2017

The Hogan Development Survey: Personality in Selecting and Training Aviation Pilots

Jenna McChesney
Minnesota State University, Mankato

The Hogan Development Survey: Personality in Selecting and Training Aviation Pilots

By

Jenna Ellen-Marie McChesney

A Thesis Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Arts

in

Industrial-Organizational Psychology

Minnesota State University, Mankato

Mankato, Minnesota

May 2017

April 6, 2017

The Hogan Development Survey: Personality in Selecting and Training Aviation Pilots

Jenna Ellen-Marie McChesney

This thesis has been examined and approved by the following members of the student's committee.

Kristie Campana
_____
Advisor

Andrea Lassiter
_____
Committee Member

Tom Peterson
_____
Committee Member

Abstract

Data from approximately 24 students enrolled in the aviation programs at two medium sized Midwestern universities were analyzed as part of this study. Students were asked to take a personality test, the Hogan Development Survey, and share their cumulative GPA. Using multiple regression to analyze the information, we investigated if the Hogan Development Survey can be used to predict student's performance in collegiate aviation programs (student GPA). A better understanding of how to train and select pilots has the potential to reduce the costs and time spent educating students who are likely to drop out or perform poorly in aviation programs. Therefore, we find this study to be both interesting and practical. Results are discussed in terms of limitations and recommendations for future studies.

The most popular pathway to becoming a civilian pilot has traditionally been through military pilot training. In the past, about 75% of new hires for major U.S. civilian airlines came from military pilot training backgrounds (Carretta, 2000). However, trends are changing at a rapid rate. Since 2001, the U.S. aviation industry has experienced significant turbulence as a result from the 9/11 terrorist attacks, two recessions, and numerous mergers and bankruptcies (United States Government Accountability Office, 2014). As a result of this turmoil, military pilots are experiencing an increase in commitment requirements and a reduction in incentives to transfer to commercial aviation. Therefore, fewer pilots are leaving the military and transferring into commercial jobs (United States Government Accountability Office, 2014). This is problematic for the aviation industry because the military has traditionally been an important source for highly skilled pilots due to the training it provides. Adding to the shortage of commercial pilots is the fact that Vietnam-era trained pilots are currently reaching retirement age (Karp, 2000). Therefore, the number of highly trained commercial pilots available from the military is declining while the number of positions becoming available from retiring pilots is increasing.

Current forecasts predict significant growth for the global aviation industry overall and a hiring boom for the next several years. The Boeing forecast predicts a demand for 3,300 new airline pilots per year between 2014 – 2024 for the North American market, specifically (United States Government Accountability Office, 2014). With a decline in supply of former military pilots and an increase in demand for civilian pilots, U.S. civilian carriers are now turning to collegiate-based programs to fulfill their

staffing needs (Carretta, 2000). Therefore, the need to recruit and retain students through collegiate-aviation programs is becoming more important.

Consequently, a concern for the industry is the retention of students enrolled in collegiate aviation programs (Federal Aviation Administration (FAA) Academy, 2002). Many students find the mystery and excitement of an aviation degree appealing, but then they find the environment is more challenging and complex than they realized and drop out prematurely (Luedtke & Papazafiropoulos, 1996). In fact, some institutions have reported as high as a 75% attrition rate for students enrolled in their aviation programs (FAA Academy, 2002). These high attrition rates further add to the pilot shortage problem for the aviation industry.

High attrition rates also raise concern for aviation students. Due to the high cost of aviation training, the monetary loss to students is great when a student is not successful in their aviation courses or does not successfully complete an aviation program. It is not uncommon for aviation students to enter their careers with $100,000 of debt or more (Wiener, Kanki, Helmreich, 2010). This high cost of training combined with the shortage of pilots available, makes the selection, training, and success of student pilots enrolled in collegiate-based aviation both useful and extremely important. Therefore, the goal of this research is to find effective ways to properly select pilots who will be successful in training programs.

The first step in selecting individuals who will be successful in a specific role, is to look at those who are successful, or unsuccessful, in the role already. Because military pilots tend to be more available as research subjects, many studies have looked at the predictive validity of various factors on military pilot performance (Gao & Kong, 2016).

Researchers have found three important factors predictive of pilot performance: technical skills, attitudes, and personality characteristics (Chidester, Helmreich, Gregorich, & Geis, 1991). It is not uncommon for the military to use selection batteries assessing all three factors. However, there is currently a heavier focus on training technical skills and aptitude in pilots rather than assessing personality, despite findings that aviation accidents stemming from a lack of knowledge or technical skill are fairly rare. Instead, issues in communication and workload distribution are more commonly the underlying issue when aviation mistakes occur (Chidester et al., 1991; Cooper, White, & Lauber, 1979).

In 1975, the Federal Aviation Administration (FAA) partnered with the National Aeronautics and Space Administration (NASA) and began collecting incident reports within the airline industry. The reports maintained by NASA are referred to as the Aviation Safety Reporting System (ASRS). The ultimate goal of the ASRS is to reduce aviation accidents by identifying problem areas and insufficiencies within the aviation industry (Hendrickson, 2009). Pilots, air traffic controllers, flight attendants, mechanics, and all personnel involved in aviation operations are asked to submit reports to the ASRS after they witness or are a part of an unsafe or error producing operation.

The majority of reports submitted to the ASRS involve communication-related issues. The FAA estimates that all aviation accidents and mishaps are attributed to human error 60-80% of the time and cites factors related to interpersonal communication as the main underlying cause of this human error (FAA, 2004). Others also agree that communication is an important part of aviation safety. Monan (1988) states, “Perhaps no other essential activity is as vulnerable to failure through human error and performance limitations as spoken communication” (p. 3). Technical skills and issues are important

too, but technical ability cannot overcome the consequences of poor communication (Sexton & Helmreich, 2000). Better communication would have prevented numerous accidents and mishaps.

The ASRS releases a monthly publication, *Callback*, in which they include comments of those who analyze the incident reports to the ASRS. Many of the reports published in *Callback* include examples of typical incidents caused by mishaps in communication and illustrate how these incidents can have major consequences. An incident cited by Krivonos (2007) describing a flight instructor and student who almost collided with an inbound plane on a runway is example of an incident resulting from a lack of communication and clarifying expectations between the instructor and tower. The instructor noted:

> "I thought the tower meant taxi into position and hold...and we crossed the hold short line…[I blame] the use of non-standard phraseology by the tower, and my failure to verify… [in the future] I will always ask if I am not sure of a clearance, especially before entering the active runway" ("Crossing the Line", 2004, p. 2).

While this instructor and student were lucky that the inbound flight was able to slow down and move around them, others have not been so lucky. Between 1976 and 2000, more than 1,100 passengers and crew members have lost their lives to accidents in which communication was found as a large contributing factor (Flight Safety Information, 2004). In fact, the most recognized and deadliest crash in aviation history, the Tenerife Air Disaster of 1977, has been attributed to communication issues.

The Tenerife Air Disaster refers to the time in which two 747 flights, bound for the Canary Islands, were redirected to Los Rodeos airport at Tenerife after their original

destination, Las Palmas airport, had to temporarily closed after a bomb explosion. Due to Tenerife not being a major airport, the taxi space was restricted. Therefore, when the Las Palmas airport reopened and both planes were ready for take-off, Pan Am (one of the 747 flights) requested to stay off the runway until KLM (the other 747) had departed. However, this request was denied and both flights were directed to approach the runway. The KLM then proceeded to move at the end of the takeoff runway and stated, "we are now at takeoff." Due to the ambiguous nature of this statement, neither the air traffic controllers or flight crew of Pan Am were certain what KLM had meant, yet neither asked for clarification. Pan Am then told the controllers that it would report when it was clear off the takeoff runway and there was no further communication thereafter. A few seconds later the two planes collided. As a result, a total of 583 people lost their lives (Weick, 1990). Investigations later lead to the conclusion that this incident could be attributed to communication causes.

This is not the only time a fatal crash has been due to ineffective communication. There have been other large fatal crashes attributed to communication issues, such as the Avianca crash in Jamaica Bay near JFK and the American Airlines crash in Columbia in 1995 and the Air Florida Crew crash in Washington D.C. in 1982 (Krivonos, 2007; Wiener, Kanki, Helmraeich, 2010). Over time, the effect of communication on safety and pilot performance has been firmly established through close investigation and analysis of incidents like these. Due to the universal recognition of the importance of effective communication in the cockpit, most airlines have incorporated a training commonly referred to as Cockpit Resource Management (CRM) to improve communication skills. CRM training can be defined as:

> "a set of instructional strategies designed to improve teamwork in the cockpit by applying well-tested tools (e.g. performance measures, exercise, feedback mechanisms) and appropriate training methods (e.g., simulators, lectures, videos) targeted at specific content (i.e., teamwork knowledge, skills, and attitudes)" (Salas, Fowlkes, Stout, Milanovich, & Prince, 1999, p. 163).

In other words, CRM programs address and focus on training pilots on the "people skills" involved with flying an aircraft. Many studies have looked into the effectiveness of CRM training and found positive results. One study carried out by Connolly and Blackwell (1987) reported 46% of fewer errors after implementing CRM through manuals, lectures, and simulator training (as cited in Kern, 2001). Due to its effectiveness, CRM has become one of the most widely applied and accepted team-based trainings in the aviation industry in the last 20 years. It has also brought attention to the importance of effective communication in teamwork and crew coordination in the prevention of aircraft accidents.

Personality

Despite the efficacy of CRM, research has demonstrated that personality can also affect team performance. A primary goal of CRM training is to shape and reshape attitudes of pilots. Attitudes are different from personality characteristics in that attitudes are changeable and therefore viewed as trainable (Kern, 2001). However, personality traits are found to be predictive of effective communication and therefore ultimately predictive of team performance (Neuman & Wright, 1999). Personality can be described as "the characteristic way in which a person thinks, feels, and behaves; the ingrained pattern of behavior that each person evolves, both consciously and unconsciously, as the

style of life or way of being in adapting to the environment." (Shahrokh, Hales, Phillips, & Yudofsky, 2011, p. 189).

Because personality traits are consistent, unchanging, and relatively unique to each individual, personality assessments are commonly used as part of a selection battery when selecting individuals for a particular career. Selection tests are used to assess whether an individual would be predicted to highly perform in the job s/he is applying. For pilots, personality can be used to predict how well they will communicate and perform within a team because personality traits can affect the way individuals respond to certain situations, communicate with others, and distribute work (Shahrokh, Hales, Phillips, & Yudofsky, 2011). Arguably, programs should aim to select individuals with appropriate traits beforehand and follow up with training on knowledge and technical skills with those who have the personality traits to be successful.

The U.S. military has heavily invested in research for selecting pilots using personality measures to determine who could readily be trained since World War II (Barron, Caretta, & Rose, 2016; Damos, 2011). A commonly used personality tool used in aviation research is the Big Five. The Big Five provides a taxonomy of personality traits classified in 5 simple dimensions commonly known as OCEAN: openness to experience (O), conscientiousness (C), extraversion (E), agreeableness (A), and neuroticism (N) (Juhasz, 2010). Piedmont & Weinstein (1994) defined an individual's predisposition toward negative affect as neuroticism, the amount of determination and motivation towards goal-oriented behaviors as conscientiousness, the degree to which a person seeks out new experiences as openness to experience, the amount and degree of

interpersonal interactions as extraversion, and the range from empathy to hostility these interactions fall on as the level of agreeableness.

The Big Five has been investigated with airline pilots more than any other personality measure. For example, a study by Schutte, Fitzgibbons, & Davis (2004) assessed ninety-three commercial pilots employed by 14 different airlines. Their results indicate commercial pilots, when compared to the general public, report low levels of neuroticism (N), high levels of extraversion (E), average levels of agreeableness (A) and openness (O), and very high levels of conscientiousness (C). Many researchers have also investigated personality traits, such as agreeableness, and how they relate to pilot performance. Specifically relating to communication, the personality trait agreeableness, "the quality of one's interpersonal interactions along a continuum from compassion and altruism to antagonism", has been found predictive of team work (Juhasz, 2010). Individuals with high levels of agreeableness tend to be rated as cooperative team members by their peers because agreeableness is described by caring for a team over individual wants or interests (Juhasz, 2010). While other personality measures exist, most have been underexplored up to this point. However, existing evidence from the Big Five suggest that other measures may be useful.

Hogan Development Survey

The Hogan Development Survey (HDS) might be a helpful tool for identifying communication issues, thereby predicting pilot performance. Unlike the Big Five, the HDS is specifically concerned with personality characteristics that may cause an individual to derail or be unsuccessful at certain tasks. Instead of looking at what makes a pilot successful, the HDS looks at what makes a pilot unsuccessful. These negative

personality characteristics are often referred to as derailing measures of personality and tend to emerge when people find themselves in new or stressful situations, such as flying a plane when something mechanically goes wrong. These "derailers" are extremely important to identify because they can ultimately derail careers regardless of one's individual talent or skill (Hogan & Hogan, 1997). Therefore, it may be helpful to identify aviation students' "derailers" when they enter a program. Conversations and concerns then could be brought up, or specific trainings tailored to meet students' needs.

The HDS outlines 11 scales: excitable, skeptical, cautious, reserved, leisurely, bold, mischievous, colorful, imaginative, diligent, and dutiful. The excitable scale measures how likely an individual may become emotionally volatile or panic under pressure. The skeptical scale measures an individual's level of difficulty in trusting others, the cautious scale looks at those who are conservative and risk averse, the reserved scale identifies those who may be indifferent to others' feelings, the leisurely scale measures levels of cooperativeness and identifies those who are stubborn, the bold scale identifies those who may be arrogant, and the mischievous scale identifies those who are careless about commitments and act impulsively. A high score on colorful may indicate an individual who tends to be dramatic and enjoys being in the spotlight. Individuals considered imaginative tend to be impractical and eccentric, whereas those who are diligent tend to be perfectionists and have difficulty not micromanaging. Similarly, those who score high on the dutiful scale are thought to be respectful but perhaps too eager to please (Hogan & Hogan, 1997).

While each scale shows development areas or "dark sides" to individual personalities, some scales may be more harmful than others in performance depending on

the characteristics necessary to be successful on the job. Based on the literature, it is clear pilots must be able to communicate effectively in stressful situations in order to avoid making fatal mistakes. Therefore, the HDS may be a good measure of personality and indicator of emerging "derailers" that are most dangerous for a pilot to possess. Yet, due to the dearth of research in this area, which derailers are predictive of poor pilot performance remains relatively unknown.

Derailers Related to Pilot Performance

Fitzgibbons et al. (2004) looked at which factors of the Big Five are most commonly found in successful pilots. They concluded that pilots are individuals that are emotionally stable, competent, and demonstrate achievement-striving behaviors. Conversely, pilots were described as being low in anxiety, hostility, and impulsiveness. Although there is little research on the HDS and pilot performance, the literature surrounding the Big Five, such as Fitzgibbons et al. (2004), can be used to predict which scales on the HDS would be most detrimental for an individual entering the field of aviation.

For example, previous research has indicated that agreeableness relates positively to pilot performance (Juhasz, 2010). Most likely, this is because pilots need to be good listeners if they are to be good communicators. The HDS scales bold and leisurely (which demonstrate poor listening, a refusal to consider feedback, and correction) can be used to identify poor communicators. Therefore, high scores on bold and leisurely would arguably negatively relate to pilot performance.

Fitzgibbons, Davis, & Schutte (2004) also found that most successful pilots have low levels of neuroticism. This is most likely because pilots need to keep their cool in

stressful and scary situations. Therefore, derailers that indicate an individual's tendency to act impulsively or panic under pressure would likely be a problem. The excitability factor on the HDS may therefore negatively relate to performance in this case, because those who are excitable are going to be more likely to panic under pressure and make careless mistakes. Similarly, the mischievous factor on the HDS, may also negatively relate to performance as it identifies those who tend to act impulsively.

High-performing pilots have also been found to contain very high levels of conscientiousness (Fitzgibbons, Davis, & Schutte, 2004). This is most likely because highly conscientious pilots tend to be good at following directions and rules. Therefore, due to the perfectionist nature of diligent individuals and the risk-aversion of cautious individuals, those who score higher on the scales cautiousness and diligence may be better pilots than those who score low because risk-averse and rule following individuals may be less likely to make careless mistakes under pressure.

Therefore, based on the literature, the present study puts forth the following hypotheses:

H1: Scores on Bold and Leisurely will negatively correlate with pilot performance.

H2: Scores on Mischievous and Excitable will negatively correlate with pilot performance.

H3: Scores on Diligent and Cautious will positively correlate with pilot performance.

Method

Participants

Twenty-seven pilot students from the Aviation Departments of two Midwestern universities were recruited to participate in research during the 2016 – 2017 school year.

Measures

Hogan Development Survey

The Hogan Development Survey (HDS) was used to detect where participants fall on the scales of excitable, skeptical, cautious, reserved, leisurely, bold, mischievous, colorful, imaginative, diligent, and dutiful. This measure contained 11 scales, each with 14 items, plus 14 additional items to check for social desirability, resulting in 168 items total. Each item asked the respondent to indicate if each item was true/false. See Table 1 for sample items from each factor.

Table 1

HDS Factors and Example Items

HDS Factor	Example Item
Excitable	I frequently argue with my family and friends.
Skeptical	Some people have treated me in ways that I can never forget.
Cautious	I feel awkward around strangers.
Reserved	Other people's problems don't concern me.
Leisurely	It doesn't hurt others at work to wait for me.
Bold	I am destined for greatness.
Mischievous	At work I often act on impulse.
Colorful	I must admit that I like to show off.
Imaginative	People think I am something of a character.
Diligent	It bothers me when others don't proofread their work.

Grade Point Average

Fall 2016 GPA , on a scale of 0.00 – 4.0, was gathered from the Office of Institutional Research, Planning and Assessment (IRPA) at MNSU and through the director of the aviation program at KSU for all participants to assess whether scales on the HDS predict differences in GPA. Student cumulative GPA was used as a measure of student performance in their respective collegiate aviation programs.

Procedure

The Hogan Development Survey was administered to students both in the fall and spring semesters. The survey was proctored through the online survey software, Qualtrics,

and Hogan Assessment Systems. Before completing the Hogan Development Survey, participants were asked to give permission to the researchers to look at their GPA information. After completion of the Hogan Development Survey, students were asked if they would like to enter their name and email address into a drawing to win one of four Amazon $25 gift-cards. After data has been collected from the Hogan Development Survey, performance data (student GPA) was collected during the first week of March.

Results

Of the original 27 responses, a selected number (n= 3) were deleted. Deleted responses included individuals who provided incomplete data. After omitting these cases, the final number of valid responses gathered was 24.

Hypothesis 1 stated scores on bold and leisurely would negatively relate with pilot performance (student cumulative GPA). A linear regression indicated bold scores have a small beta weight when predicting pilot performance (β= .10, p=.32). Observed leisurely scores to have a small beta weight when predicting pilot performance (β= .13, p=.27). In this sample, scores on bold and leisurely were not related to the performance measure.

Hypothesis 2 stated scores on mischievous and excitable would negatively relate with performance. This was tested with a linear regression and was not supported. A linear regression observed excitable scores to have small beta weight when predicting pilot performance (β= -.18, p=.19). Therefore, scores on excitable were not related to the performance measure. A linear regression observed mischievous scores to have moderate substantial beta weight when predicting pilot performance (β= -.22, p=.15). This substantial effect size indicates there could be a negative relationship between mischievous and pilot performance, but the present sample is too small for the

relationship to reach statistical significance.

Hypothesis 3 predicted scores on diligent and cautious would positively relate with performance and was not supported. A linear regression observed scores on cautious to have a substantial beta weight when predicting pilot performance (β= -.34, p=.052). Surprisingly, this beta weight suggests scores on cautious negatively relate with performance. A linear regression also observed scores on diligent to have a substantial beta weight when predicting pilot performance (β= .24, p=.13). Overall, these effect sizes indicate there could potentially be a relationship between scores on diligent and cautious and the performance measure, but the present sample is too small for the relationship to reach statistical significance.

Additional Relevant Analyses

Exploratory analyses were conducted to provide additional support to the hypotheses. To evaluate the predictors that were most valuable for predicting pilot performance, a step-wise regression was conducted using the Hogan Development Survey scales of skeptical, reserved, colorful, imaginative, and dutiful. The results of this analysis indicated that there was no relationship between any one of the scales and the performance measure. However, the analysis observed scores on skeptical (β= -.25, p=.12), reserved (β= -.27, p=.10), and imaginative (β=-.24, p=.13) to have a substantial beta weights when predicting pilot performance. These effect sizes indicate there could potentially be a relationship between scores on skeptical, reserved, imaginative, and the performance measure, but the present sample is too small to observe a significant relationship.

Discussion

Hypothesis 1 stated scores on bold and leisurely would negatively correlate with pilot performance (student cumulative GPA). This was not supported. Scores on bold and leisurely were not related to the performance measure.

Hypothesis 2 stated scores on mischievous and excitable would negatively correlate with performance. This was not supported. In this sample, scores on mischievous and excitable were not related to the performance measure. However due to the substantial beta weight associated with scores on mischievous, it is plausible that scores on mischievous negatively correlate with performance but the sample is too small to observe a statistically significant relationship.

Hypothesis 3 stated scores on diligent and cautious would positively correlate with performance. This was not supported. In this sample, scores on diligent and cautious were not related to the performance measure. However, the effect size of both diligent and cautious in predicting performance suggests that with further data collection a significant effect may be observed. The effect size of diligent indicates some support for Hypothesis 3 in that it indicates a non-significant but positive relationship with the performance measure. However, the effect size of cautious surprisingly suggests there may be a negative relationship between scores on cautious and pilot performance. This could be because even though high-performing pilots have been found exhibit very high levels of conscientiousness, they may not be as risk-adverse because they have also been found to possess low levels of anxiety (Fitzgibbons, Davis, & Schutte, 2004). It is, therefore, plausible that those who score high on cautious, would also contain higher levels of anxiety and therefore not be able to think as clearly or perform as well as other

pilots.

Although additional exploratory analyses were conducted, no relationships were found between any of the Hogan Development Survey scales and pilot performance. However, the effect size of both the skeptical, reserved, and imaginative scales suggest with further data collection a significant negative relationship may be observed. Therefore, future research should consider investigating these three scales further.

Overall, the results did not support any of the three original hypotheses. Limitations of this study include small sample size and incomplete data. Although 84 students signed the consent form and agreed to participate, only 27 finished the Hogan Development Survey. Of those 27 participants, only 24 provided sufficient data to be analyzed. It is recommended that future researchers recruit more participants and perhaps be more clear and concise in the instructions given to complete the HDS.

A second limitation is the performance measure. For this study, cumulative GPA was used as a measure of performance due to the practicality of collecting data from 250 aviation students. However, students ranged in years of experience and number of courses. In fact, some students had not been in their programs long enough to earn a cumulative GPA and therefore had to be excluded from analysis. Additionally, the researchers intended to investigate personality characteristics that would derail pilot performance. However, by using GPA as the performance measure, it may be more appropriate to say the researchers investigated how personality characteristics derail aviation students in academia. In short, how the personality of aviation students derails their study habits may have been tested more so than their ability to become a pilot. Therefore, GPA may not have been the best measure of pilot performance. Future studies

are recommended to examine how personality might relate more directly to pilot performance rather than in the classroom. For example, longitudinal studies looking at whether or not students become successful pilots after graduation may be a better measure of performance in the future.

It is important for researchers to further investigate the personality characteristics that make a student successful in aviation programs and trainable for commercial roles due to the current and increasing shortage in military pilots and retirement rates. Future research could also help aviation college programs understand characteristics that can derail aviation students when designing their training programs. Therefore, further research should be conducted to further investigate how the following HDS scales directly relate to pilot performance: skeptical, cautious, mischievous, reserved, imaginative, and diligent. This specific recommendation is based on the large effect sizes each scale yielded in this small sample of aviation students.

References

Barron, L. G., Carretta, T. R., & Rose, M. R. (2016). Aptitude and trait predictors of manned and unmanned aircraft pilot job performance. *Military Psychology, 28*(2), 65-77. doi:10.1037/mil0000109

Carretta, T. R. (2000). U.S. Air Force pilot selection and training methods. *Aviation, Space, and Environmental Medicine*, *71*(9), 950-956.

Crossing the Line. (2004, April). *Callback*, 295.

Chidester T. R., Helmreich R. L., Gregorich S. E., & Geis, C. E. (1991). Pilot Personality and Crew Coordination: Implications for training and selection. *The International Journal of Aviation Psychology*, *1*(1), 25-44.

Connolly, T. J., & Blackwell, B. B. (1987). A simulator-based approach to training in aeronautical decision making. In R. S. Jensen (Ed.), *Proceedings of the Fourth International Symposium of Aviation Psychology*, (pp. 251-257). Columbus: Ohio State University.

Cooper, G. E., White, M. D., & Lauber, J. K. (1979). *Resource management on the flight deck* (NASA Conference Publication No. 2120; NTIS No. N80-22083). Moffett Field, CA: NASA-Ames Research Center.

Damos, D. L. (2011). A summary of the technical pilot selection literature. *Defense Technical Information Center*. Retrieved from http://www.dtic.mil/docs/citations/ADA553707

Federal Aviation Administration Academy. (2002). International journal of applied aviation studies. Retrieved from http://hdl.handle.net/2324/1120916*

Federal Aviation Administration (2004). Crew resource management. Advisory Circular 120-51E. Washington, D.C. Fitzgibbons, A., Davis, D., & Schutte, P.C. (2004). *Pilot personality profile using the NEO-PI-R*. NASA Center for Aerospace Information.

Flight Safety Information (2004). Language proficiency requirements. *Flight Safety Information Quarterly Journal*. Retrieved from http://www.fsinfo.org/docs/FSI%202Q04.pdf

Gao, Y., & Kong, S. (2016). Personality types of pilot students: A study of an australian collegiate aviation program. *International Journal of Aviation, Aeronautics, and Aerospace*, *3*(3). doi:10.15394/ijaaa.2016.1130

Hendrickson, S. M. (2009). *The wrong wright stuff: Mapping human error in aviation* (Unpublished doctoral dissertation). The University of New Mexico, Albuquerque, New Mexico.

Hogan, R. & Hogan J. (1997). *Hogan development survey manual.* Tulsa, OK: Hogan Assessment Systems Inc.

Juhász, M. (2010). Influence of personality on teamwork behaviour and communication. *Periodica Polytechnica Social and Management Sciences, 18*(2), 61. doi:10.3311/pp.so.2010-2.02

Kern, T. (Ed.). (2001). *Culture, environment, and CRM* (Vol. 10). McGraw Hill Professional.

Karp, M. R. (2000). University aviation education: An integrated model. *Collegiate Aviation Review, 18*(1), 1. Retrieved from http://search.proquest.com/docview/861325185

Luedtke J. R. & Papazafiropoulos I. (1996). Retention in collegiate aviation. *Journal of Air Transportation World Wide, 1*(1).

Monan, W. P. (1988). *Human factors in aviation operations*. Washington, DC: U.S. Department of Commerce.

Neuman, G. A., & Wright, J. (1999). Team effectiveness. *Journal of Applied Psychology, 84*(3), 376-389. doi:10.1037/0021-9010.84.3.376

Krivonos, P. D. (2007, June 9). Communication in aviation safety: Lessons learned and lessons required. *2007 Regional Seminar of the Australia and New Zealand Societies of Air Safety Investigators Presentation.* New Zealand.

Piedmont, R., & Weinstein, H. (1994). Predicting supervisor ratings of job performance using the NEO personality inventory. *The Journal of Psychology*, *128*(3), 255-265.

Salas, E., Fowlkes, J. E., Stout, R. J., Milanovich, D. M. and Prince, C. (1999). Does CRM training improve teamwork skills in the cockpit? Two evaluation studies. *The Journal of the Human Factors and Ergonomics Society*, *4*, 326–343.

Sexton J. B. & Helmreich R. L. (2000). Analyzing cockpit communications: The links between language, performance, error, and workload. *Journal of Human Performance in Extreme Environments*, *5*(1), 6. doi: 10.7771/2327-2937.1007

Shahrokh, N. C., Hales, R. E., Phillips, K. A., & Yudofsky, S. C. (2011). The language of mental health: A glossary of psychiatric terms. (1st ed.). Arlington: American Psychiatric Publishing, Inc.*1st ed or Ed?

United States Government Accountability Office. (2014). Aviation workforce: Current and future availability of airline pilots (Report No. 14-232). Washington D.C.: GAO.

Weick, K. (1990). The vulnerable system: An analysis of the Tenerife air disaster. *Journal of Management*, *16*, 571-593.

Wiener, E. L., Kanki, B. G., & Helmreich, R. L. (Eds.). (2010). *Crew resource management*. San Diego: Academic Press.