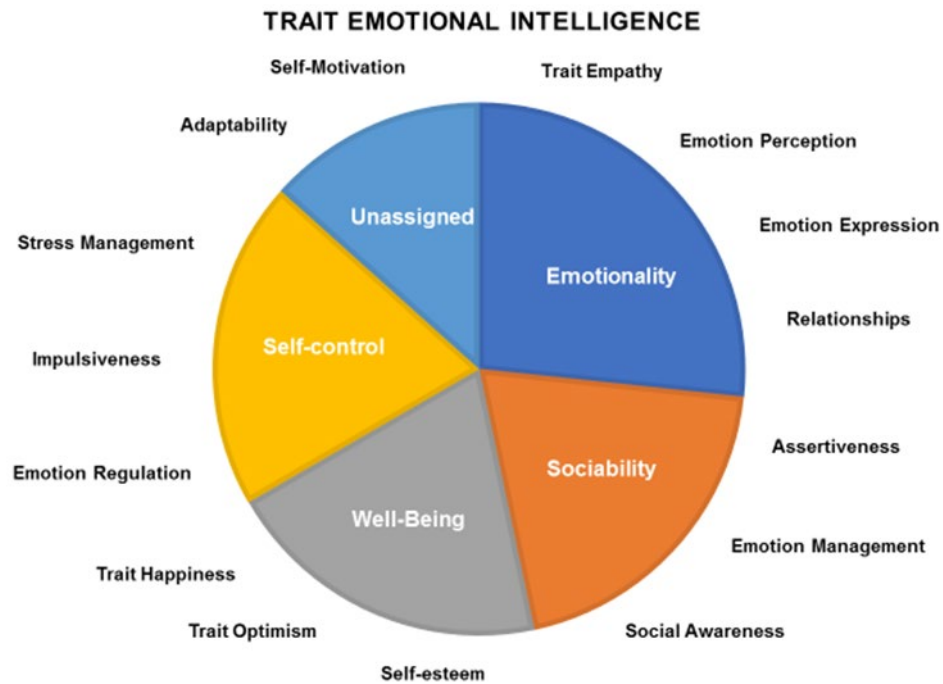


Figure 1: 4 Trait EI Factors and 15 Facets (adapted from Petrides, 2009)

Performance

In general, performance deals with how well a person completes a task. Holistically, aviator performance encompasses elements such as knowledge, leadership skills, professionalism, organizational skills, judgment and decision-making, communications skills (Barron, Carretta, & Bonto-Kane, 2016), as well as physical performance, of flight maneuvers (Dai et al., 2019). Typically, aviator performance is assessed on a routine basis within the confines of a flight test or “check ride” during which a pilot’s physical performance and decision-making skills are evaluated by a certified examiner (Thorne, 2017). However, over the past forty years, added emphasis has been placed upon the importance of proficiency in Crew Resource Management

(CRM) (Ruff-Stahl et al., 2016). This is most evident in the European Union where CRM is included as a measure of pilot flight performance in annual flight proficiency evaluations (Flin et al., 2003). Typically, when evaluating CRM, a pilot's performance is rated using the qualitative input of his/her evaluator(s) however, CRM has also been evaluated through peer-assessment as well. (Gontar, Hoermann, Deischl, & Haslbeck, 2014).

Safety Attitude

Even though flight has become an increasingly common method of travel, it still carries inherent risks due to the often-catastrophic nature of aircraft incidents. It is imperative that pilots have an appropriate attitude towards risk and that they avoid the hazardous attitudes of complacency, indiscipline, and overconfidence which lead to increased human error (FAA, 2013). Decision-based error accounts for approximately 36 percent of all fatal general aviation accidents (Wiegmann & Shappell, 2017). Therefore, a pilot's ability to make sound decisions in flight has a direct impact on the safety of the flight. It has been well-documented that a pilot's willingness to accept risk and/or place the aircraft in hazardous situations has a significant impact on the overall safety of their entire crew (David R Hunter, 2002; O'Hare, 1990). Therefore, increasing appropriate attitudes towards safety will lead to lower risk, sound decisions, and ultimately less aviation incidents.

Problem Statement and Research Aims

The focus of this study was to examine the relationship between emotional intelligence, as measured by Trait Emotional Intelligence Questionnaire (TEIQue), safety attitude, safety citizenship, and peer-assessed CRM performance for aviators to determine which factors/facets contribute the most to pilot CRM performance. To the author's knowledge, no other study has holistically assessed these elements together within an aviation context.

Aim 1: This thesis sought to understand if crewmember CRM performance is affected by EI and what facets and/or factors are most closely related.

HA: EI is associated with crewmember performance.

Expected Outcome: EI will have a positive association with CRM performance as gauged by an aviator's peers. Pilots with high scores in emotion regulation, stress management, adaptability, and self-motivation will have high CRM performance scores.

Aim 2: This study will seek to determine if safety attitude and safety citizenship are affected by EI.

HA: EI is associated with SA and SC. Facets including emotion regulation, emotion management, assertiveness, and low impulsiveness are most closely related to SA and SC.

Expected Outcome: EI will have a positive association with SA and SC; pilots with high scores in emotion regulation, emotion management, assertiveness, and low impulsiveness

will have higher SA and SC. Improved understanding of the relationship between EI and SA will contribute to improved training and selection for pilots.

Aim 3: The final aim will be to understand if SA and SC relate to peer-assessed CRM performance.

***H_A*:** SA and SC are associated with peer-assessed performance.

Expected Outcome: Crewmembers will indicate a preference for pilots with higher SA and SC. Associating SA with peer-assessed performance will improve efforts to improve aviation safety culture and provide increased incentive for pilots to behave accordingly.

Importance of Proposed Research

Much research emphasis has been placed upon EI and its effects on an individual's performance in many aspects of life (Cowden, 2016; Frederickson, Petrides, & Simmonds, 2012; Goleman, 1996; Joshi, Srivastava, & Raychaudhuri, 2012; Siegling, Nielsen, & Petrides, 2014), however little has been done to evaluate the effects of EI on aviator performance. According to the FAA, 167,572 pilots held an active Airline Transport Pilot (ATP) rating and nearly 11 million flights carried an estimated 1.018 trillion passengers (FAA, 2019). As a general rule, aircraft carrying passengers require multiple pilots, so for nearly every commercial flight, at least two pilots operated as a crew for the entire flight. When considering aviation incidents, specifically those that cause fatalities, human factors account for nearly 70% (Shappell et al., 2006).

Understanding how EI affects aviator safety and performance and will provide critical insight to improve pilot training and selection. This may be particularly beneficial to the

commercial airline industry and military where pilots are required to serve in stressful, high-stakes environments. Identifying EI factors and/or facets with highest association with pilot performance will enable improved pilot entry screening and CRM courses to ensure that pilots are better equipped to serve in the dynamic environment.

CHAPTER 2

LITERATURE REVIEW

Intellectual view of emotions

Emotions are commonly discussed in contemporary society in relation to both feelings and actions. Emotion is defined as a combination of experiential, conscious feeling, neural processes, and observable expressive patterns (Izard, 2013). In other words, emotions generate a reaction within an individual that can lead to both physical and behavioral response. Emotions are subjective and typically oriented toward a person, place, or more abstract event that an individual has experienced. Historically, emotions were seen as “disruptive in nature,” a hinderance to “a person’s thought process” (Gayathri & Meenakshi, 2013). Emotions were a type of weakness that limited a person’s ability to function effectively; “acute disturbances” that made people “lose control” (Young, 1943). However, during the later half of the 20th century, scholars such as Stanley Schachter and Jerome Singer established a basis for the study of emotion as coexisting with the cognitive abilities and not as an uncontrollable “passion” that limited them (Dror, 2017). Emotions were seen to operate in a positive relationship with cognition as the personal interpretation of events was required to establish emotional response and provide motivation (Gayathri & Meenakshi, 2013). As such, “emotions are not necessarily opposed to reason... rather, they also help in effectual reasoning and decision making” (Gayathri & Meenakshi, 2013). These intellectual developments paved

the way for the continued study of emotion (Dror, 2017) and ultimately the idea of emotional intelligence (Salovey & Mayer, 1990).

Development of Emotional Intelligence

EI theory is rooted in the development of the theory of multiple intelligence as outlined by Howard Gardner in the early 1980s (Gayathri & Meenakshi, 2013). According to Gardner, the IQ test was not adequate as a singular gauge of intelligence but that “human intelligence encompasses a far wider, more universal set of competencies,” (Gardner, 1998). His theory was based upon two primary claims: 1) that “all humans possess all these intelligences” and, 2) “we all have different profiles of intelligences” or in simple terms, we are all unique (Gardner, 1998). Using the concept of multiple intelligences as a starting point, Peter Salovey and John Mayer (1990) introduced the theory of EI as a sub-set of social intelligence. They defined EI as the “ability to monitor one’s own and others’ feelings and emotions, to discriminate among them and use this information to guide one’s thinking and action” (Salovey & Mayer, 1990).

Since its inception, EI has been immensely popular within the academic community (Gayathri & Meenakshi, 2013). Significant study has been conducted to link EI to individual performance (Lyons & Schneider, 2005), teamwork (Jordan, Ashkanasy, Härtel, & Hooper, 2002), academic performance (Joshi et al., 2012), and leadership (Siegling et al., 2014). These studies have revealed a positive association between EI and situational performance. With such emphasis on EI within the research space, there has been considerable disagreement between scholars as to finer details regarding an individual’s EI. This is particularly evident in the debate about whether EI is a cognitive

ability or a component of an individual's unique personality (Gayathri & Meenakshi, 2013). Salovey and Mayer (1990), hold firmly to the view of EI as a cognitive ability while others assert that is better seen as "emotion-related dispositions" innate within a person's personality (K. Petrides, Furnham, & Mavroveli, 2007).

As a cognitive ability, EI is seen as a framework composed of learned qualities that allow a person to "accurately perceive their emotions and use integrated, sophisticated approaches to regulate them as they proceed toward important goals" (Salovey & Mayer, 1990). As a learned ability, J. D. Mayer and Salovey (1997), posit skill areas that contribute to one's EI: perception expression of emotion, assimilating emotion in thought, understanding and analyzing emotion, and reflective regulation of emotion. Proponents of this perspective argue that, as an individual matures and/or develops he or she will develop improved skills in each of these four areas that would aid in their ability to act appropriately based upon their own, and others', emotions. They see the entire process as an intellectual activity in which emotions, "are understood and controlled through intellectual prowess," while remaining independent of any ingrained personality traits (Gayathri & Meenakshi, 2013). Critics of the "ability model" claim that the current tests evaluate a person's, "knowledge of emotions but not necessarily the ability to perform tasks that are related to the knowledge that is assessed" (Brody, 2004). In other words, a person with vast knowledge about a subject, "may not be skilled in the actual performance of the actual task" so their high test scores would not align with their actual abilities (Brody, 2004). Because of this, the critics claim that the current testing methods are "psychologically invalid" which means that practitioners are unable to

“subject them to factor analyses, correlate them with other variables, and enter them into regression equations” (K. Petrides, 2009).

Though Salovey, Mayer, and Caruso (2004) developed the only “purely ability-based” model that has been implemented to date, numerous other “mixed ability models” have been developed over the past years (Gayathri & Meenakshi, 2013). Models such as Bar-On (2002) and Goleman (1996) integrate the concept of cognitive ability with certain “non-ability” (personality) traits (J. Mayer, Salovey, & Caruso, 2004). These models include traits such as assertiveness, empathy, optimism, (Bar-On, 2002) impulsiveness and empathetic awareness (Goleman, 1996) as aspects of overall EI. Critics of the mixed model approach highlight inadequacies of the current self-report questionnaires, particularly in the subjectivity of individual emotional experience (K. Petrides et al., 2007). They argue such models fail to assess maximum-performance objectively because they require information that is only available “to the individual who is providing those responses” (K. Petrides et al., 2007)

The understanding of EI as a personality trait is based upon the belief that EI, “relates to behavioral tendencies and self-perceived abilities” (K. Petrides & Furnham, 2001). Proponents of this model believe that an individual’s behavioral tendencies are indicative of a person’s personality, not their ability as gauged by a maximum-performance measure (K. Petrides & Furnham, 2001). Unlike the ability or mixed ability models, the trait EI model effectively uses self-report methods as it gauges general “dispositions” instead of an individual’s subjective assessment of performance (K. Petrides, 2009; K. Petrides & Furnham, 2001; K. Petrides et al., 2007).

Viewing EI as a construct of an individual's unique personality as opposed to a cognitive ability presents the question as to whether or not an individual's EI would develop over a lifetime (improvement through maturity) (K. Petrides et al., 2007). Proponents of the cognitive ability view of EI, clearly argue that EI is a set of skills that may be developed and learned over time and through experience (J. D. Mayer & Salovey, 1993; Salovey & Mayer, 1990). However, viewing EI as a personality trait, "implies that the constellation of emotion-related self-perceptions and dispositions it comprises is generally stable" (K. Petrides et al., 2007). Yet, when looking at the long term, it seems plausible that EI does increase through the adulthood maturation process, though no conclusive studies have been completed to date (K. Petrides et al., 2007).

Emotional Intelligence and Aviation Crewmembers

There has been limited research into the effects of EI and aviator performance. Dai et al. (2019) conducted a study to evaluate the interaction between EI and flight student performance in a simulator evaluation. During this study, EI was evaluated using the Wong and Law Emotional Intelligence Scale (WLEIS) which is an ability-based evaluation measure developed for use with Chinese subjects (Dai et al., 2019). Their research findings indicated that, "EI affected simulated flight performance through emotional state" (Dai et al., 2019). Though their research indicated an association between EI and performance, their data collection was based purely upon performance in a single evaluation (Dai et al., 2019), not continued performance over numerous flights, settings, and conditions.

Hokeness (2012) conducted in-depth research into the relationship between Certified Flight Instructor (CFI) EI score and flight student performance. Using the Skills for Career And Life Effectiveness© Test (SCALE©), a web-based ability model, to evaluate CFIs EI scores, he concluded that EI contributed to flight student success (Hokeness, 2012). Similarly, Geetu and Rycroft (2009), conducted a study into the effects of EI on crewmember performance within the United Kingdom's Royal Air Force (RAF). Using the Bar-On EQ-i™ Scale, the researches evaluated military aviators from a variety of aviation duty positions and demographic backgrounds (Geetu & Rycroft, 2009). Ultimately, researchers found little difference between group EI scores but a statistical basis to suggest that EI, “accounts for a sizeable portion of performance in flying training” (Geetu & Rycroft, 2009).

Crew Resource Management

The concept of crew resource management (CRM) traces its origin to a National Aeronautics and Space Administration (NASA) meeting conducted in 1979 (Cooper, White, & Lauber, 1979). After identifying human error, as the primary causal element of aviation incidents, the concept of CRM was coined as a method to train aircrews on how to reduce error in cockpit interaction (Helmreich, Merritt, & Wilhelm, 1999). Over the past four decades, CRM has continued to develop as further research and technological advances have changed the cockpit as well as the academic understanding of the elements involved in effective aircrew coordination (Kaps, Keren-Zvi, & Ruiz, 1999).

Research has indicated a linkage between pilot personality and cockpit performance (Chidester et al., 1991). This is particularly evident when considering the

realm of social competence, or a person's assessment and application of the "interactions among individual characteristics, social demands, and situational characteristics" that define distinct situations (Hoermann & Goerke, 2014). Proper social action is defined not by "universal code" alone but also by the specific context in which the individual finds themselves (Argyle, Henderson, & Furnham, 1985). This concept is clearly evident in aviation, specifically within the context of cockpit interaction and "flight-crew behavior" where pilots are required to work together as a team to fly the aircraft safely (Chidester et al., 1991; Tullo, 2019).

Non-Technical Skills

The Non-Technical Skills (NOTECHS) system was developed in the late 1990s under the guidance of the European Union's (EU) Joint Aviation Authority (JAA) as a means to obtain an evaluative metric for the non-technical skills involved in effective CRM (Flin et al., 2003). Due to the cultural diversity found within the EU, the JAA required a metric that could "contribute to standardization between examiners and instructors with different national and/or organizational backgrounds" (JARTEL, 2002) while maintaining the ability to evaluate an individual pilot's performance (Flin et al., 2003). The NOTECHS method evaluates performance as a function of four main categories: Cooperation, Leadership and Managerial Skills, Situational Awareness, and Decision Making; each of which is further defined by their associated sub-elements (Flin et al., 2003) as a general framework (Table 1). NOTECHS has been widely used within the aviation community and has been adapted for use in surgery, anesthesiology, and nuclear power (Flin, 2010). Though not originally developed for self/peer assessment

(JARTEL, 2002) previous research has established a basis for such use (Gontar et al., 2014).

Table 1: NOTECHS Framework (adapted from JARTEL, 2002)

Non-Technical Skills			
Cooperation	Leadership and Managerial	Situational Awareness	Decision Making
<ul style="list-style-type: none"> • Team-building and maintaining • Considering others • Supporting others • Conflict solving 	<ul style="list-style-type: none"> • Use of authority and assertiveness • Providing and maintaining standards • Planning and co-ordination • Workload management 	<ul style="list-style-type: none"> • Awareness of aircraft systems • Awareness of external environment • Awareness of time 	<ul style="list-style-type: none"> • Problem definition and diagnosis • Option generation • Risk assessment and option selection • Outcome review

Safety Attitude

Attitude refers to how an individual pilot's perceptions influence them to, "think or behave in a fairly predictable manner toward objects, persons, or situations" (Wilkening, Wilkening, & Wilkening, 1973). Therefore, safety attitude refers to an individual's, "motivational predisposition" (FAA, 2016) towards safety and safety related issues. As part of a national survey of pilots, David R. Hunter (1995) developed a scale to assess pilot's attitude toward safety in flight (David R. Hunter, 2005). This survey, known as the Aviation Safety Attitude Scale (ASAS), utilizes a Likert Scale to reflect pilot's attitudes in respect to "hazardous thought patterns," as well as, "other attitudes believed to be reflective of safety, or conversely, risky flying" (David R. Hunter, 2005). (Table 2).

Table 2: ASAS Items and Factors (adapted from David R. Hunter, 2005)

Aviation Safety Attitude (ASAS) Items and Factors	
Factor	Example Items
Self Confidence (ASAS- SC)	I am very skillful on the controls.
	I know aviation procedures very well.
	I am a very capable pilot.
	I deal with stress very well.
Risk Orientation (ASAS-RO)	Sometimes you just have to depend on luck to get you through.
	The rules controlling flying are much too strict.
	If you don't push yourself and the aircraft a little, you'll never know what you could do.
	Most of the time accidents are caused by things beyond the pilot's control
Safety Orientation (ASAS-SO)	I am a very cautious pilot .
	I am a very careful pilot.
	It is riskier to fly at night than during the day.
	Aviation weather forecasts are usually accurate.

Safety Attitude and CRM

Research has shown that pilots' attitudes influence "overall crew coordination" (Gregorich, Helmreich, & Wilhelm, 1990). Most emphasis has been upon understanding the effects of pilot's attitudes toward CRM (Gregorich et al., 1990; Helmreich, Foushee, Benson, & Russini, 1986). Nonetheless, some research has indicated the link between safety attitude and flight performance. Sexton and Klinec (2001) found that aircrews, "composed of pilots with high safety culture attitudes trapped more of their errors, had fewer undesirable aircraft states, fewer error chains, and were less likely to make a violation than crews with low safety culture attitudes." In other words, crews with high safety attitude had improved CRM performance. Wetmore and Lu (2006) found that

pilots with hazardous attitudes were less adept at evaluating risk, making decisions, and utilizing all cockpit resources—three critical CRM skills.

EI and Safety Attitude

To the author's knowledge, no research has been conducted to infer the relationship between EI and safety attitude within the aviation space. However, personality traits have been associated with attitudes within traffic safety (Barron et al., 2016; Chen, 2009; Ulleberg & Rundmo, 2003). Using the understanding of EI as a "conceptualization of emotional intelligence as a personality trait at the lower levels of personality taxonomies" (K. Petrides et al., 2007), it is not a far reach to envision a connection between EI and safety attitude as well.

Safety Citizenship

Safety Citizenship (SC) is based upon the understanding that instilling a sense of responsibility for others will lead to a reduction in risky behavior (Finley, Riggs, Otto, & Ward, 2015). As such, SC is not tied to the formal reward structure, but are rather discretionary behaviors that benefit the organization (Didla, Mearns, & Flin, 2009). Numerous measures have been developed to assess individual's SC (Hofmann, Morgeson, & Gerras, 2003; Mearns & Reader, 2008; Willis, Brown, & Prussia, 2012). Willis et al. (2012) developed a 22-item questionnaire with seven-point Likert scale to assess and individual's perception of organizational safety climate, personal SC, and unsafe exposure events encountered at work. For the purposes of this thesis, only the eight personal SC items were utilized (Table 3).

Table 3: Safety Citizenship Items (adapted from Willis et al., 2012)

1.	I am involved in improving safety policy and practices.
2.	I initiate steps to improve work procedures if I think it will make work safer.
3.	If I see something unsafe, I go out of my way to take care of it.
4.	I voluntarily carry out tasks or activities that help to improve workplace safety.
5.	I often make suggestions to improve how safety is handled around here.
6.	I often try new approaches to improving workplace safety.
7.	I often try to solve problems in ways that reduce safety risks.
8.	I keep abreast of changes related to safety.

CHAPTER 3

EMOTIONAL INTELLIGENCE AND SAFETY CITIZENSHIP
AMONG ARMY AVIATORS

Contribution of Authors and Co-Authors

Manuscript in Chapter 3

Author: Zachary T. Dugger

Contributions: Collected TEIQue and SC data, conducted statistical analysis, generated figures, and wrote the manuscript in preparation for submission

Co-Author: Bernadette McCrory

Contributions: Provided key insights throughout the data collection and analysis process and edited manuscript prior to submission.

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Abstract

The purpose of this study was to develop an understanding of the relationship between trait emotional intelligence and safety citizenship among United States Army aviators. The study includes analysis of survey responses from 29 individual aviators. Regression analysis was performed to evaluate the relationship between safety citizenship, emotional intelligence, and 15 emotional intelligence facets. Results indicate a significant association ($F(1,28) = 15.45$; $p = 0.001$) between safety citizenship and emotional intelligence, and between safety citizenship and three emotional intelligence facets: *Adaptability* ($F(1,25) = 23.91$; $p < 0.001$), *Self Esteem* ($F(1,25) = 10.75$; $p = 0.003$), and *Optimism* ($F(1,25) = 8.71$; $p = 0.007$). Increased *Adaptability* and *Self Esteem* can increase safety citizenship behaviors among aviators. Training and selection of Army aviators with these traits could result in safer air travel and possibly reduced human factor-related aviation incidents.

Introduction

Powered flight, by its very nature, retains inherent risks for pilots and passengers alike. Despite the modern technological improvements, over 340 fatalities occurred in the United States alone in 2017 (Federal Aviation Administration, 2018). Studies have shown that between 60-80% percent of all aviation incidents are caused by human error (Shappell et al., 2006). As such, it is imperative that pilots have an appropriate attitude towards risk and avoid the hazardous attitudes of complacency, indiscipline, and overconfidence that often lead to increased rates of human error (Federal Aviation Administration, 2013). A

pilot's willingness to accept risk and/or place the aircraft in hazardous situations have a significant impact on the overall safety of the flight crew (David R Hunter, 2002; O'Hare, 1990). This is particularly true within the realm of military aviation where pilots operate in complex environments with increased individual workloads due to mission scope (Harding & Goosey, 2019).

Developed under the constructs of organizational citizenship behavior, Safety Citizenship (SC) is defined as the, "behaviors that are discretionary, not directly or explicitly recognized by the formal reward system, and that in the aggregate promote the effective functioning of the organization" (Didla et al., 2009). SC activities are focused on the improved safety performance of others and the organization as a whole (Hofmann et al., 2003). SC has been associated with behaviors such as taking initiative to improve safety policy and volunteering for safety programs or activities (Finley et al., 2015). Therefore, in an aviation context, pilots with a high SC orientation may be more actively concerned with the well-being of their fellow crewmembers. It is crucial that pilots accurately understand the associated risks and act in ways that promote the well-being of their fellow crewmembers to maintain flight safety.

Emotional Intelligence (EI) encompasses an array of traits and self-perceived abilities that relate to an individual's ability to engage others socially (K. Petrides & Furnham, 2001). Over the past three decades, EI has been associated with success in numerous fields including job satisfaction (Jorfi et al., 2012), mental toughness (Cowden, 2016), and even stroke recovery (Hoffman et al., 2010). As of yet, little has been done to specifically understand how EI relates to SC, but studies have linked EI with safety (Arnau-

Sabatés, Sala-Roca, & Jariot-Garcia, 2012; Lu & Kuo, 2016) and other aspects of citizenship participation such as organizational citizenship behavior (Chin, Anantharaman, & Tong, 2011; Ng, Ke, & Raymond, 2014).

To the authors' knowledge, no research has been conducted to evaluate the relationship between military aviators' EI and SC. However, research has demonstrated a relationship between EI and organizational citizenship behaviors (Ahmadzadeh Mashinchi, 2011; Chin et al., 2011; Ng et al., 2014) For instance, Ng et al. (2014) concluded that EI was closely associated with organizational citizenship behaviors among nurses, while Chin et al. (2011) determined that EI "had a positive and significant relationship with the dimensions of organizational citizenship behavior" within manufacturing sectors. These results seem to indicate the possibility of a positive relationship between EI and SC as well.

Using the understanding of EI as a "as a personality trait at the lower levels of personality taxonomies" (K. Petrides et al., 2007) additional past research findings may be applied that have linked personality traits to safety-related attitudes within motor traffic safety (Chen, 2009; Ulleberg & Rundmo, 2003). This research seeks to investigate the relationship between EI and SC among Army aviators to better understand how EI associates with an individual's SC related behavior. A secondary outcome was to determine what facets of EI are most closely related to SC behaviors.

Methods

Participants

Twenty-nine (29) United States Army aviators from two Army aviation battalions were participants in this study. Pilots from a representative range of experience were

selected to participate (150-5000+ hrs) Participants were between 24 and 44 years old (\bar{x} = 32.6, s = 5.1). Of the participants, the majority were male (96.6%). The survey included both fixed-wing, airplane (n = 20) and rotary-wing, helicopter (n = 9) pilots. Participants were generally white (89.7%), married (82.8%), and had completed at least some college (96.6%) (Table 1).

Table 4: Participant Descriptive Statistics (n=29)

Characteristic		Frequency (n)	Proportion (%)	Cumulative (%)
Age	24-30	11	37.9%	37.9%
	31-37	13	44.8%	82.8%
	38-44	5	17.2%	100.0%
Gender	Male	28	96.6%	96.6%
Race	White	26	89.7%	89.7%
	Other ¹	3	10.3%	100.0%
Marital Status	Single	2	6.9%	6.9%
	Married	24	82.8%	89.7%
	Divorced/Separated	3	10.3%	100.0%
Education Level	Associate's Degree or less	3	10.3%	10.3%
	Some College	11	37.9%	48.3%
	Bachelor's Degree	12	41.4%	89.7%
	Master's Degree	3	10.3%	100.0%
Aircraft Type	Rotary-Wing	9	31.0%	31.0%
	Fixed-Wing	20	69.0%	100.0%
Flight Time	0-200 hrs	2	6.9%	6.9%
	200-500 hrs	7	24.1%	31.0%
	500-1000 hrs	5	17.2%	48.3%
	1000-2000 hrs	8	27.6%	75.9%
	2000+ hrs	7	24.1%	100.0%
Pilot in Command	Yes	18	62.1%	62.1%
	No	11	37.9%	100.0%

¹ Includes persons of Black/ African American, Hispanic/Latin/Spanish,

Assessments

Demographic Characteristics Questionnaire: This portion of the survey consisted of 14 items for the collection of specific individual data such as age, gender, marital status, educational level, flight time, etc. (Table 1)

Trait Emotional Intelligence (TEIQue): TEIQue is a widely utilized and validated tool used to evaluate an individual's trait EI (K. Petrides & Furnham, 2003). This questionnaire is composed of 153 items that evaluate an individual's EI based upon the four factors and 15 facets. This serves as a self-assessment metric and is composed of verbally-anchored 7-point Likert-scale type questions (ranging from "1= Completely Disagree" to "7= Completely Agree").

Safety Citizenship: Willis et al. (2012) developed this survey metric as a 22-item questionnaire to assess individual perception of personal SC as well as organizational safety climate, and occupational unsafe event exposure. For the purposes of this study, the survey instrument only utilized eight (8) SC related items were used assess aviator SC. The items are formatted using a similar 7-point Likert scale from "1= Strongly Disagree" to "7= Strongly Agree".

Data Collection Process

The assessment metrics were compiled together as one survey tool using Qualtrics^{®XM} Online Survey Software (Qualtrics, Provo, UT). The survey was distributed to Army aviators at two separate military installations located in the continental United States. Participants were informed about the specifics of the research study and were made

aware of the anonymous nature of their participation. Every participant provided signed informed consent as approved by the institutional review board.

Statistical Analysis

All survey responses were compiled and exported for further analysis. The TEIQue questionnaire responses were evaluated using the online scoring program provided by the London Psychometrics Laboratory (LPL) at psychometriclab.com (accessed 2020, LPL, London, UK). This provided detailed scores for each aviator for all EI factors, facets, and the combined global EI scores. The SC survey responses were evaluated using a simple summation of each aviator's responses. Minitab® (v19, Minitab, LLC, State College, PA) was used for all analysis. For simple linear regression, the independent variable was the global EI score and the dependent variable was SC. After simple linear regression, the data were evaluated using stepwise backward elimination multiple linear regression, which included the 15 EI facets as independent variables. The level of significance was set at $\alpha = 0.05$.

Results

Total EI accounted for 34.04% of the variability in SC when using simple linear regression (Table 4). The resulting regression equation was:

$$SC = -17 + 11.25 \text{ Global EI} \quad \text{Equation 1}$$

Using this, every unit increase of EI total score resulted in a 11.25 unit increase in individual SC. This model was significant with ($p = 0.001$, Table 2).

The stepwise regression analysis of the data showed that the model with SC as the dependent variable and EI facets as the independent variables accounted for 49.65% of the variation in SC. The resulting regression equation was:

$$SC = -5.3 + 7.92 \textit{Self Esteem} - 8.83 \textit{Optimism} + 12.09 \textit{Adaptability} \quad \text{Equation 2}$$

This equation indicated a positive association between SC and *Self Esteem* ($\beta = 7.92$) and *Adaptability* ($\beta = 12.09$) but a negative association between SC and *Optimism* ($\beta = - 8.83$). The independent variables were significant with *Adaptability* ($p < 0.001$), *Optimism* ($p = 0.007$), and *Self Esteem* ($p = 0.003$).

Table 2: Simple Linear and Stepwise Regression Results

Regression	Variable	β	F- Value	P-Value	S	Adj. R ²
Simple Linear	Global EI	11.25	F (1,28) = 15.45	0.001	7.84	0.3404
Stepwise Multiple Linear	Self Esteem	7.92	F (1, 25) = 10.75	0.003	7.84	0.4965
	Optimism	-8.83	F (1, 25) = 8.71	0.007		
	Adaptability	12.09	F (1,25) = 23.91	< 0.001		

Discussion

The purpose of this study was to investigate the relationship between SC and EI to better understand if EI contributed to an individual Army aviator's SC. In particular, the goal was to determine if an aviator's TEIQue could influence his/her SC behavior. The results indicated a positive association between global EI score and SC ($p = 0.001$), demonstrating that EI can be used to predict SC. Practically, this means that individuals with higher global EI scores would have a higher SC. These findings align with Lu and Kuo (2016) who found that EI has a positive association with safety behaviors; suggesting

that high EI would generate higher safety standards. Arnau-Sabatés et al. (2012) noted a similar relationship between EI and risk taking behavior among vehicle drivers, with high EI limiting a person's propensity to engage in risky behavior.

Similarly, the results indicated a positive relationship between SC and both *Adaptability* ($\beta = 12.09$) and *Self Esteem* ($\beta = 7.92$), but a negative relationship with *Optimism* ($\beta = -8.83$). Pilots with higher levels of *Self Esteem* and *Adaptability* seemed to be more inclined to pursue SC related behaviors, while those with high *Optimism* scores did not.

To further understand the impact of all 15 EI facets, a multiple linear regression was conducted without elimination of non-significant factors. This indicated that *Adaptability* ($\beta = 14.02$; $p = 0.03$) and *Optimism* ($\beta = -14.11$; $p = 0.05$) were most significant (Figure 1). Marginally significant facets were *Emotion Regulation* ($\beta = -8.50$; $p = 0.12$) and *Self Esteem* ($\beta = 10.78$; $p = 0.15$). *Adaptability* consistently appeared to have the highest positive association with SC which is consistent with previous research that has noted a similar relationship between individual adaptability and performance, particularly in jobs with higher stress and/or complexity (Bernard, 2018; Pulakos, Arad, Donovan, & Plamondon, 2000). Yet, no research has evaluated the relationship between EI facets and SC related behaviors as was done in this study.

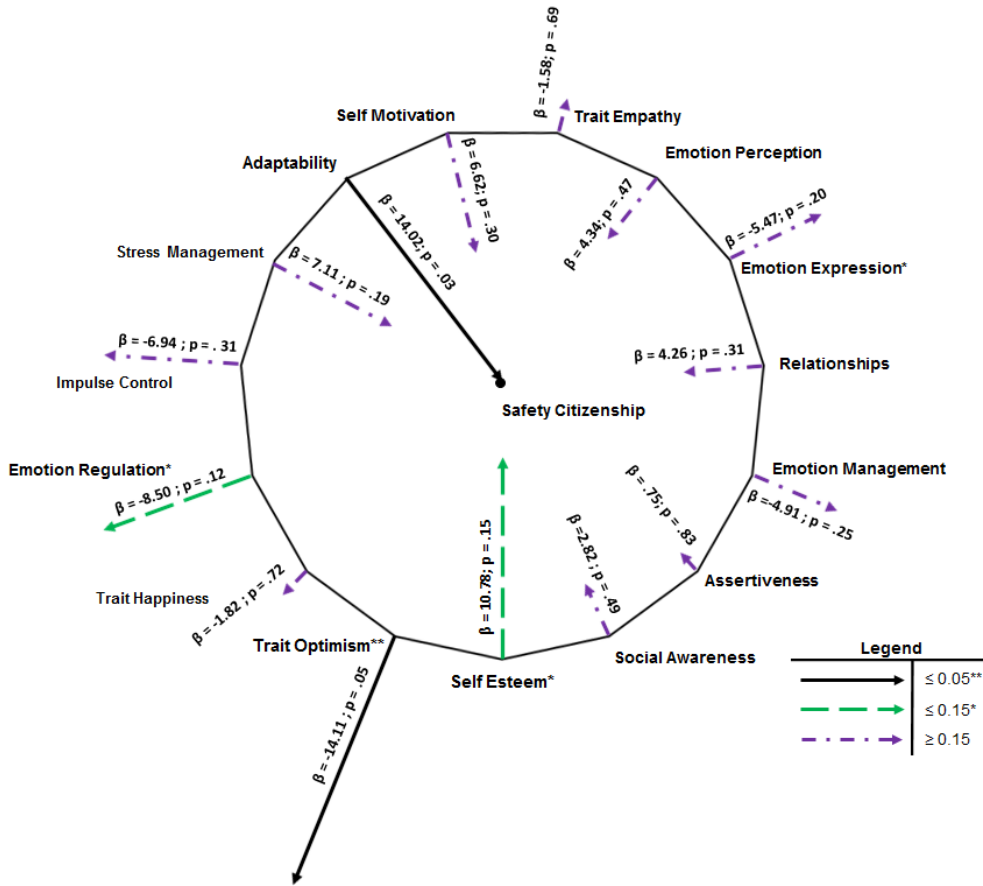


Figure 2: Regression coefficients (β -value) compared across all 15 EI Facets

Of note, further analysis indicated that aviators with more than 1000-hrs of flight time scored higher on the SC behaviors questionnaire. Likewise, individuals who identified as Pilot in Command (PC) indicated higher SC scores than non-pilot in command individuals. This seems to indicate that persons with higher levels of responsibility are more inclined to present SC related tendencies. This aligns with the findings of Ng et al. (2014) who found that work locus of control, or the degree in which one feels in control of their work environment, appeared to relate to organizational citizenship behaviors and EI among nurses.

The results of this study clearly indicated a relationship between EI and SC among Army aviators. This has potentially important implications for efforts to increase safety in aviation organizations. For example, improved understanding of how *Adaptability* and *Self Esteem* impact pilot safety citizenship behaviors could lead to key improvements in the pilot selection process through improved screening metrics. Likewise, further knowledge of EI's relationship to safety citizenship behaviors could generate improvements in pilot training focused on increasing EI traits that benefit SC behaviors while decreasing individual trait tendencies that limit individual safety citizenship behaviors.

The present research has a limited sample size composed of a specific subgroup of Army pilots. Military pilots generally receive more training and annual flight hours than most of their general aviation counterparts (Shappell & Wiegmann, 2004) and, therefore, may not accurately represent the entirety of the aviation community. Future analysis of a larger pilot population including general aviation and commercial pilots should be conducted to further investigate the relationship between EI and SC within the greater aviation community. The results of the study indicate that *Optimism* has a negative association with SC. Future studies should evaluate this relationship in order to understand why *Optimism* might be negatively associated with safety citizenship in Army aviators. Finally, future research should evaluate training methods focused on improving individual *Adaptability* and *Self-Esteem* for implementation in an aviation context.

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CHAPTER 4

SAFETY CITIZENSHIP, SAFETY ATTITUDE, AND PEER-ASSESSED CRM

Abstract

The purpose of this study was to develop an understanding of the relationship between safety citizenship, safety attitude, and peer-assessed performance ratings among United States Army aviators. The study includes analyses of survey responses from 30 individual aviators. Stepwise regression analysis was performed to evaluate the relationship between safety citizenship, aviation safety attitude, and peer-assessed pilot crew resource management. Results indicate a significant association [$F(1, 25) = 9.00$; $p = 0.006$] between safety citizenship and peer-assessed pilot crew resource management. Increased safety citizenship can increase peer-assessment of a pilot's crew resource management performance. Implementation of pilot selection and training methods, which account for these traits could result in increased flight safety and reduced aviation incidents.

Introduction

Flight is an inherently dangerous pursuit; even more so for military pilots who must balance highly complex requirements while flying an aircraft (Harding & Goosey, 2019). To compensate for these challenges, the Army requires multiple pilots to operate many of the aircraft in the fleet (Army, 2011). The multi-crew cockpit provides the opportunity for pilots to distribute workload in order to make decisions and maintain

situational awareness through the use of crew coordination or CRM techniques (Katz & Grubb, 2003). CRM was developed to reduce human-error in cockpit interaction (Helmreich et al., 1999). It encompasses the interpersonal skills involved in aircrew interaction during flight including traits such as: communication, leadership, situational awareness, and decision-making (JARTEL, 2002). Used effectively, these techniques lead to increased teamwork within the cockpit and increased aircrew performance (Salas, Fowlkes, Stout, Milanovich, & Prince, 1999). At its core, however, CRM requires that participants have an appropriate level of motivation to function together as a crew. Concern for safety often provides sufficient incentive.

Safety citizenship encompasses the discretionary behaviors that are not directly recognized in a formal reward system but that, in the aggregate, promote effective organizational function (Didla et al., 2009). These behaviors focus on improving the safety performance of others and the overall safety of organization as a whole (Hofmann et al., 2003). Safety citizenship behaviors include actions such as taking initiative to improve safety policy and volunteering for safety programs or activities (Finley et al., 2015). Therefore, persons with a high safety citizenship orientation may be more actively concerned with the well-being of their co-workers. In contrast, safety attitude refers to an individual's "motivational predisposition" towards safety and safety related issues, and does not necessarily account for their concern for other's safety (FAA, 2016). Nevertheless, a pilot's willingness to accept risk by placing the aircraft in dangerous situations has a direct impact on the overall safety of the aircrew (David R Hunter, 2002; O'Hare, 1990). So, it may be inferred that pilots with appropriate safety attitudes will be

more inclined to take actions that avoid unnecessary danger, leading to increased safety and reduced aviation incident rates.

To the authors' knowledge, no research has been conducted to evaluate the relationship between aviator's safety citizenship, safety attitude, and CRM performance. However, some research has indicated a link between safety attitude and flight performance. Sexton and Klinect (2001) found that aircrews with high safety culture caught more of their errors and were less likely to have undesirable aircraft stats than crews with low safety culture. Wetmore and Lu (2006) found that pilots with hazardous attitudes (low safety attitude) were less adept at evaluating risk, making decisions, and utilizing all cockpit resources—three critical CRM skills. This study sought to investigate the relationship between peer-assessed CRM performance, safety citizenship, and safety attitude among aviators to better understand how EI associates with an individual's safety related tendencies and behaviors.

Methods

Participants

United States Army aviators (n=30) from two Army aviation battalions participated in this study. The participants were between 24 and 44 years old ($\bar{x} = 32.5$, $s = 5.0$) and a wide range of flight experience (150-5000+ hrs). The survey included both fixed-wing (n = 20) and rotary-wing (n = 10) pilots. Participants were primarily male (96.7%), white (86.7%), married (83.3%), and had completed at least some college (96.7%) (Table 1).

Assessments

The demographic characteristics questionnaire consisted of 14 items for the collection of specific individual data such as age, ethnicity, gender, marital status, educational level, flight time, etc. Safety citizenship was evaluated using the eight items from a survey metric developed by Willis et al. (2012). The items are formatted using a 7-point Likert-type scale from “1= Strongly Disagree” to “7= Strongly Agree”. Safety Attitude was evaluated using the Aviation Safety Attitude Scale (ASAS), a 27-item scale developed by David Hunter (1995). This scale divides SA into three sub-categories: self-confidence, safety orientation, risk orientation (David R. Hunter, 2005). The items are formatted using a 5-point Likert-type scale with “1= Strongly Disagree” and “5= Strongly Agree”. CRM performance was evaluated using the Non-Technical Skills (NOTECHs) metric developed to evaluate pilots within the European Union (JARTEL, 2002). This metric is composed of 15 items formatted using a 5-point Likert-type scale with “1= Very Poor” and “5 =Very Good”. The surveys were distributed to Army pilots at two separate military installations located in the continental United States. Participants were informed about the specifics of the research study and were made aware of the anonymous nature of their participation. Every participant signed an informed consent form in accordance with the institutional review board requirements.

Statistical Analysis

The ASAS and safety citizenship survey responses were evaluated using a simple summation of each aviator’s Likert scale responses. CRM performance scores were calculated using pilots average peer-evaluation score (Table 1).

Table 5: Pilot Questionnaire Response Statistics

Construct (Range)	Mean	SD	Median	Response Range
Aviation Safety Attitude (27-135)	85.6	7.22	84	73-103
Self-Confidence (14-70)	50.2	5.88	50	41-65
Risk Orientation (8-40)	17.43	4.14	17	11-26
Safety Orientation (5-25)	17.97	1.80	18	15-21
Safety Citizenship (8-56)	41.57	9.33	41	21-56

SD = Standard Deviation

Statistical analysis was conducted in multiple steps in order to isolate factor or sub-factor of most significance. First, a simple regression was conducted using peer-assessed performance as the dependent variable and global safety attitude and safety citizenship as independent variables. Next, the data were evaluated using safety citizenship and safety attitude's three sub-components: risk orientation, safety orientation, self-confidence as independent variables. Finally, the regression variables were reduced following a stepwise reduction technique to determine the most closely associated variable.

Results

Global safety attitude and safety citizenship accounted for 21.05% ($r = 0.2105$) of the variability in peer-assessed CRM. The model was significant ($p = 0.022$) (Table 2).

$$CRM = 34.5 + 0.113 SA + 0.383 SC$$

Equation 3

Inclusion of self-confidence, safety orientation (SO), and risk orientation (RO) yielded a marginally significant model ($p = 0.062$) that accounted for 20.03% of the variability.

$$CRM = 26.1 - 0.078 \textit{Self Conf.} - 0.171 \textit{RO} + 1.098 \textit{SO} + 0.504 \textit{SC} \quad \text{Equation 4}$$

Removing the nonsignificant variables (self-confidence and risk orientation) a more significant model ($p = 0.010$) was developed that accounted for 26.05% ($r = 0.2605$) of the variance.

$$CRM = 22.1 + 1.059 \textit{SO} + 0.453 \textit{SC} \quad \text{Equation 5}$$

Safety citizenship [$F(1, 25) = 9.93$; $p = 0.004$] was most highly associated with peer-assessed CRM performance therefore, a final regression model was developed using safety citizenship as the sole independent variable. The final model accounted for 23.52% ($r = 0.2352$) of variance with safety citizenship [$F(1, 25) = 9.00$; $p = 0.006$].

$$CRM \textit{ Score} = 41.90 + 0.437 \textit{SC} \quad \text{Equation 6}$$

Table 2: Stepwise Regression Results comparing Safety Attitude and sub-factors with Safety Citizenship as predictors of peer-assessed CRM.

Equation 3: Multiple Linear Regression of with Global Safety Attitude and Safety Citizenship						
Variable	β	<i>F</i> Statistic (<i>df</i>)	<i>P</i> -Value	<i>S</i>	<i>Adj. R</i> ²	<i>Regression P</i> -Value
Safety Attitude	0.113	F (1,24) = 0.22	0.644	7.42	0.2105	0.022*
Safety Citizenship	0.383	F(1,24) = 4.18	0.052			
Equation 4: Multiple Linear Regression with inclusion of Safety Attitude sub-factors						
Self-Confidence	-0.078	F (1, 22) = 0.05	0.832	7.46	0.2003	0.062
Risk Orientation	-0.171	F (1, 22) = 0.18	0.678			
Safety Orientation	1.098	F (1, 22) = 1.35	0.257			
Safety Citizenship	0.504	F (1, 22) = 5.30	0.031*			
Equation 5: Multiple Linear Regression with Safety Orientation and Safety Citizenship						
Safety Orientation	1.059	F (1, 24) = 1.86	0.186	7.18	0.2605	0.010*
Safety Citizenship	0.453	F (1, 24) = 9.93	0.004*			
Equation 6: Simple Linear Regression with Safety Citizenship						
Safety Citizenship	0.437	F (1, 25) = 9.00	0.006**	7.30	0.2352	0.006**

β = Regression Coefficient

S = Standard Error of Regression

* $p < 0.05$

** $p < 0.01$

Discussion

The purpose of this study was to investigate the relationship between Army pilots' safety inclinations and their peers' assessment of their CRM performance. Initial results indicated a weak association between aviation safety attitude and peer-assessed performance so further analysis was conducted to determine if the sub-components (self-confidence, risk orientation, and safety orientation) had a stronger association. Of the three, none were significant while safety citizenship ($F(1, 24) = 9.93; p = 0.004$) demonstrated an association with peer-assessed CRM performance. When implemented as the sole independent variable, safety citizenship ($F(1, 25) = 9.00; p = 0.006$) was clearly a predictor of peer-assessed CRM performance. Practically, the positive linear relationship indicates that pilots with high safety citizenship tendencies will have higher CRM performance ratings. However, the low β -value ($\beta = 0.437$) seems to indicate that safety citizenship plays a limited role in the method that pilots assess each other's CRM performance. One possibility is that a pilot's flight experience could play a large role in the peer assessments as pilots with more flight experience tend towards better performance (Causse, Dehais, & Pastor, 2011; Martinussen, 1996). An one-way ANOVA revealed that pilots with 1,000 or more flight hours were consistently rated higher than those with less than 1,000 hours ($p = 0.001$). Inclusion of flight time as a categorical predictor in regression analysis generated a model that accounted for 47.21% of variation. However, in this model, safety orientation [$F(1, 23) = 5.54; p = 0.027$] was more significant than safety citizenship [$F(1, 23) = 2.90; p = .102$]. Future research should be conducted with a larger sample size ($n > 100$) to further investigate this relationship.

This study limited in scope due to the selection of only U.S. Army pilots, a small, distinct portion of the aviation community. Military pilots tend to receive more training than their civilian counterparts (Shappell & Wiegmann, 2004) and military members are known to have a unique organizational culture (Soeters, Winslow, & Weibull, 2006) and, therefore, may not represent the aviation community as a whole. Future studies should focus on the inclusion of a larger cross-section of the aviation community including pilots from civilian commercial and general aviation backgrounds.

The results of this study indicate a relationship between safety citizenship and peer-performance evaluations among U.S. Army aviators. This has important implications for efforts to improve flight safety in aviation organizations. Increased emphasis on safety citizenship tendencies in pilot selection and training could lead to improved CRM performance and lower human error-related incidents. Recent research has demonstrated a relationship between emotional intelligence, particularly the sub-facets of self-esteem and adaptability, and safety citizenship among Army pilots (Dugger & McCrory, 2021). As such, future research should be conducted to develop selection and training methodologies aimed at increasing pilot adaptability and self-esteem to improve CRM and flight safety.

CHAPTER 5

TRAIT EMOTIONAL INTELLIGENCE AMONG AMERICAN PILOTS: A
COMPARISON WITH THE GENERAL POPULATION

Contribution of Authors and Co-Authors

Manuscript in Chapter 5

Author: Zachary T. Dugger

Contributions: Collected TEIQue data on pilots, conducted initial statistical analysis, generated figures, and wrote the manuscript in preparation for submission.

Co-Author: Nicole Carnegie

Contributions: Provided statistical insights and edited SAS code.

Co-Author: Bernadette McCrory

Contributions: Provided key insights throughout the data collection, statistical analysis, and manuscript writing processes.

Co-Author: K.V. Petrides

Contributions: Provided TEIQue data for all control subjects and key insights during data interpretation and manuscript writing process.

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Abstract

Trait emotional intelligence (EI) has been a topic of research interest over the past two decades. Interestingly, relatively few studies have evaluated trait EI within an aviation context. The present study investigated the differences in trait EI between pilots and the general population (n=132) in the United States using the Trait Emotional Intelligence Questionnaire. Comparison of both groups revealed significant differences with pilots scoring consistently lower than their matched counterparts in *global trait EI* [F (1,125) = 7.90; p = 0.006], *Well Being* [F (1,125) = 6.33; p = .0132], *Emotionality* [F (1,125) = 6.16; p =0.0144], and *Sociability* [F (1, 125) = 6.16; p = 0.144]. Thus, there were specific differences in trait EI between pilots and the general population and pilots demonstrating more muted emotion-related tendencies.

Introduction

Trait emotional intelligence, also known as trait EI or trait emotional self-efficacy, deals with the way an individual perceives their emotional world and is composed of traits located at the lower levels of personality hierarchies (K. Petrides et al., 2016). Unlike many of the popularized ability-based EI models (e.g. Goleman, 1996; Salovey & Mayer, 1990), trait EI encompasses “behavioral tendencies and self-perceived abilities,” which indicate an individual’s general dispositions and are more accurately assessed through self-report methods (K. Petrides & Furnham, 2001). Since its inception, trait EI has been the focus of much research emphasis, associated with prosocial behaviors (Frederickson et al., 2012), leadership (Walter, Cole, & Humphrey, 2011), and

career selection (Sánchez-Ruiz, Pérez-González, & Petrides, 2010). The conceptualization of trait EI as a portion of the personality trait taxonomy gives credence to its connection to mainstream personality research that is particularly beneficial for novel and exploratory research (K. Petrides et al., 2016; Sánchez-Ruiz et al., 2010).

Despite its increasing popularity among researchers, very limited research to evaluated trait EI within an aviation context (Dugger & McCrory, 2021; Geetu & Rycroft, 2009). Trait EI has been associated with pilot training performance (Geetu & Rycroft, 2009) and self-reported safety citizenship behaviors (Dugger & McCrory, 2021). In stark contrast, personality traits have long been evaluated within aviation research and have been associated with crew coordination (Chidester et al., 1991), training success (Campbell, Castaneda, & Pulos, 2009), and pilot selection (Goeters, Timmermann, & Maschke, 1993). Pilots appear to have high extraversion scores (particularly evident in facets such as assertiveness, activity, and excitement seeking) when compared to population norms (Grice & Katz, 2007). Pilots also appear to have lower neuroticism scores than their non-pilot peers, indicating an ability to handle fear and anxiety and stress (Callister, King, Retzlaff, & Marsh, 1999; Gao & Kong, 2016). Based upon these findings, this study investigated possible differences in trait EI between pilots and the general population in the United States. Given the current absence of trait EI research within aviation, this research explored trait EI using previous research regarding personality traits (Callister et al., 1999; Gao & Kong, 2016; Grice & Katz, 2007) to hypothesize that pilots would exhibit significantly different trait EI than the general American population.

Methods

Participants

Forty-four (44) pilots participated in this IRB approved study. Participants were between 24 and 67 years old ($\bar{x} = 34.6$, $s = 8.87$) and had a wide range of flight experience (150-5000+ hrs). The cross-sectional sample included both fixed-wing ($n = 29$) and rotary-wing ($n = 15$) pilots. Participants were primarily male (93.2%), white (90.9%), and had completed at least some college (97.7%). Of the participants, 93.2% served as a military aircrew member. Eligibility for the survey was based on current flight status and pilot qualification (i.e. FAA license and/or military qualification).

The control group was drawn from the TEIQue US normative database ($n = 531$) and were matched based upon age (± 3 yrs), gender, and ethnicity based upon a literature-based methodology of applicable factors known to affect trait EI (Gökçen, Furnham, Mavroveli, & Petrides, 2014; K. Petrides & Furnham, 2006; K. Petrides et al., 2007). Additionally, participants were matched, when able (73%), by education level (± 1 level) to reduce possible confounding due to education-level differences (Perera & DiGiacomo, 2013). The control sample was matched to the pilot sample at a 2:1 ratio resulting in 88 non-pilot control subjects for a total sample of 132. Additional factors of interest were English fluency and employment (Table 1).

Table 6: Matching Criteria and Pertinent Participant Criteria

	Characteristic	Proportion (%)	
		Pilot	Control
Age ^M	20-29	29.5	27.3
	30-39	52.3	54.5
	40-49	11.4	11.4
	50-59	2.3	2.3
	60-69	4.5	4.5
Gender ^M	Male	93.2	93.2
	Female	6.8	6.8
Ethnicity ^M	White	90.9	90.9
	Other ¹	9.1	9.1
Education Level ^M	Associate's Degree or less	31.8	29.5
	Bachelor's Degree	59.1	37.5
	Graduate Degree	9.1	33.0
Employment Type	Full-time	95.5	86.4
	Part-time	--	2.3
	Student	4.5	6.8
	Other ²	--	4.5
English Fluency	Completely articulate	100	93.2
	Mostly articulate	--	6.8

^M Matching Criteria

¹ Includes persons of Black/African American, Hispanic/Latin/Spanish, and Mixed Race/Ethnicity

² Includes unemployed and unidentified employment status

Measures

The TEIQue v. 1.50 was used to evaluate trait EI (K. Petrides, 2009). This 153-item inventory covers four factors and 15 facets that comprise trait EI (Table 2) and has demonstrated satisfactory psychometric properties in numerous studies (e.g. Freudenthaler, Neubauer, Gabler, Scherl, & Rindermann, 2008; K. Petrides, 2009). The items are formatted in a 7-point Likert-type scale from “1= Completely Disagree” to “7= Completely Agree.” Internal reliability analysis indicated robust alpha values (> .70) for global trait EI and all four factors.

Table 7: Trait EI Factor and Facet definitions and descriptive statistics by study group

Factors/Facets	High Scorers assess themselves as...	Pilots (n=44)		Controls (n=88)	
		Mean (SD)	α	Mean (SD)	α
Well Being		5.24 (0.47)	0.77	5.94(0.54)	0.73
Self Esteem	... confident with a positive view of themselves.				
Happiness	... cheerful and satisfied with themselves.				
Optimism	... likely to "look on the bright side."				
Self-control		5.09 (0.65)	0.75	5.25(0.71)	0.76
Emotion Control	... able to control their own emotions.				
Stress Management	... able to regulate stress and withstand pressure.				
Impulsiveness	... reflective, less likely to give in to urges.				
Emotionality		5.17 (0.70)	0.84	5.52(0.59)	0.78
Emotion Perception Index	... clear about their own and other's feelings.				
Emotion Expression	... fluent in communicating their emotions to others.				
Relationships	... capable of fulfilling personal relationships.				
Empathy	... able to take someone else's perspective.				
Sociability		5.16 (0.50)	0.80	5.38(0.57)	0.75
Social Awareness	... networkers with excellent social skills.				
Emotion Management	... able to influence other's feelings.				
Assertiveness	... forthright and frank, willing to stand up for rights and beliefs.				
Adaptability*	... flexible and willing to adapt to new environments and conditions.				
Self-motivation*	... driven, determined, and able to persevere.				
Global trait EI		5.70 (0.56)	0.90	5.49(0.45)	0.88

SD = Standard deviation

α = Cronbach's Alpha measure of internal consistency.

*Denotes facets unrelated to four trait EI factors. Both facets are accounted for though global trait EI score.

Analyses

Statistical analyses were performed using SAS software (Version 9.4, SAS Institute, Inc, Cary, North Carolina). The level of significance was set at $\alpha = 0.05$ (two-tailed). Bonferroni adjustments were assessed to ensure the 95% confidence intervals for the estimates of study group effects matched the significance levels in the corresponding test. Generalized linear regression models were developed to analyze the fixed effects of study group (pilot v. control), age, gender, ethnicity, and education level on global trait EI as well as the four factors: Well Being, Self-Control, Emotionality, and Sociability.

Ethnicity was dichotomized and treated as a binary measure with white (0) and all other ethnicities (1). Education level was considered on a three-level basis with Associate's degree and less (0), Bachelor's degree (1), and all graduate degrees (2). Since age, gender, ethnicity, and education level were utilized in the matching process, interaction effects were not evaluated.

Ethics

This study was approved by the institutional review board and all participants provided informed consent prior to participating.

Results

The generalized linear model indicated differences between study groups in Global Trait EI scores [F (1,125) = 7.90; p = 0.006], Well Being [F (1,125) = 6.33; p = .0132], Emotionality [F (1,125) = 6.16; p = 0.0144], and Sociability [F (1, 125) = 6.16; p = 0.144]. In contrast, no significant difference was identified based upon Self-Control [F (1, 125) = 1.04; p = 0.309]. (Table 3). Pilots exhibited lower least squared mean scores in global trait EI, Well Being, Emotionality, Sociability.

Table 3: TEIQue scores by study group

Measure	LS Mean	SE	F statistic (df)	Bonferroni t-value	P-value
Global TEIQue					
Pilot (n=44)	5.44	(0.12)	F (1, 125) = 7.90	$t_{125} = 2.81$	0.006**
Control (n=88)	5.69	(0.11)			
Well Being					
Pilot (n=44)	5.99	(0.14)	F (1,125) = 6.33	$t_{125} = 2.52$	0.0132*
Control (n=88)	6.24	(0.12)			
Self Control					
Pilot (n=44)	5.37	(0.17)	F (1,125) = 1.04	$t_{125} = 31.58$	0.3088
Control (n=88)	5.49	(0.15)			
Emotionality					
Pilot (n=44)	5.44	(0.17)	F (1,125) = 6.16	$t_{125} = 2.48$	0.0144*
Control (n=88)	5.74	(0.15)			
Sociability					
Pilot (n=44)	5.05	(0.17)	F (1, 125) = 6.16	$t_{125} = 2.48$	0.0144*
Control (n=88)	5.34	(0.14)			

* p < 0.05

** p < 0.01

Of the secondary measures, only ethnicity was identified as a significant factor in regard to Global Trait EI [F (1,125) = 5.63; p = 0.019], Well Being [F (1,125) = 5.85; p = 0.017], and Self-control [F (1,125) = 7.90; p = 0.009] (Table 4). In all cases, white participants had lower least squared mean scores with less standard error than their non-white counterparts.

Table 4: TEIQue scores by ethnicity

Measure	LS Mean	SE	F statistic (df)	Bonferroni t-value	P-value
Global TEIQue					
White	5.40	(0.09)	F (1, 125) = 5.63	$t_{125} = 2.37$	0.019*
Other ¹	5.73	(0.16)			
Well Being					
White	5.92	(0.10)	F (1,125) = 5.85	$t_{125} = 2.42$	0.017*
Other ¹	6.31	(0.18)			
Self Control					
White	5.16	(0.12)	F (1,125) = 6.97	$t_{125} = 2.64$	0.009**
Other ¹	5.69	(0.22)			
Emotionality					
White	5.48	(0.12)	F (1,125) = 1.29	$t_{125} = 1.14$	0.258
Other ¹	5.70	(0.22)			
Sociability					
White	5.11	(0.11)	F (1, 125) = 0.97	$t_{125} = 0.99$	0.326
Other ¹	5.29	(0.21)			

¹ Includes Black/African- American, Hispanic/Latin/Spanish, and Mixed Race/Ethnicity

* p < 0.05

** p < 0.01

Discussion

This comparative study was conducted to address the current lack of trait EI research within the aviation community by investigating the differences between pilots and the general American population. Pilots tend to have lower Global Trait EI, Well Being, Emotionality, and Sociability scores than their non-pilot counterparts. In general, individuals with high scores in these factors have a positive self-assessment (Well Being), are better at social interaction (Sociability), and can perceive and express

emotions and maintain close relationships (Emotionality) (K. Petrides, 2009). Initially, these findings appear to disagree with previous research in pilot personalities (e.g. Grice & Katz, 2007); however, though trait EI is a personality construct, it primarily deals with the emotion-related components of an individual's personality (Jolić-Marjanović & Altaras-Dimitrijević, 2014; K. Petrides et al., 2007). As such, the seemingly “muted” trait EI characteristics noted among pilots may be more easily understood as emotion-coping mechanisms oriented towards avoidance of negative thoughts or fears that distract or disturb, particularly during times of stress (Larsson & Hayward, 1990). In other words, instead of controlling their emotions, pilots seem to avoid any distracting thoughts that could lead to the development of negative emotion. Since emotional pressures can alter decision-making processes allowing irrational behavior (Causse, Dehais, Péran, Sabatini, & Pastor, 2013), pilots have the ability to keep emotions “in check” to maintain cognitive focus during flight.

Alternatively, pilots' lower trait EI scores could lie in the realm of organizational culture. Pilots have long been associated with a masculine culture that emphasizes aggressiveness, competition, performance orientation (Soeters & Boer, 2000). The aversion to emotion-related expression is no doubt aided by this culture that stresses the perception of invulnerability and resistance to human weaknesses (Helmreich & Davies, 2004). In practice, the pilot selection and training process likely produces pilots, both male and female, that fit within this culture. Longitudinal analysis of pilot trait EI scores over the duration of their training and early career years would likely yield significant insights into the effects of organizational culture on pilots' trait EI.

Moreover, results indicated that ethnicity was the only other significant factor among the two groups. White participants demonstrated lower mean scores and less variance in Global Trait EI, Well Being, and Self-control. This may be due to the relatively small proportion (9.1%) of participants from other ethnic backgrounds. Nonetheless, further analyses will be necessary to evaluate the relationship between trait EI and ethnicity within the aviation context.

Limitations

The present study was conducted with a relatively small sample of pilots (n=44). Therefore, analysis and conclusions were held at the factor level. Analyses at the facet-level will require further investigation with a larger sample group (n >100). Additionally, this study was conducted with a group of pilots that were predominantly White males with at least some military background. Military pilots tend to experience more rigorous training than their civilian counterparts (Shappell & Wiegmann, 2004) and serve within a very distinct organizational culture (Soeters et al., 2006). For these reasons, the findings may not be a complete representation or generalization of the entire aviation community. Future studies should seek to incorporate a more diverse sample of pilots (i.e. gender, ethnicity, education level, and military background).

Conclusion

Understanding the prevalent trait EI profiles of pilots has the potential to inform future pilot selection processes by helping to identify potential candidates. Aviation organizations may want to account for trait EI as a selection metric. The utility of personality inventories as selection tools has been discussed in-depth within aviation (e.g. Butcher, 2016; Carretta & Ree, 2003; King, 2014), but the emotion-related aspects of personality remain relatively unexplored. Further study of the relationship between trait EI and success within aviation career fields (i.e. training, career progression, stress management, etc.) can help to identify the trait EI factors and/or facets that are most beneficial to pilots. The present findings indicate that pilots tend towards more neutral trait EI factor scores; understanding what factors most closely associate with pilot performance will aid in the development of future pilot training and selection metrics.

The cross-sectional nature of this study precluded the assessment of the effects introductory training and organizational culture on pilot EI. Research has indicated that while personality, commonly considered a more static trait, plays a role in career selection, it may also be changed during times of intense training or social experiences (Jackson, Thoemmes, Jonkmann, Lüdtkke, & Trautwein, 2012). Longitudinal analysis will likely lend key insight into the relationship between training, culture, and the development of a pilot's trait EI profile. Such knowledge will help practitioners identify the aspects of pilot training and/or organizational culture that best equip pilots for aviation duty, ultimately leading to higher levels of safety and reduced aviation incidents.

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CHAPTER 6

PRINCIPAL COMPONENT ANALYSIS IN MCDM: AN EXERCISE IN PILOT
SELECTION

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Manuscript in Chapter 6

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Co-Author: Gage Halverson

Contributions: Designed and developed algorithm and associated code, conducted statistical analysis, generated figures, and assisted in manuscript preparation.

Co-Author: Bernadette McCrory

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Co-Author: David Claudio

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Assignment of criteria weights during group multi-criteria decision making (MCDM) processes is a challenging and time-consuming process often rife with subjectivity. This is particularly evident in hiring or personnel selection processes. This paper outlines a study conducted to evaluate the effectiveness of principal component analysis (PCA) as an objective weight assignment method to establish a rank order of United States Army pilots based upon their emotional intelligence, safety attitude, and safety citizenship scores. PCA results were compared to an algorithm tracking the rank order of pilots using every possible criteria weighting combination to test PCA's validity as a criteria weight assignment method. Regression analysis demonstrated strong correlation ($p < 0.000$) between the algorithm ranking results and PCA's ranking results, reinforcing PCA's validity as a quantitative approach to criteria weight assignment in group MCDM applications. Implications of this study include increased efficiency in group decision-making processes involving numerous criteria and reduced subjectivity in hiring and/or personnel selection processes.

Keywords: multi criteria decision making; principal component analysis; emotional intelligence; safety citizenship; safety attitude; pilot selection

Introduction:

One of the greatest challenges with multi criteria decision making is determining the best criteria to evaluate and then assigning an accurate weight to that criteria. This is particularly true when dealing with group decisions where it often difficult to establish a consensus among decision-makers (Dyer & Forman, 1992). The more criteria that are used to determine the “best” solution, the more complicated the decision becomes and the more complicated it is to collect the decision makers’ preferences and attribute values. A prime example of this is the difficulty of determining criteria and criteria weights during

the hiring or personnel selection process where decision-makers may struggle to gain consensus on criteria selections. Within an aviation context, pilots are often selected based upon prior experience (e.g., flight hours, years of experience, aircraft qualifications) and test competence (e.g., check ride performance) (Carretta & Ree, 2003). However, research has shown that other characteristics such as emotional intelligence and safety attitude may affect a pilot's ability to safely perform as a flight crewmember (Dai, Wang, Yang, & Wen, 2019; Geetu & Rycroft, 2009; Hunter, 2002). As such, it is important that this data be included in the pilot selection process but, in doing so, the number of criteria increases as well as the challenges associated with developing a timely consensus on criteria weights via traditional multiple criteria decision-making methods. In cases such as this, the best solution may be to leverage the benefits of the data dimension reduction.

Dimension Reduction

Across many fields of study, in recent years, there has been an increase in ability to collect data due to the capabilities of computers to interface with the outside world. This not only includes the interface between humans and computers via the internet but also includes the reduction in cost of sensors that interface with computers. With this increase of data collection methods, it becomes much too complex for humans to be able to visualize or even comprehend due to the large dimensionality of these growing datasets. In order to solve this problem, dimension reduction techniques have been developed to reduce the number of dimensions within a dataset while attempting to preserve as much information as possible. (Bunte, Biehl, & Hammer, 2012). From a

decision-making perspective, data reduction allows for an informed decision to be made with increased efficiency.

Over the years there have been many different dimension reduction methods and strategies developed to assist in evaluating large data sets including: Canonical Correlation Analysis (Shin, & Park, 2011), Linear Discriminant Analysis (Shin & Park, 2011), Data Envelopment Analysis (Zhu, 1998), and Principal Component Analysis (Zhu, 1998; Petroni & Braglia, 2000; Bro & Smilde, 2012).

Principal Component Analysis (PCA)

PCA is a multivariate statistical process that is used as a data reduction technique to identify variables that account for a large proportion of variance in a large data set (Zhu, 1998; Petroni & Braglia, 2000). By viewing multivariate problems as composed of multiple dimensions, PCA develops linear vectors that aim to account for the data's variability (Bro & Smilde, 2012).

PCA has become an increasingly popular analytical method largely due to its accessibility through common statistical computer programs (Petroni & Braglia, 2000). It has been proven as a large data multivariate analysis tool in numerous sectors including vendor and supply chain (Petroni & Braglia, 2000), chemometrics (Wold, Esbensen, & Geladi, 1987; Bro & Smilde, 2012), commercial airline industry (Adler & Golany, 2001), and decision-making (Zhu, 1998; Petroni & Braglia, 2000)

In decision-making contexts, PCA is used to reduce multiple variables into a smaller, more manageable number of variables or principal components. PCA is particularly beneficial to decision makers (DM)s because it does not require *a priori*

weight assignment or standardized units for all data and thereby reduces the subjectivity of the decision being made (Petroni & Braglia, 2000). PCA has also proven its utility in its ability to account for uncertainty in data, particularly when paired with kernel smoothing methods (Ning & You, 2018).

Little has been done to evaluate PCA as a large data decision-making tool. Zhu (1998) conducted a study to compare PCA with the outputs provided by data envelopment analysis process (DEA), a non-statistical efficiency technique, by analyzing real world data on Chinese cities to evaluate economic performance. His research indicated that both tests provided highly correlated results for each data set that was evaluated. To the authors' knowledge, no prior research has been conducted to evaluate PCA as a personnel selection tool or to specifically evaluate PCA's performance as a weight assignment method.

Psychological Indicators of Pilot Performance

Emotional Intelligence (EI) EI encompasses an array of individual traits that relate to a person's ability to engage others socially. Trait EI is evaluated based upon four individual factors composed of 15 different facets (K. Petrides, 2009). These factors and facets may be individually analyzed to determine individual relation to performance in certain tasks or situations. Of note, two facets, adaptability and self-motivation, are not specifically linked with a parent factor but are nevertheless seen as essential facets of a person's EI (Table 1).

Table 8: 4 Trait EI Factors and 15 Facets (adapted from Petrides, 2009)

Factors	Facets
Emotionality	Trait Empathy Emotion Perception Emotion Expression Relationships
Sociability	Assertiveness Emotion Management Social Awareness
Well-being	Self-esteem Trait Optimism Trait Happiness
Self-control	Emotion Regulation Impulsiveness Stress Management
Unassigned	Adaptability Self-Motivation

EI has been linked to pilot performance, particularly when related to flight training (Dai, Wang, Yang, & Wen, 2019; Geetu & Rycroft, 2009). For the purposes of this study, EI was evaluated using the Trait Emotional Intelligence Questionnaire (TEIQue) which is composed of 153 items using a 7-point likert scale (TEIQue; K. Petrides & Furnham, 2003).

Safety Attitude A pilot's willingness to accept risk and place an aircraft in hazardous situations has a significant impact their safety (Hunter, 2002; O'Hare, 1990). Therefore, the pilot's attitude towards safety and risk has an impact upon the safety of the aircraft and crew. Safety attitude among pilots is measured through the Aviation Safety Attitude Scale (ASAS) which is composed of 27-items with a 5-point Likert scale (ASAS; Hunter, 1995).

Safety Citizenship The concept of safety citizenship with an individual's attitude and tendencies toward actions that lead to, "improving the safety performance of others and the organization" (Didla, Mearns, & Flin, 2009). Individual safety citizenship was measured using 8-items developed by Willis, Brown and Prussia (2012) formatted with a 7-point Likert scale developed by Willis, Brown and Prussia (2012).

Purpose

The purpose of this study was to: 1) use PCA to assign criteria weights to determine the rank order of pilots based upon their emotional intelligence, safety attitude, and safety citizenship scores and 2) compare PCA's pilot selection results to an algorithm tracking the ranking of pilots using every possible criteria weighting combination in order to test the validity of PCA as a criteria weight assignment method.

Method

Data Collection

Data was collected by combining the three assessment metrics into one survey using Qualtrics Online Survey Software (Qualtrics, 2020). The survey was distributed to U.S. Army pilots at two separate military installations. In total, 29 responses were received and analyzed. The participants were between the ages of 24 and 44 years old and demonstrated a range of experience with flight times ranging from 150-5000+ hours of flight time.

Statistical Analysis

All survey responses were compiled via Qualtrics and exported for analysis. The TEIQue results provided scores for each participant's emotional intelligence facets and factors. For the purposes of the study, the four emotional intelligence factors were analyzed along with the two "unassigned" emotional intelligence facets: Self-Motivation and Adaptability. Safety attitude and safety citizenship scales provided total scores that were included in the dataset along with the emotional intelligence scores. The combination of these elements yielded 8 final criteria for evaluation.

Minitab® (v19, Minitab, LLC, State College, PA) was used to conduct PCA on the 8 criteria in order to determine appropriate principal components and weights. Following the methodology utilized by Zhu (1998), the principal components were developed and used in lieu of criteria and the proportion values were used as the criteria weights. The principal component weights were calculated using Equation 1 below. Note, the values within the principal component can be negative, within this paper an absolute value is to ensure the final summation is not negative. This is different from Zhu (1998), who used more complicated methods when principle components had both negative and positive values in the same principle component.

$$W_c = \left| \sum_{k=1}^n (P_k * C_{c,k}) \right| \quad (1)$$

Where,

W_c = Weight for criteria c

n = number of criteria in dataset

t = total number of pilots

PC_k = Principal Component k

P_k = Proportion for PC_k

$C_{c,k}$ = Component c in PC_k

$V_{c,t}$ = Rating for alternative t on criteria c

Once the principal components and associated weights had been determined, the final ranking of pilots was determined through Equation 2.

$$WS_t = \sum_{c=1}^n (W_c * V_{c,t}) \quad (2)$$

Where,

WS_t = Weighted Rating Sum for alternative t

Of note, all PCA evaluation was done under the assumption that a higher score in each area represents a more qualified pilot.

In order to fully evaluate PCA's weight assignment, an algorithm (Appendix A) was developed using the Python coding language to calculate and track all of the pilots' rankings through all possible criteria weighting combinations. In order to do this, matrix algebra was conducted using the following equation:

$$V * C_{i_1, \dots, i_c} = \text{matrix } O \quad (3)$$

Where,

$$V = \begin{bmatrix} V_{1,1} & \dots & V_{c,1} \\ \vdots & \ddots & \vdots \\ V_{1,t} & \dots & V_{c,t} \end{bmatrix}$$

$$C = \begin{bmatrix} W_1 \\ \vdots \\ W_c \end{bmatrix}$$

$$O = \begin{bmatrix} O_{1,1} & \cdots & O_{t,1} \\ \vdots & \ddots & \vdots \\ O_{1,p} & \cdots & O_{t,p} \end{bmatrix}$$

$O_{t,p}$ = Number of times alternative t was ranked p place

It is important to highlight that the algorithm repetitively conducts the multiplication of matrices V and C until every possible C matrix combination has been utilized. For every iteration of the multiplication process, the only portion to change in value is matrix C which is iterated over $\begin{bmatrix} 0 \\ \vdots \\ 0 \end{bmatrix}$ through $\begin{bmatrix} 4 \\ \vdots \\ 4 \end{bmatrix}$. Once the calculation iterations are completed, the final weighted sum for each alternative is calculated using:

$$\mathbf{S} = \begin{bmatrix} V_{1,1} & \cdots & V_{c,1} \\ \vdots & \ddots & \vdots \\ V_{1,t} & \cdots & V_{c,t} \end{bmatrix} * \begin{bmatrix} W_1 \\ \vdots \\ W_c \end{bmatrix} = \begin{bmatrix} S_1 \\ \vdots \\ S_t \end{bmatrix} \quad (4)$$

Where,

S = Weighted Rating Sum for all alternatives

S_t = Weighted Rating Sum for alternative t

Once the weighted rating sum has been calculated, the algorithm takes the weighted rating sum matrix and reorders the matrix from the highest score to lowest score. Then each alternative's rank is recorded within the O matrix. For example, if alternative 5 was ranked 2nd. The algorithm would increase the $O_{5,2}$ value by one within the O matrix. Once the O matrix has been reordered, the resulting matrix depicts how

many times each alternative achieved each possible rank over the course of all the different combinations of criteria weighting.

Time Complexity of algorithm:

Since computation speed is relative to other computers and coding languages, algorithms are compared using time complexity. Time complexity represents the number of times an algorithm executes a main statement and how that scaled over the sample size of the dataset. The algorithm that was written for this paper was a brute force method that tried every combination. Equation 5 below shows the number of different combinations of matrix C increases based on number of criteria and the range of criteria weights. Note, 2^n is the second most complex time complexed after $n!$.

$$C = d^n \quad (5)$$

Where,

d = Number different Criteria Weight Values

n = Number of criteria in dataset

C = Number of different combinations of matrix

Results

PCA

The results of the PCA of pilot selection criteria are depicted in table 2 below. The weights for each of the principal components were assigned using the proportion value for each principal component, therefore, PC1, which accounts for most of the variation within the dataset, was weighted at 0.564 and PC2 assigned a weight of 0.136.

Table 9: Principal Component Analysis for Pilot Selection criteria

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	
Proportion	0.564	0.136	0.098	0.066	0.055	0.03	0.029	0.024	
Cumulative	56.4%	69.9%	79.7%	86.3%	91.8%	94.8%	97.6%	100.0%	
Criteria	Weight								
ASAS	0.244	0.741	-0.015	0.343	-0.221	-0.444	-0.072	0.150	0.234
Safety Citizenship	0.350	0.439	0.331	-0.249	0.026	0.674	-0.165	-0.180	0.295
Motivation	0.380	-0.85	-0.422	-0.065	-0.436	0.286	0.002	0.606	0.128
Adaptability	0.375	-0.136	0.097	-0.693	-0.113	-0.503	-0.264	-0.125	0.135
Well Being	0.374	-0.327	-0.095	0.514	0.082	0.022	-0.622	-0.294	0.196
Self-Control	0.361	0.101	-0.606	-0.046	0.217	0.008	0.470	-0.471	0.167
Emotionality	0.340	-0.289	0.524	0.256	-0.404	-0.056	0.514	-0.175	0.197
Sociability	0.385	-0.076	0.228	0.064	0.729	-0.102	0.160	0.472	0.270

In order to obtain a criteria weight for each of the original criteria it was first necessary to determine the cumulative proportion of variation (C_M) within the data that was necessary for the decision making process. For this example, 95 % was determined to be an adequate C_M so only the first 6 principal components, which account for a cumulative of 98.4% of variation, were utilized for weight assignments. The final criteria weights were calculated by using the absolute value of the cross multiplication of the PC proportion value and the individual criteria values associated with that PC. Thus, $0.564 * 0.244 + 0.136 * .741 + 0.098 * -0.015 + 0.066 * 0.343 + 0.055 * -0.221 + 0.03 * -0.444 = 0.234$ (Table 2). To determine the final pilot ranking order, the criteria weights were multiplied by each individual pilot's scores. The resulting scores were then added together to determine the pilot's final score (Table 3).

Table 10: Pilot Rankings

	ASAS	Safety	Citizenship	Motivation	Adaptability	Well Being	Self-Control	Emotionality	Sociability	
Weights	0.234	0.295	0.128	0.135	0.196	0.167	0.197	0.270		
Pilot	Individual Values								Score	
1	3.41	7.00	4.90	4.67	5.56	4.74	4.73	5.43	8.40	
2	3.30	4.13	5.40	4.44	5.99	5.23	4.84	3.36	7.19	
3	3.00	4.88	5.30	4.33	5.99	5.54	5.98	5.48	8.16	
4	2.81	5.13	5.20	5.44	5.75	5.15	5.63	5.64	8.19	
5	2.70	2.63	4.30	3.89	5.59	4.32	4.39	4.26	6.32	
6	3.07	4.75	5.00	4.56	5.50	4.40	5.12	5.08	7.57	
7	3.19	5.50	4.70	4.56	5.08	4.92	4.73	4.69	7.60	
8	3.22	4.13	5.40	5.22	5.22	5.81	3.86	5.36	7.57	
9	2.89	6.00	5.90	6.00	5.72	5.54	6.59	5.21	8.77	
10	3.33	4.50	5.50	4.78	5.84	5.19	5.60	5.27	8.00	
11	3.37	6.50	6.30	5.67	6.00	5.96	5.76	5.41	9.05	
12	3.15	5.00	5.30	3.78	5.94	5.87	4.75	5.58	7.99	
13	2.96	4.50	5.60	5.22	5.95	5.42	4.82	5.58	7.98	
14	3.26	4.50	4.60	3.89	4.75	4.41	5.10	3.86	6.92	
15	3.00	7.00	4.80	5.11	5.90	5.00	5.42	5.43	8.60	
16	3.37	5.75	5.60	4.67	5.97	5.72	5.73	5.43	8.56	
17	3.07	6.13	5.30	5.11	5.41	5.35	5.31	4.98	8.24	
18	3.41	7.00	5.70	5.22	6.59	5.59	5.85	6.18	9.35	
19	3.11	5.00	4.10	3.44	4.23	4.34	4.01	4.32	6.71	
20	3.33	5.63	5.70	4.89	5.52	5.42	4.05	4.92	7.95	
21	3.19	5.13	5.30	4.11	6.02	5.49	5.78	5.58	8.24	
22	3.59	6.13	6.10	4.67	6.26	5.02	6.26	5.75	8.91	
23	3.11	3.38	4.50	4.00	5.65	5.06	4.52	4.70	6.96	
24	3.07	5.63	5.50	5.11	6.24	5.03	5.68	5.53	8.45	
25	2.70	3.75	5.20	4.00	5.21	5.10	4.02	4.34	6.79	
26	3.11	4.00	4.30	4.00	4.41	4.32	4.43	4.14	6.58	
27	3.81	7.00	5.10	4.67	5.02	5.92	4.64	5.03	8.49	
28	3.74	6.63	5.10	6.00	6.31	5.72	6.52	6.56	9.55	
29	2.78	3.38	4.80	4.22	4.68	4.29	5.24	4.78	6.79	

Algorithm

The algorithm conducted 390,625 iterations in order to test all possible combinations for the 29 pilots where $t = (\text{Jordan et al., 2002 } 4, 5)$. The final pilot rankings (Table 4) reveal that pilot 28 ranked in 1st place 78.4% of the time and was one of the top three positions 97.7% of the time. The results also indicated that pilot 18 and pilot 11 also consistently performed well with top three rankings 88.7% and 79.7%, respectively.

Table 11: Pilot Performance Percentage for Top 5 Places

Pilot	1st Place	2nd Place	3rd Place	4th Place	5th Place
28	78.4%	12.9%	6.4%	1.8%	0.4%
18	10.7%	60.6%	17.4%	9.9%	1.4%
11	9.2%	17.7%	52.8%	17.2%	2.8%
9	0.8%	6.4%	9.2%	35.1%	31.6%
22	0.8%	2.2%	13.2%	29.9%	42.5%
27	0.1%	0.2%	0.7%	4.0%	5.8%
1	0.0%	0.0%	0.0%	0.1%	0.6%
15	0.0%	0.0%	0.2%	1.4%	6.0%
12	0.0%	0.0%	0.0%	0.1%	0.1%
16	0.0%	0.0%	0.0%	0.3%	6.4%
24	0.0%	0.0%	0.0%	0.1%	1.0%
4	0.0%	0.0%	0.0%	0.0%	0.5%
8	0.0%	0.0%	0.0%	0.0%	0.3%
13	0.0%	0.0%	0.0%	0.0%	0.4%
3	0.0%	0.0%	0.0%	0.0%	0.1%
21	0.0%	0.0%	0.0%	0.0%	0.1%
20	0.0%	0.0%	0.0%	0.0%	0.0%
17	0.0%	0.0%	0.0%	0.0%	0.0%
2	0.0%	0.0%	0.0%	0.0%	0.0%
5	0.0%	0.0%	0.0%	0.0%	0.0%
6	0.0%	0.0%	0.0%	0.0%	0.0%
7	0.0%	0.0%	0.0%	0.0%	0.0%
10	0.0%	0.0%	0.0%	0.0%	0.0%
14	0.0%	0.0%	0.0%	0.0%	0.0%
19	0.0%	0.0%	0.0%	0.0%	0.0%
23	0.0%	0.0%	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%	0.0%	0.0%
26	0.0%	0.0%	0.0%	0.0%	0.0%
29	0.0%	0.0%	0.0%	0.0%	0.0%

Discussion

The test results indicate a strong consistency of top performers with both PCA and the cumulative total of all possible weight combinations. Pilots 28, 18, and 11,

respectively, were the top 3 pilots in the algorithm and PCA. In fact, the same 5 pilots were chosen by both the algorithm and PCA to fill the top five positions however pilots 9 and 22 switched between 4th and 5th places in the algorithm and PCA (Table 5).

Table 12: PCA vs. Algorithm results comparison

Pilot	Algorithm					PCA			
	1 st Place	2 nd Place	3 rd Place	4 th Place	5 th Place	Top 3	Top 5	PCA Score	PCA Rank
28	78.4%	12.9%	6.4%	1.8%	0.4%	97.7%	99.9%	9.55	1
18	10.7%	60.6%	17.4%	9.9%	1.4%	88.7%	100.0%	9.35	2
11	9.2%	17.7%	52.8%	17.2%	2.8%	79.7%	99.7%	9.05	3
9	0.8%	6.4%	9.2%	35.1%	31.6%	16.5%	83.2%	8.91	5
22	0.8%	2.2%	13.2%	29.9%	42.5%	16.1%	88.5%	8.77	4

In order to test the validity of PCA as a predictor of success versus the compellation of all possible criteria weighting combinations a simple linear regression analysis was conducted. For this analysis, the dependent variable was the algorithm's first place win total for each pilot and the independent variable was the PCA score value. The developed model was significant ($F= 187.59$; $P < 0.000$) and accounted for 86.95 % of the variance ($\text{Adj } R^2 = .8695$) (Table 6). The regression equation is:

$$\text{Algorithm Rank Order} = 0.98 + 0.935 * \text{PCA Rank Order} \quad (6)$$

This indicates that the Algorithm rankings and PCA's rankings are closely correlated and that PCA can be used as an accurate depiction of performance per all weighting criteria.

Table 13: Regression Analysis Summary

	F- Value	P-Value	S	Model Adj. R ²
PCA Ranking	187.59	< 0.000	3.076	0.8695

The regression analysis demonstrates the effectiveness of PCA weight assignment when accounting for 95% of the data variance ($C_M = 95\%$). To further explore the validity of PCA, sensitivity analysis was conducted to determine how the addition or subtraction of principal components affected the regression analysis (Table 7).

Comparison of the results indicated no significant difference between adjusted R^2 values for regressions using at least three principal components. Therefore, practitioners should expect similar ranking results when C_M accounts for approximately 80% or more of the total variance within the dataset.

Table 14: Sensitivity Analysis for PC combinations

PCs	C_M	Model Adj. R^2
1-3	79.7%	0.8714
1-4	86.3%	0.8628
1-5	91.8%	0.8858
1-6	94.8%	0.8695
1-7	97.6%	0.8829
1-8	100%	0.8829

Conclusion

This study focused on detailed analysis of PCA's ability to develop criteria weights in order to rank pilots based upon their emotional intelligence, safety attitude, and safety citizenship scores as well as the comparison of PCA's ranking results with those from an algorithm designed to calculate the rankings based upon every possible criteria weight combination. Based upon our results, PCA is a valid tool for criteria

weighting with large data sets. Direct comparison of both PCA and all other criteria weighting possibilities revealed that PCA consistently favored the same pilots that were most favored by the algorithm.

PCA provides a data focused method that weights criteria without the addition of unnecessary subjectivity due to human preferences or the requirement for standardized units (Petroni & Braglia, 2000). Furthermore, the abundance of statistical tools available allow decision makers with limited statistical background to easily use PCA to develop criteria weights for large datasets much more quickly than with traditional methods (Petroni & Braglia, 2000). For these reasons, PCA is an excellent tool for personnel selection or hiring processes where multiple stakeholders must decide between numerous candidates based off of numerous criteria.

The main limitation of the study was the time complexity of the algorithm. The computer used to run the algorithm was able to run through 293 combinations per second. While this might sound fast, it constrained the amount of combinations that could be checked. With the original number of criteria in the dataset, it would have taken over 16.5 years to try the 150+ billion combinations. Algorithm optimization ideas are mentioned below in the future research section.

Another limitation was the time given to complete this paper, there were many subtopics such as comparing the alternative ranking of PCA and the algorithm and determining how much “better” one alternative was than the other. The study also did not use the peer assessment and self-assessment ratings to determine if the best pilot on paper was truly the best pilot.

Since PCA and the algorithm were developed to use the original dataset to determine the criteria weightings one could argue that all of the findings are dataset dependent. It is recommended that similar research should be executed on other datasets. Findings that were not mentioned in the paper, suggest that PCA generated criteria weightings under a certain value can be eliminated while maintaining the exact same alternative ranking order. Future research could include finding the cut-off point in which the data retention is high enough to maintain the same alternative ranking order. Follow up research comparing the methods shown in this paper to methods such as AHP and other multi criteria decision making methods that require human criteria weight input would be important to see if the criteria weighting step can be eliminated.

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Appendix

The python-based computer algorithm used for this study may be viewed at

<https://github.com/hi2gage/PCA-Pilot-Selection/>.

CHAPTER 7

SUMMARY AND CONCLUSIONS

Summary of Original Aims and Subsequent Findings

The focus of this thesis was to examine the relationship between trait EI, safety attitude, safety citizenship, and peer-assessed CRM performance among aviators to better understand the overall relationship between these constructs. Accordingly, three main research aims and associated hypotheses were established to guide the research and analyses processes. The first research aim was to understand the relationship between trait EI and peer-assessed CRM with the alternative hypothesis being that trait EI is associated with CRM performance. Though not specifically addressed in previous chapters, this research found no significant relationship between a pilot's trait EI score and his/her associated CRM scores ($p = 0.691$). The results appear to indicate that other factors, including technical skills, play a larger role in the development of a pilot's assessment of another pilot's performance. This finding could also be due to the interconnected nature of technical and non-technical skills which, in practice, makes it difficult to accurately assess only non-technical performance (Mavin & Dall'Alba, 2010; Roth & Mavin, 2015). Nonetheless, this study failed to determine that trait EI significantly impacted a pilot's performance as a flight crewmember. This aligns with previous studies that have indicated that pilot personality factors play a limited role in pilot performance (Besco, 1994; Martinussen, 1996).

This does not change the fact that trait EI may still affect pilots' desire to fly with

other pilots that possess certain traits. Anecdotally, many pilots favor certain crewmembers over others within the organization because of their individual attitudes and dispositions. In this case, both groups, “the preferred” and “not-preferred,” were qualified and experienced pilots but the main discriminator was personality based. While a different social context, research has shown that school children with higher trait EI are more desirable as friends (K. V. Petrides, Sangareau, Furnham, & Frederickson, 2006). It is likely that a similar effect occurs among adults within a work environment with high peer interaction. The current study fails to directly address this aspect of crewmember selection. Further analysis of pilot trait EI preferences may yield considerable benefits to organizations for aircrew selection and matching.

The second research aim focused on understanding the relationship between trait EI, safety attitude, and safety citizenship. The alternative hypothesis was that both safety constructs would be associated with trait EI. The findings revealed that safety attitude held only a marginally significant association ($\beta=0.024$; $p = 0.061$) with trait EI, while safety citizenship was strongly associated with trait EI ($\beta=11.25$; $p = 0.001$). Further analysis revealed that safety citizenship was most closely related to the facets such as adaptability ($\beta= 12.09$; $p < 0.001$), self-esteem ($\beta= 7.92$; $p = 0.003$), and optimism ($\beta= -8.83$; $p = 0.007$). This has important implications for efforts to increase flight safety within aviation organizations through modifications to pilot selection screening and implementation of pilot training focused on building adaptability and self-esteem.

The third research aim was to understand the relationship between safety attitude, safety citizenship, and peer-assessed CRM performance with both safety constructs being

associated with a pilot's peer-assessed CRM performance. Results indicated a significant association between safety citizenship and CRM performance scores ($p = 0.006$). These results indicated that pilots prefer crewmembers who demonstrate concern for others through active advocacy for organizational safety. Such active advocacy includes stewardship, helping their peers, reporting unsafe acts or conditions, and initiating positive changes to improve safety (Didla et al., 2009). This aligns with Turnipseed and Rassuli (2005) who noted a strong association between peer performance assessments and an individual's advocacy participation within the organization. Research has shown a strong relationship between safety culture and safety citizenship which is encouraged by an organization's prioritization of safety (Didla et al., 2009). Therefore, efforts focused on improving organizational safety culture will lead to improvements in pilot safety citizenship that, supported by this research, will lead to improved pilot CRM performance.

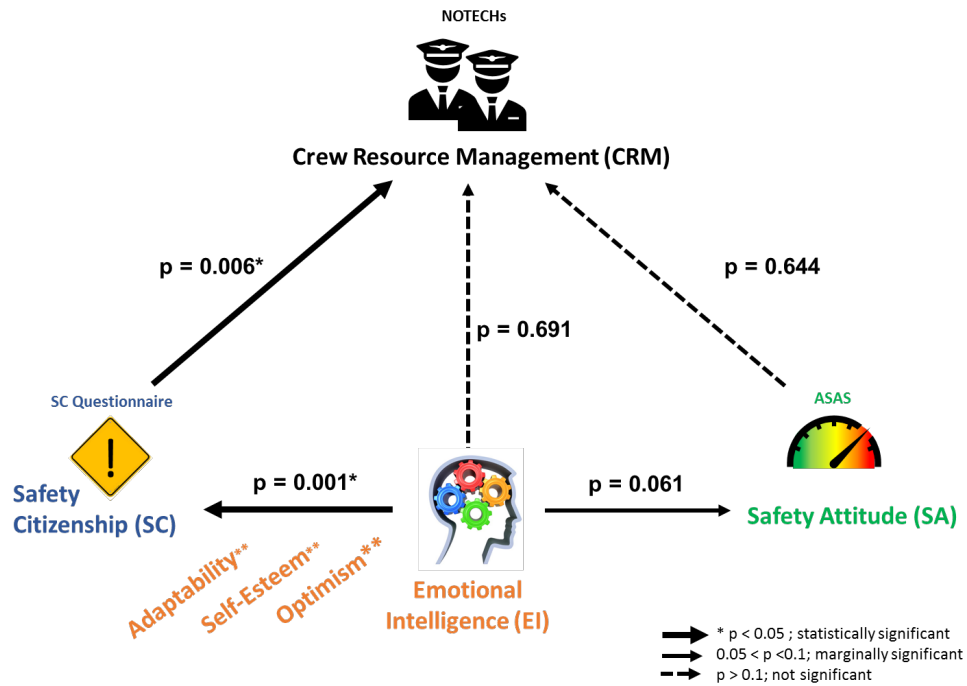


Figure 3: Relationship between trait EI, Safety Citizenship, Safety Attitude, and peer-assessed CRM.

Additional Research and Findings

In addition to the three primary aims listed above, research was conducted to evaluate how trait EI scores of American pilots differed from the general civilian population. Comparison of the two groups revealed that pilots had lower global trait EI scores [$F(1,125) = 7.90$; $p = 0.006$], Well Being [$F(1,125) = 6.33$; $p = .0132$], Emotionality [$F(1,125) = 6.16$; $p = 0.0144$], and Sociability [$F(1,125) = 6.16$; $p = 0.0144$] scores than their matched counterparts from the general population. This implies that pilots tend to have more muted emotion-related profiles than their counterparts, which could be a product of aviation culture or a response to the intrinsic stressors encountered during flight. Either way, this study provided novel insight into the

emotional predispositions of American pilots and demonstrated key differences between pilots and the general population.

Finally, research was conducted to evaluate personality-related traits and behaviors such as trait EI, safety attitude, and safety citizenship utilized as selection criteria. Principal component analysis (PCA) was employed to develop less subjective pilot selection metrics. Results demonstrated that PCA was an effective tool retrospectively, particularly when evaluating large groups with numerous selection criteria (Dugger, Halverson, McCrory, & Claudio, 2021), but it has not been validated prospectively. The implications of these findings are most beneficial to larger aviation organizations such as the military or commercial aviation companies because of the large numbers of pilots that are selected each year. Development of an efficient, effective, and far less subjective, hiring process could significantly reduce the time required to select competent and qualified pilots from a large applicant pool and find ideal co-pilots for existing employees. This PCA-based pilot selection tool would use personality-related traits to pair aircrews to ensure compatibility for each flight.

Limitations and Future Research

The novel nature of this research affords numerous opportunities for continued research and analysis. Future studies composed of larger samples ($n > 100$) will enable better translation and generalizability of findings as well as opportunities to unify and validate these preliminary findings. Study participants were primarily white males with military aviation backgrounds and therefore, may not completely represent the greater aviation community. Further studies should be undertaken to gain a better understanding

of the greater aviation community, with specific interest placed upon inclusion of a more diverse (that is: gender, ethnicity, training background) group of pilots.

Additionally, this research did not identify a relationship between trait EI and peer-assessed CRM performance. Yet, this study did not account for the possible relationship between trait EI and the development of technical skills. Future studies should include both technical and non-technical performance measure to holistically assess how trait EI interacts with pilot performance. Similarly, this research did not directly investigate the relationship between trait EI and CRM performance under stressful conditions. Future work conducted to assess how trait EI affects aircrew response to, and performance during stressful situations, such as aircraft emergencies (e.g. engine failure in extreme weather conditions) or complex flight evaluations, would be highly valuable. Finally, this research did not fully assess pilots' preferences for crewmember trait EI. Future studies should incorporate a pilot ranking metric that is not reliant upon crewmember flight skills but is based on a holistic measure of interpersonal relationships. Only interpersonal relationship measures. This research extension may benefit organizations seeking to select candidates that will work well with others within their organization.

Analyses identified three trait EI facets (Adaptability, Self-Esteem, and Optimism) that most closely related to SC. Further research should be conducted to develop improved training methods to increase organizational safety through improved knowledge of these traits. Likewise, further research should be conducted to identify how

to improve pilot SC related behaviors to increase positive CRM participation within organizations.

The comparison of trait EI profiles between American pilots and the general population yielded novel insight into the emotion-related tendencies of pilots. Future participants should include a broader cross-section of the aviation community including more representation from the civil and commercial sectors. Second, the cross-sectional nature of this study poses additional hypotheses regarding the development of the unique pilot trait EI profiles specifically, do pilots select aviation because of their trait EI or do the training and culture dynamics related to aviation organizations cause the trait EI profiles of pilots to change? Longitudinal analysis of pilot trait EI profiles may provide significant insight into this maturation process which in turn may help the aviation community reassess pilot training and organizational culture to promote improved teamwork and safety.

The use of PCA as a criteria weighting technique for personality-related traits and behavioral tendencies was a novel approach to pilot selection. Although the results of this thesis indicated that only safety citizenship was an adequate predictor of pilot CRM performance, results of the PCA compared to an algorithm revealed that it is likely that, when all criteria are considered, the same pilots will be selected as the top candidates. Further exploration is needed to better understand if the inclusion or exclusion of certain factors (e.g. safety attitude, safety citizenship, CRM, or trait EI) changes pilot selection order. Logically, this extension could also identify those criteria most critical to the pilot selection process.

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APPENDIX A

COMPILED SURVEY INSTRUMENT

Informed Consent**INFORMED CONSENT**

PURPOSE: The focus of this study is to examine the relationship between emotional intelligence, safety attitude and citizenship behavior, and peer-assessed performance for aviators to determine which factors/facets contribute the most to crew resource management performance and safety attitude and behavior.

PARTICIPANTS: Aviation crewmembers who are at least 18 years old and fully qualified to serve in flight duties.

LENGTH: It will take ~30 minutes to complete.

PARTICIPATION: Involvement in this survey is entirely voluntary. To participate please answer as many questions as you feel comfortable answering. If you feel uncomfortable with a question, you can skip that question or withdraw from the study altogether. You may withdraw from the study or quit at any time without penalty.

AUDIO/VISUAL RECORDING: For some participants, a visual recording may be made during the survey process. This is entirely voluntary and will be used to examine eye movement and individual emotional response to survey questions.

CONFIDENTIALITY: Your responses will remain anonymous and confidential. Your completed survey will be assigned a randomly generated participant number. Only the researchers below will see your individual survey responses. The data will be stored on a secured network and will be seen only by members of the research team.

De-identified data from this study may be shared with the research community at large to advance science and health. We will remove or code any personal information that could identify you before files are shared with other researchers to ensure that, by current scientific standards and known methods, no one will be able to identify you from the information we share. Despite these measures, we cannot guarantee anonymity of your personal data.

EXPECTED BENEFITS: You will be contributing to the knowledge of how emotional intelligence affects aviator performance in the cockpit as well as safety attitude and behavior.

RISKS/DISCOMFORTS: There are no foreseeable risks or discomforts. If you feel uncomfortable with a question, you can skip that question or withdraw from the study. We anticipate that your participation in this survey presents no greater risk than everyday use of the Internet.

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SURVEY RESULTS: The results of the study will be used for scholarly purposes only. The results will be presented in educational settings and at professional conferences. The results will be published in a professional journal. Only non-attributable results (i.e., non-identifiable) will be reported.

QUESTIONS/CONCERNS: If you have any questions or concerns about this survey or participation, please contact Zachary Dugger below.

PRINCIPAL INVESTIGATOR:
 Zachary Dugger
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Co-INVESTIGATORS:
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 PO Box 17300 Bozeman, MT 59717-3800

Funding: None

CONFLICTS OF INTEREST: Researchers have none to disclose.

APPROVED
MSU IRB
07/17/2020
 Date approved

INFORMED CONSENT: Marking the "I agree" option below indicates that you read and understood the explanation provided to me, and voluntarily agree to participate in this study. If you do not wish to participate in the research study, please decline participation by checking the "I disagree" option.

I Agree

I Disagree

Full Name

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Participant Signature

×

SIGN HERE

clear

TEIQue

Below are a series of statements that will help us understand a little bit about you. Please indicate how much you agree or disagree with each statement that is indicative of the way you typically think, feel, and act.

	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I'm usually able to control other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generally, I don't take notice of other people's emotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive wonderful news, I find it difficult to calm down quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to see difficulties in every opportunity rather than opportunities in every difficulty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I have a gloomy perspective on most things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have a lot of happy memories	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understanding the needs and desires of others is not a problem for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I generally believe that things will work out fine in my life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often find it difficult to recognise what emotion I'm feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I'm not socially skilled	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I find it difficult to tell others that I love them even when I want to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others admire me for being relaxed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I rarely think about old friends from the past	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generally, I find it easy to tell others how much they really mean to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generally, I must be under pressure to really work hard	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to get involved in things I later wish I could get out of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm able to "read" most people's feelings like an open book	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm usually able to influence the way other people feel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I normally find it difficult to calm angry people down	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to take control of situations at home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I generally hope for the best	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others tell me that they admire me for my integrity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I really don't like listening to my friends' problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm normally able to "get into someone's shoes" and experience their emotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe I'm full of personal weaknesses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to give up things I know and like	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always find ways to express my affection to others when I want to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I feel that I have a number of good qualities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to rush into things without much planning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to speak about my intimate feelings even to my closest friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm not able to do things as well as most people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm never really sure what I'm feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm usually able to express my emotions when I want to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
When I disagree with someone, I usually find it easy to say so	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I normally find it difficult to keep myself motivated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know how to snap out of my negative moods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
On the whole, I find it difficult to describe my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult not to feel sad when someone tells me about something bad that happened to them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When something surprises me, I find it difficult to get it out of my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often pause and think about my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to see the glass as half-empty rather than as half-full	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often find it difficult to see things from another person's viewpoint	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm a follower, not a leader	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Those close to me often complain that I don't treat them right	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Many times, I can't figure out what emotion I'm feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I couldn't affect other people's feelings even if I wanted to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I'm jealous of someone, I find it difficult not to behave badly towards them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get stressed by situations that others find comfortable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to sympathize with other people's plights	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the past, I have taken credit for someone else's input	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I can cope with change effectively	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't seem to have any power at all over other people's feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have many reasons for not giving up easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like putting effort even into things that are not really important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I always take responsibility when I do something wrong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to change my mind frequently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I argue with someone, I can only see my point of view	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Things tend to turn out right in the end	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I disagree with someone, I generally prefer to remain silent rather than make a scene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I wanted to, it would be easy for me to make someone feel bad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would describe myself as a calm person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often find it difficult to show my affection to those close to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are many reasons to expect the worst in life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I usually find it difficult to express myself clearly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't mind frequently changing my daily routine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most people are better liked than I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Those close to me rarely complain about how I behave toward them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually find it difficult to express my emotions the way I would like to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generally, I'm able to adapt to new environments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often find it difficult to adjust my life according to the circumstances	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would describe myself as a good negotiator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can deal effectively with people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
On the whole, I'm a highly motivated person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have stolen things as a child	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I'm pleased with my life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I find it difficult to control myself when I'm extremely happy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sometimes, it feels like I'm producing a lot of good work effortlessly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I take a decision, I'm always sure it is the right one	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I went on a blind date, the other person would be disappointed with my looks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I normally find it difficult to adjust my behaviour according to the people I'm with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I'm able to identify myself with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I try to regulate pressures in order to control my stress levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't think I'm a useless person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually find it difficult to regulate my emotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can handle most difficulties in my life in a cool and composed manner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I wanted to, it would be easy for me to make someone angry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I like myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe I'm full of personal strengths	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I generally don't find life enjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm usually able to calm down quickly after I've got mad at someone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I can remain calm even when I'm extremely happy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generally, I'm not good at consoling others when they feel bad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm usually able to settle disputes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I never put pleasure before business	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Imagining myself in someone else's position is not a problem for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need a lot of self-control to keep myself out of trouble	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy for me to find the right words to describe my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I expect that most of my life will be enjoyable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am an ordinary person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I tend to get "carried away" easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually try to resist negative thoughts and think of positive alternatives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't like planning ahead	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Just by looking at somebody, I can understand what he or she feels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Life is beautiful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I normally find it easy to calm down after I have been scared	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to be in command of things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually find it difficult to change other people's opinions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm generally good at social chit-chat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
Controlling my urges is not a big problem for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I really don't like my physical appearance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to speak well and clearly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I'm not satisfied with how I tackle stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most of the time, I know exactly why I feel the way I do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to calm down after I have been strongly surprised	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I would describe myself as assertive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I'm not a happy person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When someone offends me, I'm usually able to remain calm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
Most of the things I manage to do well seem to require a lot of effort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have never lied to spare someone else's feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to bond well even with those close to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I consider all the advantages and disadvantages before making up my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't know how to make others feel better when they need it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually find it difficult to change my attitudes and views	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others tell me that I rarely speak about how I feel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I'm satisfied with my close relationships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can identify an emotion from the moment it starts to develop in me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
On the whole, I like to put other people's interests above mine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most days, I feel great to be alive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to get a lot of pleasure just from doing something well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is very important to me to get along with all my close friends and family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I frequently have happy thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have many fierce arguments with those close to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Expressing my emotions with words is not a problem for me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to take pleasure in life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm usually able to influence other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
When I'm under pressure, I tend to lose my cool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually find it difficult to change my behaviour	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others look up to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others tell me that I get stressed very easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm usually able to find ways to control my emotions when I want to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe that I would make a good salesperson	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I lose interest in what I do quite easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I'm a creature of habit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Completely Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Completely Agree
I would normally defend my opinions even if it meant arguing with important people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would describe myself as a flexible person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Generally, I need a lot of incentives in order to do my best	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Even when I'm arguing with someone, I'm usually able to take their perspective	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the whole, I'm able to deal with stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I try to avoid people who may stress me out	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often indulge without considering all the consequences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to "back down" even if I know I'm right	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to take control of situations at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Some of my responses on this questionnaire are not 100% honest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ASAS

Below are a series of statements that will help us understand a little bit about you. Please indicate how much you agree or disagree with each statement that is indicative of the way you typically think, feel, and act.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I am very skillful on the controls.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know aviation procedures very well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am a very capable pilot.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am capable of instrument flight.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a thorough knowledge of my aircraft.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know how to get help from ATC if I get into trouble.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I deal with stress very well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

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	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I fly enough to maintain my proficiency.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often feel stressed when flying in or near weather.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it easy to understand the weather information I get before flights.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is very unlikely that a pilot of my ability would have an accident.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are few situations I couldn't get out of.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am so careful that I will never have an accident.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I never feel stressed when flying.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Sometimes you just have to depend on luck to get you through.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The rules controlling flying are much too strict.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If you don't push yourself and the aircraft a little, you'll never know what you could do.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed is more important than accuracy during an emergency.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You should decide quickly and then make adjustments later.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would duck below minimums to get home.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most of the time accidents are caused by things beyond the pilot's control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The pilot should have more control over how he/she flies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am a very cautious pilot.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am a very careful pilot.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is riskier to fly at night than during the day.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Usually, your first response is the best response.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aviation weather forecasts are usually accurate.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SCB

Below are a series of statements that will help us understand a little bit about you. Please indicate how much you agree or disagree with each statement that is indicative of the way you typically think, feel, and act.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I am involved in improving safety policy and practices.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I initiate steps to improve work procedures if I think it will make work safer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I see something unsafe, I go out of my way to take care of it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I voluntarily carry out tasks or activities that help to improve workplace safety.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I often make suggestions to improve how safety is handled around here.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often try new approaches to improving workplace safety.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often try to solve problems in ways that reduce safety risks.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I keep abreast of changes related to safety.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Demographics

How old are you?

What is your Gender?

Male

Female

Race/Ethnicity

Marital Status

- Single (Never Married)
- Married
- Divorced/Seperated
- Widowed

What is your service status?

- Civilian
- Military
- Prior Service or Retired

While in the military did you serve as a pilot or aircrew member?

- Yes
- No

Were you ever deployed overseas?

- Yes
- No

What is your current or highest military rank?

Total Flight Time ?

- 0-200 hrs
- 200-500 hrs
- 600-1000 hrs
- 1000-2000 hrs
- 2000- 5000 hrs
- 5000+ hrs

How long have you been flying?

- 0-2 yrs
- 3-5 yrs
- 6-10 yrs
- 11-15 yrs
- 16-20 yrs
- 21-25 yrs
- 26-30 yrs
- 30+ yrs

What type of aircraft do you primarily fly?

- Helicopter
- Fixed Wing/ Airplane

What is your highest FAA rating?

- Private Pilot
- Instrument
- Commercial
- ATP
- None

Are you a Pilot-in-Command?

Yes

No

What is your educational background?

High School Graduate or Equivalent

Trade/Technical/Vocational

Associate Degree

Some College, no Degree

Bachelors' Degree

Master's Degree

Professional Degree

Doctorate Degree

NOTECHS (Self Eval)

Cooperation Skills			
Team Building & Maintaining	Considering Others	Supporting Others	Conflict Solving
<ul style="list-style-type: none"> Establishes atmosphere for open communication/ participation Encourages inputs & feedback from others Does not compete with others 	<ul style="list-style-type: none"> Takes notice of the suggestions of other crewmembers even if he/she does not agree Takes condition of other crewmembers in to account Gives appropriate feedback 	<ul style="list-style-type: none"> Helps other crewmembers in demanding situations Offers assistance 	<ul style="list-style-type: none"> Keeps calm in conflicts Suggests conflict solutions Concentrates on what is right rather than who is right.

Evaluate your own Cooperation Skills based upon the following elements

	Very Poor	Poor	Acceptable	Good	Very Good
Team building & Maintaining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consideration of Others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support of Others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conflict Solving	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Leadership & Managerial Skills			
Use of Authority & Assertiveness	Providing & Maintaining Standards	Planning & Co-ordination	Workload Management
<ul style="list-style-type: none"> Advocates own position Takes initiative to ensure involvement & task completion Takes command if necessary 	<ul style="list-style-type: none"> Ensures SOP compliance Intervenes if task completion deviates from standards Consults crew for applying non-standard procedures 	<ul style="list-style-type: none"> Encourages crew participation in planning & task completion Clearly states intentions & goals Consults crew, changes plan if necessary 	<ul style="list-style-type: none"> Allowing secondary operational tasks to interfere with primary flight duties Distributes tasks Ignoring signs of stress and fatigue

Evaluate your Leadership and Managerial Skills based upon the following elements

	Very Poor	Poor	Acceptable	Good	Very Good
Use of Authority & Assertiveness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Providing & Maintaining Standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planning and Coordination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Workload management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Situational Awareness		
Awareness of Aircraft Systems	Awareness of External Environment	Awareness of time & Anticipation
<ul style="list-style-type: none"> Monitors and reports changes in system states Acknowledges entries and changes to system 	<ul style="list-style-type: none"> Contacts outside resources when necessary Shares information about environment with others Comments on relevant environmental factors 	<ul style="list-style-type: none"> Discusses contingency strategies Identifies possible/future problems

Evaluate your Situational Awareness based upon the following elements

	Very Poor	Poor	Acceptable	Good	Very Good
Awareness of Aircraft Systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awareness of External Environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awareness of Time & Anticipation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Decision Making Skills			
Problem definition & diagnosis	Option Generation	Risk Assessment & Option Selection	Outcome Review
<ul style="list-style-type: none"> Gathers information and identifies problem Reviews causal factors with other crewmembers 	<ul style="list-style-type: none"> States alternative courses of action Asks crewmembers for options 	<ul style="list-style-type: none"> Considers and shares risks of alternative courses of action Talks about possible risks for course of action in terms of crew limitations Confirms selected course of action 	<ul style="list-style-type: none"> Checks outcome against plan

Evaluate your Decision Making ability

	Very Poor	Poor	Acceptable	Good	Very Good
Problem Definition & Diagnosis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Option Generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk Assessment & Option Selection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Outcome Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

1st Peer Assessment

Who are you evaluating? (First and Last Name)

Cooperation Skills			
Team Building & Maintaining	Considering Others	Supporting Others	Conflict Solving
<ul style="list-style-type: none"> Establishes atmosphere for open communication/ participation Encourages inputs & feedback from others Does not compete with others 	<ul style="list-style-type: none"> Takes notice of the suggestions of other crewmembers even if he/she does not agree Takes condition of other crewmembers in to account Gives appropriate feedback 	<ul style="list-style-type: none"> Helps other crewmembers in demanding situations Offers assistance 	<ul style="list-style-type: none"> Keeps calm in conflicts Suggests conflict solutions Concentrates on what is right rather than who is right.

Evaluate his/her Cooperation Skills based upon the following elements

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	Very Poor	Poor	Acceptable	Good	Very Good
Team building & Maintaining	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consideration of Others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support of Others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conflict Solving	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Leadership & Managerial Skills			
Use of Authority & Assertiveness	Providing & Maintaining Standards	Planning & Co-ordination	Workload Management
<ul style="list-style-type: none"> Advocates own position Takes initiative to ensure involvement & task completion Takes command if necessary 	<ul style="list-style-type: none"> Ensures SOP compliance Intervenes if task completion deviates from standards Consults crew for applying non-standard procedures 	<ul style="list-style-type: none"> Encourages crew participation in planning & task completion Clearly states intentions & goals Consults crew, changes plan if necessary 	<ul style="list-style-type: none"> Allowing secondary operational tasks to interfere with primary flight duties Distributes tasks Ignoring signs of stress and fatigue

Evaluate his/her Leadership and Managerial Skills based upon the following elements

	Very Poor	Poor	Acceptable	Good	Very Good
Use of Authority & Assertiveness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Providing & Maintaining Standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Planning and Coordination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Workload management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Situational Awareness		
Awareness of Aircraft Systems	Awareness of External Environment	Awareness of time & Anticipation
<ul style="list-style-type: none"> Monitors and reports changes in system states Acknowledges entries and changes to system 	<ul style="list-style-type: none"> Contacts outside resources when necessary Shares information about environment with others Comments on relevant environmental factors 	<ul style="list-style-type: none"> Discusses contingency strategies Identifies possible/future problems

Evaluate his/her Situational Awareness based upon the following elements

	Very Poor	Poor	Acceptable	Good	Very Good
Awareness of Aircraft Systems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Awareness of External Environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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	Very Poor	Poor	Acceptable	Good	Very Good
Awareness of Time & Anticipation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Decision Making Skills			
Problem definition & diagnosis	Option Generation	Risk Assessment & Option Selection	Outcome Review
<ul style="list-style-type: none"> Gathers information and identifies problem Reviews causal factors with other crewmembers 	<ul style="list-style-type: none"> States alternative courses of action Asks crewmembers for options 	<ul style="list-style-type: none"> Considers and shares risks of alternative courses of action Talks about possible risks for course of action in terms of crew limitations Confirms selected course of action 	<ul style="list-style-type: none"> Checks outcome against plan

Evaluate his/her Decision Making ability					
	Very Poor	Poor	Acceptable	Good	Very Good
Problem Definition & Diagnosis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Option Generation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk Assessment & Option Selection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Outcome Review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>