

SUCCESSFUL WOMEN IN AVIATION: THE EFFECT OF MENTORING

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A Dissertation

Submitted to the Graduate Faculty
of the
University of North Dakota
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

Grand Forks, North Dakota
January
2017

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ACKNOWLEDGEMENTS

The list of people who have made this undertaking possible is long. First and foremost I need to thank my committee. Without their unwavering support and guidance this project would have failed before it ever began. You are my role models and I could wish for none better.

Next I need to thank my family. Specifically I want to thank the women in my life who have kept me grounded and moving forward during the last fifteen years. I would not have made it without your guidance and support.

This study would have been nearly impossible without the help of Kathryn McCullough and The International Society of Women Airline Pilots. Kathryn has been a great supporter and it is the women of this organization who comprise the majority of this study's participants.

Finally I would like to thank two people who have exemplified the mentor's role in my life and career. Dr. Kim Kenville has been a friend, colleague, confidant, and cheer leader. If I have enjoyed any success during my time at UND, it is because she was behind me helping make those opportunities possible. Likewise Dr. Warren Jensen has been a steadfast proponent and ally. He has freely given of his time, talent, and expertise. His insistence that I could do things "just a little bit better," has forced me to reject being merely good enough, for something far worthier.

To

Adam, Anthony, Jeffrey, Angel, Chandler, Noah, Seth, William and James

Anything is possible if you simply refuse to quit

ABSTRACT

Women have been a part of aviation since its inception, yet they have been traditionally underrepresented in the ranks of commercial pilots. This study explored what effect mentoring played in the lives and careers of successful women aviators. Using women who possess an Airline Transport Pilot (ATP) certificate or international equivalent as the benchmark for success, participants completed a modified version of the Mentor Role Instrument (MRI) developed by Ragins and Cotton. Responses to the online survey were used to determine if there was any statistically significant difference between those women who had participated in a mentoring relationship and those who had not. Additionally, the responses were compared between those who had participated in a formal mentoring relationship and those whose mentoring relationship was more informal in nature.

It was determined that there was no statistically significant difference between women who had been mentored and those who had not. Of those women who had been mentored, the pilots who were in an informal mentoring relationship were more satisfied with almost all facets of the mentoring relationship than those who had been in a more formal type of mentoring relationship. There exists a gray area in the data regarding interpersonal relationships and feelings of acceptance. While a preponderance of the evidence points towards the participants favoring an informal mentoring arrangement, the evidence is not conclusive.

CHAPTER 1

INTRODUCTION

JM is a commercial pilot for a well-known corporate flight department. During her career she has amassed over 20,000 total flight hours; the vast majority of which are in turbine engine (jet) aircraft. When JM was a junior in High School, she went to see her guidance counselor about college. When the female counselor asked what JM wanted to be she replied, “A pilot.” The counselor laughed.

Even though these events occurred over thirty years ago, JM can still remember the shame she felt at her counselor’s response. As a result she spent her freshman year in college studying computer programming, a topic she enjoyed but had no passion for.

Fortunately, a friend took JM to meet with a professor from the flight department who dispelled her myths and set her on the road to professional success. JM’s story is not unique. Aviation is gendered almost entirely male, and the idea of a woman on the flight deck remains strange for many people; even today.

Statement of the Problem

Women are grossly underrepresented in aviation. Women comprise only 5.12% of all commercial airline pilots in the United States (Goyer, 2016). “Today, 4.1 percent of airline transport pilots (ATPs) are women, 2.7 percent are black or African American, 2.5 percent are Asian and 5 percent are Hispanic or Latino” (Zirulnik, 2014). Despite over a century of industry involvement by women, the “field of aviation and other technical occupations has remained somewhat immune to the changing gender roles” (Germain, Ronan Herzog, & Rafferty Hamilton, 2012, p. 436).

This gender gap has long-term consequences for aviation. Because of unprecedented growth in global markets, and the aging of the baby boomer generation, Giovanni Bisignani, Director General and CEO of the International Air Transport Association predicts “the world's airlines may need as many as 17,000 new pilots per year to keep pace with growth and the number of pilots hitting retirement age” (Michels, 2007 n.p).

In commercial aviation, a bachelor’s degree is usually required for consideration as a professional pilot with a major or regional air carrier. “Today females constitute the majority of higher education students ... female students represented 57.4 percent of all students receiving a bachelor’s degree and 62.6 percent of students receiving a master’s degree” (Leavey, 2016, p. 8).

The implications are obvious: it will be very difficult to meet the future demands of the aviation industry without a greater representation of women. “If women do not engage in Science, Technology, Engineering, and Math (STEM) education and persevere toward STEM careers, then the STEM capable workforce’s potential will be limited ... Increased female representation in STEM is necessary to remain competitive in the global marketplace” (Leavey, 2016, p. 11).

Statement of Purpose

One possible intervention to increase the number of women in aviation is mentoring. This research will explore what effect mentoring has played in the lives of successful women aviators. The benefits of a positive mentoring relationship have been well documented (Allen, Eby, O’Brien, & Lentz, 2008; Kram, 1985; Ragins, 2012; Ragins & Cotton, 1999; Scandura, 1998). They include more promotions, higher wages, greater job satisfaction, and an increased sense of confidence and well-being by the protégé. Mentoring has also been shown to increase

recruitment and retention among underrepresented populations in traditionally male dominated industries (Johnson & Andersen, 2010; Leavey, 2016).

Background

Women Aviators

Women have played an active role in aviation from the very beginning. Katherine Wright, sister of Orville and Wilbur Wright, helped finance “man’s” first flight (Luedtke, 2011, p. 2). Without her financial backing, it is doubtful the Wright Brothers would have been the first to achieve powered, heavier than air flight.

Blanche Stuart Scott became the first woman in the United States to solo an aircraft in 1910 (Freydberg, 1998). On April 16, 1912, Harriet Quimby, “the first American woman to hold a pilot’s license,” climbed into the flight deck of a fifty-horsepower monoplane and flew across the English Channel (Jaros, 1993, p. 15). Bessie Coleman became the first African American of either sex to receive an International Pilot’s License in 1922. She toured the country giving performances until her untimely death in 1928 (Creasman, 1997).

The late 1920s and 1930s were defined by Amelia Earhart. She embodied “what women were trying to prove by their flying: flying is safe and women make good pilots” (Luedtke, 2011, p. 5). She was the first woman to fly across the Atlantic Ocean (1928) and the first president of the “Ninety Nines,” an organization of female pilots that advanced the cause of women in aviation. The disappearance of Earhart and her navigator in 1937 continues to capture the public’s imagination eighty years later.

In 1932 Ruth Nichols became the first woman hired as a pilot for commercial passenger flights. She flew for New York Airways, a feat that would not be repeated until 1973 (NASA, 2014).

During World War II over 1000 women served in the Women Airforce Service Pilots (WASP), ferrying aircraft, towing targets, and providing flight instruction. Thirty Eight of these women made the ultimate sacrifice (Luedtke, 2011). Following World War II, Jackie Cochran, the driving force behind the WASP's became the first woman to break the sound barrier on May 20, 1953. Chuck Yeager, the first man to break the sound barrier, followed Cochran in the chase plane (Gant, 2016). Cochran was not finished. In 1961 she set two world altitude records in the T38 (NASA, 2014).

Also in 1961, A group of women aviators, known as the Mercury 13, “underwent and passed the same physical and psychological exams that were given to the Mercury 7 male astronauts.” Unfortunately none were chosen to participate in the program. NASA was afraid that an accident resulting in the death of a female astronaut would lead to such a public outcry that it could derail the space program (DOT, 2016).

In 1964 Jerrie Moch became the first woman to fly around the world. She completed the 22,860 mile trip in 29 days flying a single engine Cessna 180 (Gant, 2016; NASA, 2014). In 1973 Emily Howell and Bonnie Tiburzi became the first female pilots for a major airline flying jet engine passenger aircraft (NASA, 2014).

On 12/5/1991, President Bill Clinton removed the last remaining statutory prohibition against women pilots when he signed Public Law 102-190, the National Defense Authorization Act for Fiscal Years 1992 and 1993, which Repealed “Air Force and Navy and Marine Corps provisions which prohibit the assignment of female members to combat aircraft” (*National Defense Authorization Act for Fiscal Years 1992 and 1993*, 1991). Finally in 1995, as a member of STS-63, Eileen Collins became the first woman to pilot a Space Shuttle (“STS-63,” 2011).

A Man's World

These accomplishments all occurred against a backdrop of undisguised hostility towards women aviators. Since its inception, aviation has been viewed as a man's world. Despite their sister's financial backing, the Wright brothers refused to train women (Jaros, 1993). Similarly, Glenn Curtis had to be bribed to take Blanche Stuart Scott as his first and only female student. Believing women were unfit for flight, Curtis modified Scott's aircraft to make it un-flyable, restricting her to ground runs and taxi tests. Not to be deterred, and with the help of a Curtis mechanic, Scott removed the modifications and on September 2, 1910, "managed to fly to an altitude of 12 meters (40 feet) in the air" (Cochrane & Ramirez, 2016).

Even though Curtis did not believe women were physically or mentally suited to be pilots, he was not above using their novelty to sell his products. In the 1920s and 1930s, aviation was in a period of transition. Air travel had been proven to be safe and reliable, yet the public remained skeptical. Even though they were fascinated with airplanes, many people simply refused to fly. "Nothing impresses the safety of aviation on the public quite so much as to see a woman flying an airplane," observed Bendix Trophy (Air Racing's biggest prize) winner Louise Thaden. If a woman can handle it, 'the public thinks it must be duck soup for men'" (Corn, 1979, p. 559). This undisguised misogyny was the morass early women pilots had to navigate in order to fly professionally.

The story of Bessie Coleman provides another, even more disturbing example of this institutionalized animosity. Born in Texas during the waning days of the nineteenth century, Elizabeth "Bessie" Coleman had to overcome three distinct disadvantages in order to realize her dream of flying: she was poor, she was a person of color, and she was a woman. The daughter of

illiterate sharecroppers and the children of slaves, Bessie began work at a very early age to help support her family. The small one room school house in the rural Texas town where she grew up only went to the eighth grade, but Bessie persevered and graduated from High School, something almost unheard of for an African American woman in the Jim Crow South (Creasman, 1997).

Bessie developed a fascination with aviation after listening to her brother describe the exploits of early aviators over the battlefields of Europe. “Dishearteningly, she was not allowed to enroll in a aviation school in the United States. The Jim Crow segregated schools only catered to white men and a few white women claiming, ‘there was no room for black birds in the sky over America’” (Creasman, 1997, p. 159).

In 1920 Bessie Coleman met Robert S. Abbot, a prominent newspaper publisher in Chicago. With the help of Abbot and several other wealthy philanthropists, Coleman went to France in 1921 to learn to fly, “In 1922, Bessie Coleman earned her international pilot's license and became the first African-American pilot in the world and the first American granted an international license” (Creasman, 1997, p. 159).

Bessie Coleman was more than a ground breaking female aviator, she was also a tireless advocate for social justice. Given the segregated nature of the Jim Crow South, it was common practice for white and African American customers to enter through separate gates at any public gathering. Bessie Coleman rejected this practice and would only perform her airshow routine if all customers were allowed to enter through the same gate. It is a testament to her commercial appeal that organizers throughout Texas complied with her demands (Creasman, 1997).

Gender norms are neither accidental nor biological (Hinojosa, 2010). Gender beliefs and biases are used to enhance and propagate the status quo. They are a form of social control. In 1930s America, male hegemony remained the norm. Nowhere is this more evident than in the

history of the Women's Airforce Service Pilots (WASP). In the late 1930s, as the United States and Europe ran headlong towards another world war, pilot shortages were acute. Yet, despite the critical need, the idea of women pilots contributing to the war effort was rejected out of hand. Even with powerful supporters such as Air Force Chief of Staff General Henry "Hap" Arnold, and First Lady Eleanor Roosevelt, denizens of the status quo prevailed. Among the ideas' many detractors were "the heads of various commands as well as hide-bound civilian bureaucrats whose built in prejudices and endless objections ranged from outright contempt, to nitpicking minor adjustments concerning hours, age, and experience in certain horsepower ratings" (Mizrahi, 2001, p. 41).

In the middle of this volatile mixture of military necessity and social conservatism was Jaqueline Cochran, an aviator who in the late 1930s held more flying records than any living human being, male or female (Mizrahi,2001). To demonstrate the utility of using women pilots to ferry aircraft, and thereby freeing up male aviators for combat duty, Cochran offered to fly one of the Lockheed Hudson bombers across the Atlantic to England. Before being allowed to undertake the mission, Cochran had to undergo a flight test in the aircraft. She was "subjected to what amounts to a humiliating inquisition by an instructor pilot who has no use for women in the cockpit. Cochran quickly disabused him of this attitude, greasing all eight touch and go landings before being granted permission to fly the Hudson across the ocean" (Mizrahi, 2001, p. 42). In England Cochran met with a cadre of female British pilots who were used to ferry aircraft for the Royal Air Force (RAF). It was this meeting that helped solidify her ideas for a similar program in the U.S.

In June of 1941 the Air Corp become the Army Air Force, complete with its own staff. The need for pilots during this time was crushing, and predicted to get worse. Ferry Command

was ordered to expand seven fold to meet the needs of Lend Lease and the general mobilization beginning to happen in the U.S. General Arnold asked Jackie Cochran how many women pilots could be brought into the war effort. Of the 3000 women pilots on rolls of the Civil Aviation Authority in 1941, less than 100 would qualify as ferry pilots. In addition to using those pilots who were already qualified, Cochran proposed a complete training system, along military lines, to help meet the staggering need (Merryman, 1998).

Cochran's initial plans were rejected, due in no small part to Cochran's dominating personality, and the continued belief that women did not belong on the flight deck (Mizrahi, 2001, p. 51). "The existence of a military unit populated entirely by female pilots ran counter to popular assumptions regarding the capabilities and limitations of women, and the presence of women as pilots of military planes questioned assumptions of masculinity. Because of this, efforts by the Army Air Forces to militarize the WASPs met fierce resistance" (Merryman, 1998, p. 4).

After the United States entered World War II in December, 1941, the preexisting pilot shortage became a matter of national security. "Brand new planes were piling up at the factories. Runways were so crowded, and male delivery pilots so overworked, that there was no place to store the overflow. Unless something was done to supply new pilots, and soon, the delivery pipeline would shut itself down, strangled by its own prodigious output" (Mizrahi, 2001, p. 53).

The WASP program under Cochran's leadership officially began in June, 1942. However, they were not members of the Army Air Force, they were a civilian auxiliary, the only auxiliary from any service not militarized. Furthermore, the problems that had plagued the concept since the beginning did not disappear once it was legitimized. In many ways they intensified (Cornelsen, 2005; Merryman, 1998).

At Love Field in Dallas, Texas, the commanding officer was officially reprimanded for the unfair treatment the female aviators received at the base (Cornelsen, 2005). Likewise,

The WASP encountered more discrimination by far at Camp Davis in North Carolina than at other bases. When the women arrived, the base commander, Major Stephenson, told them pointedly that both they and the planes were expendable. His obvious dislike for women in the military was usually imitated by the men under his command ... The WASP were routinely assigned inferior planes that were later found to have been improperly maintained. There were suspected incidents of sabotage at Camp Davis, and two women died while on duty there. At one WASP crash site, Jackie Cochran found traces of sugar in the engine, but opted to avoid an investigation for fear that a scandal would ensue that could end the WASP program (Cornelsen, 2005, p. 114).

While there may have been many reasons for the animosity the WASPs faced, the idea that aviation is a decidedly masculine undertaking cannot be overstated.

Although women have been active participants in all wars in which the United States has been involved, and although all branches of the U.S. military had women's auxiliaries in World War II, the WASP program remained unique because all of the women who served were pilots; thus they all served in positions desired and admired by men ... By taking on roles and missions previously associated with the masculine, WASPs challenged assumptions of male supremacy in wartime culture (Merryman, 1998, pp. 2–3).

The belief that flying is the domain of men dogged female aviators following the war. Cochran herself lamented this fact when she said,

I don't believe many women will be used actively in aviation after the war because there will be too many pilots available to the aviation companies who will need jobs. Airlines, too, will consider the hazards of hiring women who may marry and have to take time out to have children. Flying is nothing you can put on the shelf for six or eight months and then take up again (Merryman, 1998, p. 117).

Cochran's words were prophetic. Commercial air travel skyrocketed following World War II, yet the only female crewmembers were flight attendants. It was not until the 1970s and 1980s that women began to enter the ranks of commercial pilots in any appreciable numbers (Luedtke, 2011). According to Mitchell & Kristovics, (2006) this is because "Female pilots inhabit a profession steeped in patriarchal systems of dominance involving organizational power and labour" (p. 35).

The last major regulatory barrier facing women pilots came down when President Clinton signed Public Law 102-190 in 1991. This law repealed the statutes prohibiting women from flying combat aircraft and serving on combatant ships. In spite of the misgivings of hard line exclusionists, the United States military was steadily moving towards a more inclusive posture. As with earlier attempts to integrate women into combat arms, this move was met with derision as well as overt and subtle attempts at sabotage (Sagawa & Campbell, 1992).

The military is the prototypical male – masculine – institution (Bristor & Fischer, 1993; Sagawa & Campbell, 1992; Weber, 1995; Wechsler-Segal, 1995). As such, it has consciously defined itself by repudiating all things female. In keeping with this misogynistic outlook, not

only is masculinity defined in opposition to femininity, but that which is masculine must subordinate that which is feminine (Stein, 2005).

Culture and gender work together to provide a mechanism for social control. The dual constructs of masculine and feminine and the enforced behaviors associated with each, act to maintain the status quo. Masculine behavior is often defined in opposition to that which is considered feminine. This antagonistic system results in those traits that are considered masculine being more highly valued – superior – to those deemed feminine. In this way institutionalized patriarchy is maintained.

Even though legislative barriers have been removed in both civilian and military life, there remain vestiges of the old order. While these will disappear with time, they remain powerful influences on not only aviation, but society as a whole.

Moving Forward

Despite a long history of institutionalized misogyny, sabotage, and subtle violence, women aviators have endured and prospered. That said, their underrepresentation poses a potential problem for the industry. So rather than lament what has gone, a more important question is: What are we going to do about it? How do we increase the number of women involved in aviation?

One possible way to address the underrepresentation of women in aviation is mentoring. In both formal and naturally occurring relationships, mentoring has been shown to attract and retain underrepresented populations (Johnson & Andersen, 2010; Leavey, 2016).

To this end, this research seeks to answer three fundamental questions regarding the mentoring relationship as it pertains to successful female aviators: does the mentoring relationship improve the protégés self-identified feelings of success? Is informal mentoring more

effective than formal mentoring in promoting a protégé's feelings of confidence? Finally, are formal mentoring relationships more adventitious than informal relationships when it comes to career advice and advancement.

Research Questions

Null Hypothesis (N0): Mentoring plays no role in the development of successful women in aviation

Hypothesis # 1 (H1): Informal mentoring is more effective than formal mentoring in enhancing the protégé's feelings of confidence.

Hypothesis # 2 (H2): Formal mentoring results in more career oriented advice and assistance than informal mentoring.

Summary

The reason women remain underrepresented in aviation despite changing legal and cultural norms is multifaceted and complex. Aviation has always been a male dominated endeavor. One explanation that cannot be ignored is young girls and women simply do not see themselves on the flight deck. Another, less studied factor may be the sense that to compete in a male dominated industry, a woman must hide or mask her femininity.

One possible intervention to increase recruitment and retention of women in aviation is mentoring. This research seeks to understand what role, if any mentoring has played in the life of successful female aviators.

CHAPTER II

LITERATURE REVIEW

The term mentor comes from Greek mythology. In Homer's *Odyssey*, Mentor was the servant of King Odysseus who was entrusted with the education of his son, Telemachus, when Odysseus left to fight the Trojan War. "Mentor was described as providing both wise and sensitive counsel to the son to groom him to become king" (Russell & Adams, 1997, p. 1).

Today, the term mentoring "implies a relationship between a young adult and an older, more experienced adult that helps the younger individual learn to navigate in the adult world and the world of work. A mentor supports, guides, and counsels the young adult as he or she accomplishes this important task" (Kram, 1985, p. 2). The purpose of this literature review is to provide the theoretical framework and background information necessary to place this study in context. In short, does being part of a mentoring relationship improve a woman aviator's self-confidence and feelings of success?

Theoretical Framework

Kathy E. Kram is a Professor (Emeritus) at the Questrom School of Business at Boston University. Her 1985 book, "Mentoring at Work: Developmental Relationships in Organizational Life," is considered one of the groundbreaking studies on the topic of mentoring in the workplace (Lentz & Allen, 2009; Ragins, 2012a; Ragins & Cotton, 1999; Scandura, 1998). Her original work forms the basis for much of the research that has followed.

Kram, (1985) divides the mentoring relationship into four distinct phases: Initiation, Cultivation, Separation, and Redefinition.

During initiation, the mentor and protégé select one another, and initial interactions involve learning the other's style and working habits. During

the cultivation phase, career and psycho-social mentoring functions peak and learning accrues to both mentor and protégé. Protégés gain valuable knowledge from the mentor, and mentors gain the loyalty and support of the junior person, as well as a sense of well-being from being able to pass on knowledge to the next generation of managers. During the separation phase, the relationship ends, often due to geographical separation. Finally, the redefinition phase is often marked by the mentor and protégé relationship, becoming more like a peer friendship (Scandura, 1998).

Levinson, Darrow, Klein, Levinson, & McKee (1974) describe the progression of the relationship this way

In the usual course, a young man initially experiences himself as a novice or apprentice to a more advanced, expert, and authoritative adult. As the relationship evolves, he gains a fuller sense of his own authority and his capability for autonomous and responsible action. The young man increasingly has the experience of “I am” as an adult, and the relationship becomes more mutual” (p. 99)

Career Development

Kram (1985) identified two main areas mentors intervene for their charges: career development and psychosocial support. Under this model, each of these categories can be further subdivided into distinct behaviors. Career development functions are those that “help protégés learn the ropes and facilitate the protégé’s advancement in the organization” (Ragins & Cotton, 1999, p. 530). Behaviors associated with career development include:

1. **Sponsorship**, or providing growth opportunities for the protégé. It is important to not confuse this important mentoring function with a free ride. The mentor may open the door, but it is the protégé's responsibility to prove themselves (Adams, 1997).
2. **Coaching, teaching and guiding.** The mentor instructs the protégé in specific skills needed to succeed within the organization as well as some of the organization's "unwritten rules" so that the protégé may avoid embarrassment later.
3. **Increased exposure and visibility with the organization.** Closely related to sponsorship, the mentor insures the protégé sees and is seen by decision makers within the organization. By doing so the protégé becomes known as an individual.
4. **Protection.** The mentor acts as a buffer between the organization and the protégé. In doing so the mentor creates an "environment where the protégé can make mistakes without losing self-confidence. This important aspect makes it easier for the protégé to make decisions when faced with uncertainty" (Adams, 1997, p. 6).
5. **Providing challenging assignments.** Closely related to sponsorship and exposure, the mentor provides opportunities for the protégé to succeed in challenging and beneficial assignments. These successes are then brought to the attention of decision makers within the organization.

Psychosocial Support

Psychosocial support are those behaviors that address interpersonal aspects of the mentoring relationship and “enhance the protégé’s sense of competence, self-efficacy, and professional and personal development” (Ragins & Cotton, 1999, p. 530). Unlike career development functions, psychosocial support does not rely on the mentor’s position within the organization. Rather, it is dependent upon the quality of the interpersonal relationship between mentor and protégé. Behaviors associated with psychosocial support include:

1. **Acceptance and Confirmation.** The mentor helps the protégé develop their professional self.
2. **Counseling.** The mentor assists with problem solving and acts like a sounding board for the protégé. The mentor provides a safe place to express ideas and frustrations while receiving concrete advice and options.
3. **Friendship.** Giving respect and support.
4. **Role Modeling.** The mentor acts as a guide, someone who the protégé can emulate while they are forming their own sense of their professional self.

The Mentoring Relationship

Mentoring functions “differentiate developmental relationships from other work relationships” (Kram, 1985, p. 22). Career functions assist the protégé to advance within the organizational hierarchy. “Career functions are possible because of the senior person’s experience, organizational rank, and influence in the organization ... [it is the mentor’s position] that enables him or her to provide sponsorship, coaching, and exposure and visibility to help a junior colleague navigate effectively in the organizational world” (Kram, 1985, p. 23).

In contrast, psychosocial support is not position dependent. Rather it relies upon a “relationship that fosters mutual trust and increasing intimacy” (Kram, 1985, p. 23). The quality of this relationship allows the protégé to identify with the mentor and “find a model who the younger would like to become” (Kram, 1985, p. 23). Psychosocial support “enhances an individual’s sense of competence, identity, and effectiveness in a professional role” (Kram, 1985, p. 32).

As Johnson and Ridley (2008) put it, “In mentorship, where the stakes are high and the pressure to succeed is intense, there can be no shortage of affirmation. If you could do only one thing as a mentor, affirm your protégés ... Affirmation is an artful blending of personal acceptance and professional endorsement. When mentors affirm their protégés, they communicate an unequivocal belief in the protégé (p. 11, 12).

Both functions are important for the protégé’s advancement. “Mentoring scholars have also discovered that different mentoring functions predict different protégé outcomes: Career functions are a stronger predictor of protégés' compensation and advancement, while psychosocial functions have a stronger relationship with protégés' satisfaction with the relationship. However, both career and psychosocial functions predict protégés' job and career satisfaction” (Ragins & Kram, 2008, p. 4).

Formal vs Informal Mentoring

Mentoring relationships also tend to fall into two broad categories: formal and informal. Formal mentoring relationships are developed within the context of the organization and require organizational support and intervention. One third of the nation’s major companies have some form of a formal mentoring program (Ragins & Cotton, 1999). Conversely, informal mentoring

relationships develop spontaneously. Although they occur within the context of the organization, they are not sponsored or supported by the administration (Ragins, 2012a).

Formal Mentoring

There are several key differences between formal and informal mentoring relationships. Formal mentoring relationships are assigned by a program coordinator and the participants often do not meet until the match has been made. Many formal mentoring relationships are contractual, with a specific set of goals and prearranged meeting times agreed upon at the outset. These relationships last between six months and one year and the termination is often preprogrammed into the relationship (Lentz & Allen, 2009; Ragins & Cotton, 1999).

Feldman (1999) and Ragins and Cotton (1999) agree that for mentoring to be most effective, mentors and protégés should share not only work interests but deep bonds of liking and trust as well.

However, it is almost impossible for firms to determine a priori which potential mentors and protégés would best be suited to each other in terms of needs, temperament, and personal style. Organizations cannot, by fiat, dictate trust and liking among colleagues ... [stressing that] these deeper relationships take much longer to develop and consequently cannot be ‘managed’ in a top-down, ‘timely’ fashion (Feldman, 1999, p. 251).

Johnson and Ridley (2008) concur. Successful mentors are vigilant and discerning of the traits, talents, and interests of their junior personnel and careful to embark on mentorships only with those who match them well. The investment should pay dividends for both mentor and protégé” (p. 3). Since in formal programs perfect strangers may be paired with little communication about the matching process, “Finding a mentor in a formal program may be like

trying to find true love on a blind date—it can happen, but the odds are against it” (Johnson & Andersen, 2010, p. 117).

Much of the available research on formal mentoring relationships deals with the perceptions and outcomes of the protégé (Kalbfleisch, 2002; Lentz & Allen, 2009; Levinson et al., 1974; Ragins, 2012a; Ragins & Cotton, 1999). In response, an interesting body of knowledge is being developed that deals with the effect of the formal mentoring relationship on the mentor, not just the protégé. Chun, Sosik, and Yun (2012) report that enhanced transformational leadership behaviors and a heightened sense of well-being were two positive outcomes for mentors in formal mentoring relationships. Similarly, Lentz and Allen (2009) found “mentoring others was associated with more favorable job attitudes,” as well as increased retention among mentors (p. 359). Along these same lines, (T.D. Allen, Lentz, & Day, 2006) found that individuals with mentoring experience report higher current salary, greater rate of promotion, and higher perceptions of career success than individuals with no experience as a mentor.

Informal Mentoring

Because informal mentoring relationships develop organically, they are often more free form with less structured meeting arrangements and goals that evolve over time. Informal relationships last longer than formal ones, three to five years on average, and often terminate when one person is transferred or leaves the organization. Informal relationships are also more concerned (at least initially) with the psychosocial aspects of the relationship. The mentor and protégé may develop a parent-child type relationship from which both benefit. For the mentor, an informal relationship may develop because he/she views their charge as a younger version of

themselves and gain a sense of wellbeing from giving back to the future generation (Ragins & Cotton, 1999).

Informal mentoring relationships avoid many of the pitfalls of their more formalized counterparts since the relationship begins naturally. The parties sought each other out. They were not assigned. The importance of this dynamic cannot be overstated. In a military study involving 691 retired Navy flag officers (Admiral), “67% reported having at least one salient mentor during their careers as officers, and most had had at least three important mentors. In most cases, the mentorships formed due to the mentors’ initiative or through mutual interest” (Johnson & Andersen, 2010, p. 115); it is the organic genesis of these relationships, not their organizational context which makes them memorable.

In a 2016 article in Naval Aviation News dedicated to honoring female naval aviators, a series of vignettes proved not only how essential mentoring was to these Sailor’s careers, but in each one the relationships they remember the most were informal in nature. Rear Admiral CJ Jayne’s story is typical, “Within the first few weeks of arriving at my first duty station, Training Squadron (VT) 86 in Pensacola, I met Lt. Frank Smith ... he quickly became my mentor and go to person for all things Navy ... Throughout my career, Frank continued to provide guidance and is still my sounding board today” (“Forming a more perfect union: Honoring women in naval aviation,” 2016, p. 16).

Given these facts, it is not surprising that members of informal mentoring relationships report a higher degree of satisfaction as well as enjoying greater upward mobility and financial rewards than those who experienced only formal mentoring relationships (Kram, 1985; Ragins, 2012a; Ragins & Cotton, 1999; Scandura, 1998).

Dysfunctional or Toxic Mentoring Relationships

Like all relationships, mentoring relationships fall along a continuum from high quality to dysfunctional. “At its best, mentoring has the capacity to be a life altering relationship that inspires and transforms individuals, groups, and organizations” (Ragins, 2012a, p. 519). At their worst they can be disastrous.

While one might argue that dysfunctional mentoring is a ‘low-base rate phenomenon’ (i.e., poor relationships do not occur as often as good relationships), when dysfunctional mentoring does occur, its consequences might be quite serious. Similar to the issue of workplace violence, which fortunately does not occur often, the incidents that do occur are often tragic.

The same is true for dysfunction in mentoring relationships (Scandura, 1998, p. 451).

Dysfunctional or toxic mentoring relationships have not been adequately studied and are poorly understood (Feldman, 1999). Conventional wisdom has held that in any dysfunctional or toxic mentoring relationship, the problem must reside with the mentor since they occupy occupies a position of power. “Protégés are portrayed as the victims of more powerful, dominant mentors who hold the destinies of their junior colleagues in their hands” (Feldman, 1999, p. 252).

Feldman, (1999) refutes this assertion. “Protégés, as well as mentors, contribute to the interpersonal dynamics that result in dysfunctional outcomes, and that mentors, as well as protégés are hurt by these destructive relationships” (p. 247). For example, a protégé may become dependent and unable to function independently of their mentor’s assistance. This in turn can lead to the protégé demanding more and more interpersonal resources from the mentor,

who may in turn begin to develop a deep seeded resentment and animosity towards the protégé (Feldman, 1999).

Like the mentoring process itself, it is difficult to determine exactly when a relationship becomes dysfunctional. (Feldman, 1999) offers these suggestions:

1. The relationship should be viewed as dysfunctional if it frustrates any of the major needs of either individual.
2. When either the mentor or protégé perceive the long term costs of the relationship as outweighing the long term benefit.
3. If either or both members of the relationship engage in specific, concrete actions to sabotage the work projects or reputation of the other.

Destructive mentoring relationships can negatively affect the psyche and career of both individuals. It is important to realize these limitations and end the relationship before any lingering or permanent damage is done.

High Quality Mentoring Relationship

In contrast to middle of the road or toxic relationships, high quality mentoring relationships add a third, relational component to the two functions of mentoring outlined above. In doing so it changes the definition of the relationship. A high quality mentoring relationship is one that is an “interdependent and generative developmental relationship that promotes mutual growth, learning, and development within the career context” (Ragins, 2012a, p. 519).

In a traditional mentoring relationship there is a distinct power gradient between the mentor and protégé. It is a relationship where knowledge and assistance are given and loyalty and respect are returned. “Traditional perspectives on mentoring view it as a hierarchical, one way relationship in which the mentor serves as a ‘godfather’ in helping the protégé career”

(Ragins, 2012a, p. 521). The traditional mentoring paradigm explains the average or marginally effective relationship; it does not explain the high quality relationship.

In a high quality relational mentoring relationship, the relationship provides “different functions based on the needs of their members, which are continually evolving ... the continuum of mentoring quality therefore reflects not only the differences across relationships but also within them.” According to Ragins (2012), a high quality relational mentoring relationship emphasizes:

1. Mutuality and reciprocity inherent in growth producing relationships. Both members enter the relationship expecting to grow, learn, and be changed
2. Diverse mentoring relationships. Different memberships associated with power (race, ethnicity, sexual orientation, LGBT, disability). It is a platform for both people to learn and grow.
3. Communal norms: Individuals give to their partners on the basis of need, not on the basis of expected returns. Traditional mentoring relationships are often concerned with a transactional framework that values the relationship for what it can do. Communal norms emphasize giving without expectation of a return.
4. Relational mentoring is holistic. Attention is paid to the interaction between work and non-work. The relationship is such that it may affect the quality of life both inside and outside of the job.

Relational mentoring relationships also expand the number of independent variables used to measure the effectiveness of the relationship. Relational mentoring is concerned with “dependent variables that reflect personal growth and development, as well as acquisition of relational skills and competencies that may be transportable across work roles and organizational

boundaries.” The take home message from high quality relationally based mentoring relationships is that if you use only monetary compensation or number of promotions to measure the effectiveness of the relationship, you may decide the mentoring failed when in fact it was vital (Ragins, 2012a, p. 522). These relational functions include, but are not limited to:

1. Personal learning and growth. This can be both a process and an outcome. Both members of the dyad may serve as teacher, in high quality relational mentoring relationships expertise is fluid and situationally dependent. The mentor may give insights into the workings of the organization while the protégé brings the mentor up to speed on the latest technology.
2. Inspiration. This is defined as an “evoked psychological state derived from an episode with an object, event, or person” (Ragins, 2012a, p. 527). In a high quality mentoring relationship, both parties may see different and better possibilities that then energize and direct behavior. There is a difference between being inspired “by” and being inspired “to.” Being inspired “to” requires action. You are motivated to do something.
3. Affirmation of ideal, best, and authentic selves. Our sense of self is formed through our relationship with others. Our Ideal Self is the self we wish to become in the future. It encompasses our hopes, dreams, aspirations, and accomplishments. Partners play a key role in keeping each other focused on achieving their ideal self. Our Best Self refers to the characteristics an individual displays when they are on their best behavior. In a high quality mentoring relationship your partner encourages and holds you accountable for acting your best. Our Authentic Self is our “true or real self” (Ragins, 2012a, p. 530). Our authentic self includes not only our best self, but our worst traits, characteristics, and attributes. A high quality mentoring relationship makes room for the authentic self.

4. Reliance on communal norms. Communal norms shift the focus from ourselves to our partners. “The focus is on the partner’s well-being and benefits are given in response to the partner’s needs without expecting repayment” (Ragins, 2012a, p. 530). Communal relationships may be strong or weak. Strong relationships feel a responsibility for the well-being of their partner, while this sense is denuded in weaker communal relationships.
5. Shared influences and mutual respect. This refers to the process by which members of the dyad are influenced by each other. Mutuality is the norm. Influence is based on who is the subject expert, not the hierarchical position. Each member of the group empowers the other.
6. Relational trust and commitment. “A psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another” (Ragins, 2012a, p. 531). Trust comes from the relationship itself. It has an affective foundation and is based on emotional bonds. Trust is affected not only by the length of the relationship, but the frequency and intensity of the interactions. For this reason trust and commitment are more often seen in informal mentoring relationships than their formal, structured counterparts.

“Since mentoring relationships can range from close personal relationships to formally assigned relationships that embody a contractual relationship, it is reasonable to expect that high quality mentoring relationships are more likely to rely on communal rather than exchange norms, and that the stronger the communal norm, the higher quality of the relationship” (Ragins, 2012a, p. 530).

Special Considerations

Age

The aging of our society, along with the “demise of the linear career path” (Finkelstein, Allen, & Rhoton, 2003, p. 250) implies that people will have not only multiple jobs, but multiple careers, during their lifetime. This has severe implications for mentoring. “With more and more individuals changing careers or launching careers at midlife, we can expect to see more developmental relationships where the less experienced “junior” member is older than his or her mentor” (Kram, 1985, p. 5). In a study that set out to explore this phenomenon, Finkelstein et al. (2003) found that older protégés received less career counseling than younger protégés.

The finding that older protégés report less of this behavior in their relationships may indicate that mentors of older protégés did not see these individuals as having potential for development or advancement. An older person in the role of protégé may appear as not being at a typical or appropriate stage of career development, which could lead to this perception of lower potential (p. 273).

These findings are congruent with earlier research cited by the authors, most notably Whitely, Dougherty, and Dreher (1992). That said, there is another possibility. Older protégés who have changed careers may or may not need the type of career advice normally provided by an older, more seasoned mentor. They are familiar with the workings of large organizations and do not need assistance with such mundane tasks as preparing a resume or standards of corporate dress. “The idea that different forms of mentoring may be more or less needed by individuals at different career and life stages is an interesting topic for future research” (Finkelstein et al., 2003, p. 274).

Cross Gender Mentoring

Are women really from Venus and men from Mars (Gray, 1992)? Some people think so.

If women speak and hear a language of connection and intimacy, while men speak and hear a language of status and independence, then communication between men and women can be like cross cultural communication, prey to a clash of conversation styles. Instead of different dialects, it has been said they would speak different genderlects (Tanner, 1990, p. 42)

Despite the benefits that many experience through mentoring, cross gender mentoring relationships raise additional concerns that are usually not found in same sex mentorships. “To reduce uncertainty, ambiguity, and anxiety ... individuals rely on what is familiar. In mentoring relationships where the woman is the mentor and the man is a protégé, men and women’s styles exist. Whereby many women are inclined to do what is asked of them, many men are inclined to resist” suggestions, especially from a woman (Feist-Price, 1994, p. 14).

(Kram, 1985) devotes an entire chapter in her highly influential study to the problems faced by those engaged in cross gender mentoring relationships. She believes many of the problems stem from early socialization.

Men, for example, worked effectively in teams with other boys and young men in sporting events. In their adolescent and early adult years, they learned to relate to women as girlfriends, lovers, or secretaries who occupied lesser status positions. None of these experiences prepare them to work with women and peers or supervisors ... Similarly, women historically have had little training in team sports and more experience in solo sports ... in terms of relationships with potential mentors, women had

had socialization experiences that leave them inclined to behave in dependent and non-assertive ways with male colleagues. In addition, they are unlikely to have had any experiences that would prepare them to assume positions of authority and to provide mentoring functions to others, particularly to men (Kram, 1985, p. 106).

While a feminist critique of her assertions is beyond the scope of this review, certain allowances must be made for the dated nature of this material and the blindingly heteronormative bias it exemplifies. In the thirty years since this study was published, several important watersheds have occurred which have drastically altered the occupational landscape. In 1985, there were no women who held CEO positions in Fortune 500 companies (Fairchild, 2014). Today, there are 22 female CEO of Fortune 500 companies. While this is statistically a trivial number, 4.4%, the economic power it represents is staggering. “According to Fortune, these 22 women command businesses that contribute to two-thirds of the country’s GDP” (Ryals, 2016, p. 20). In 1985 women were excluded from any assignment that may include combat, including piloting combat aircraft or serving aboard combat vessels. Since 1992 women have been allowed to pilot combat aircraft and serve on board warships, both on the surface and as members of submarine crews. At the time of this writing, four women in the military have achieved the highest rank possible during peacetime: General and Admiral (4 stars). In March 2016 Air Force General Lori Robinson was named as Commander of US Northern Command, “which will make Robinson the first female commander of a combatant command in history” (Locker, 2016). While there is little doubt that much work remains, it is also fair to say the gender roles prevalent when Kram wrote this are beginning to change in meaningful ways.

In her 1985 study Kram identified five major areas where cross gendered mentoring may cause “complexities” in the relationship:

Stereotypical Gender Roles: Men and women are inclined to assume “stereotypical roles in relating to each other in work settings.” These socially mediated gender roles are deep seated and difficult to overcome. “These roles tend to constrain behavior and to reduce individual competence and effectiveness ... People perpetuate stereotypical roles because it is what they know. In developmental relationships, the challenge is to figure out how men and women can be freer to behave in a variety of ways that are more appropriate for a given work context” (Kram, 1985, p. 106).

Given the influence of gender training on our lives, it should not be surprising to see that in their research regarding gender and mentoring functions, Allen and Eby (2004) found

Mentors reported providing more psychosocial mentoring to female protégés than to male protégés, but no differences in career mentoring were observed. Perhaps mentors feel more comfortable providing the functions associated with psychosocial mentoring to women. Or perhaps because of gender norms, mentors feel compelled to provide greater psychosocial mentoring to women because they believe that women need (or want) the friendship and affirmation aspects of mentoring to a greater degree than do men (p. 136).

Role Models: the role modeling function is frequently unsatisfactory for both the mentor and protégé. Given the gender role constraints outlined above, this is not surprising. “While women in the early career years face developmental dilemmas, similar to those of male counterparts, women face some that are unique to being female in a male-dominated

organizational context” (Kram, 1985, p. 107). It is also important to remember that with the changing demographics of the modern workforce, females mentoring male protégés is becoming more common. This raises several interesting questions. Beyond male intransigence about accepting female leadership, there is the problem of how the male protégé is to act. The female mentor will be fulfilling her role according to acceptable standards of female behavior within the organization or profession. Like the young woman who is at a loss for how to act in the Boardroom because she is the only woman present, a male protégé must also determine how he is to act given his mentor is the opposite sex. Because of this, “diversified relations are perceived to provide *fewer* role modeling functions than homogeneous relationships because role modeling in diversified relations may be attenuated due to non-overlapping social identities stemming from membership in dissimilar gender groups (Sosik & Godshalk, 2000, p. 116).

Increasing Intimacy and Sexual Tension: Mentoring relationships are by definition deeper and more complex than other work type relationships. This increased intimacy can affect the relationship in several ways. “Workplaces are social centres and approximately one-third of all social relationships begin at work. Sexuality in organizations can take many forms, including psychological intimacy, sexual attraction between two people, sexual innuendoes and sexual harassment” (Hurley & Fagenson-Eland, 1996, p. 42). The specter of sexual harassment makes this type of relationship, especially when it exists between an older male who is in management with a younger female employee, ripe for exploitation. “Because it is common for a sexual liaison to occur (or be suspected) between a senior man and a junior woman, both men and women may hesitate to enter into these relationships”(O’Neill & Blake-Beard, 2002, p. 55).

Sexual involvement, real or perceived, can produce anxiety and confusion in both the internal relationship between the mentor and protégé as well as in the external relationship between the mentoring dyad and the rest of the

organization ... even the possibility of unfounded rumors may deter people from becoming involved in cross-sex mentoring relationships (O'Neill & Blake-Beard, 2002, p. 54).

Public Scrutiny: The first three categories outlined above deal with the interpersonal relationship between the mentor and protégé. The final two categories of complexities deal with how the mentoring dyad interface with the organization as a whole. “Cross gender developmental relationships are subject to public scrutiny; others study the relationship with interest and, more likely, with some suspicion” (Kram, 1985, p. 107). The long tradition of a more senior male being romantically involved with a junior female have in many ways forever tainted these relationships. Additionally, modern awareness of sexual harassment and abuse in the workplace also make these relationships potentially dangerous. “The possibilities of sexual involvement and favoritism rather than competence as the criterion for sponsorship can threaten the reputations of both individuals” (Kram, 1985, p. 108).

Peer Resentment: A final area of complexity is peer resentment. According to Kram (1985) this occurs when a female protégé is associated with a powerful male mentor in a male dominated industry or organization. “Because of the competitive dynamics that occur among peers aspiring to advance, the solo woman stands out as one who receives special attention if she is regularly coached by a male superior. Although the relationship may be important for her, she may be reluctant to maintain it for fear of becoming isolated from her peers” (p. 108). The acute shortage of female mentors in many industries and the “perception by both genders that men hold more and different forms of power to advance the protégés’ career” only exacerbates this problem (Sosik & Godshalk, 2000, p. 115).

Mentoring in the Military

As an institution, the U.S. military believes in mentoring. The U.S. Army's Field Manual now contains a special section on the "development and effective conduct of mentorships with subordinates" and the Chief of Naval Operations has declared that "mentoring sailors should be a preeminent focus of the Navy ... In the last three years alone, formal mentoring programs and online e-mentoring matching services have proliferated within the armed forces" (Johnson & Andersen, 2010, p. 113).

Mentoring has a long history in the U.S. military. One prominent example of the effects of mentoring can be seen in the life of General of the Army (5 Stars), and later Secretary of State George C. Marshall. In a career that spanned two world wars, Marshall is credited with guiding and influencing several of World War II's greatest generals, including Joseph Stillwell, Omar Bradley, Mark Clark, and Dwight Eisenhower. "Prior to that, Marshall benefited from mentoring relationships as a mentee to Brigadier General Hunter Liggett in 1915, General Franklin Bell in 1916, and General "Blackjack" Pershing in 1916" (McGuire, 2007, p. 24). Likewise,

In 1972 Colin Powell, a young bright Army officer, was interviewed and hired by Carlucci as a White House Fellow. As a result of that relationship, Powell became a rising star, serving as Carlucci's deputy on the National Security Council, and later, succeeding him as national security adviser to President Reagan. Upon his promotion to Four-Star general, Powell became the youngest member to serve as Chairman of the Joint Chiefs of Staff (Adams, 1997, p. 8).

This emphasis on mentoring is evident in several studies. In one study of 568 midshipmen at the United States Naval Academy (USNA), Baker, Hocevar, & Johnson (2003) found that 45% of those studied reported having a significant mentoring relationship while at the Academy. In this study the authors found a statistically significant relationship between the gender of the cadet and the likelihood of being mentored, with 63% of females and only 42% of males reported being involved in a mentoring relationship. Similarly, when asked to rate the importance of these relationships, the female cadets viewed the relationship as being significantly more important. Although there was no correlation between the mentoring relationship and academic standing, protégés of either sex were more satisfied with their education and much more likely to mentor others.

Likewise, a large survey of mentoring in the Army (N=3715) found that 84% of senior Non Commissioned Officers and Commissioned Officers reported having at least one significant mentoring relationship during their career (Johnson & Andersen, 2010). This is consistent with the findings of McGuire (2007) who conducted a study of 206 Senior Military Officers (SMO) attending the National War College. The results from this study showed 91% of respondents had been mentored during their military career and 87% had in turn mentored others.

What is instructive about military mentorships is those the service members rate as most beneficial, tended to be informal in nature and origin. This is consistent with the civilian studies detailed above. Even though the military is awash with formal mentoring programs (Johnson & Andersen, 2010; McGuire, 2007) informal mentoring relationships remain the most impactful.

This sentiment is seconded by Johnson & Andersen (2010) who argue that there is no empirical evidence that the plethora of formal Department of Defense mentoring programs are effective. “In spite of the fact that U.S. military commands have instituted broad and sweeping

requirements for mentoring, ... a careful review of the literature reveals not a single published evaluation of the efficacy of formal military mentoring” (p. 117). This has led many to view mentoring as the latest “fad” to come down the line and discount its usefulness (Johnson & Andersen, 2010; McGuire, 2007).

Mentoring Women in STEM

Aviation is a Science, Technology, Engineering, and Math (STEM) field. This can most easily be seen in where universities place their aviation departments. At Arizona State University in Tempe, the aviation department is located within the Ira A. Fulton Schools of Engineering. Likewise, Purdue University’s School of Aviation and Transportation Technology is situated under the “Polytechnic” umbrella, which includes such diverse subjects as aviation, engineering, construction management, technology management, and technology education. At the University of North Dakota, aviation and related programs are housed within the John D. Odegard School of Aerospace Sciences; a division that also includes computer sciences, space studies, atmospheric sciences and earth systems science and policy.

The problem of underrepresentation of women is not unique to aviation, but can be found throughout STEM career fields. For women in STEM careers, there seems to exist a “leaky pipe” or “gender filter” on the road between high school, college, and the job market (Leavey, 2016).

One interesting feature of these leaks is that women leak out more than men do. The effect of differential leaking is to create a sex-based filter that removes one sex from the stream and leaves the other to arrive at the end of the pipeline. No one in a position of power along the pipeline has consciously decided to filter women out of the STEM stream, but the

cumulative effect of many separate but related factors results in the sex imbalance in STEM that is observed today (Blickenstaff, 2005, p. 369).

In a review of the literature, Blickenstaff (2005) found six reasons various researchers have given for the persistent underrepresentation of women in STEM careers. Ranging from farcical to profound, they provide invaluable insight into not only the problem of recruiting and retaining women in STEM industries, but the latent misogyny present in the Academy.

1. **Biology:** Psychologists, Anthropologists, and Educators have studied the differences between men and women for over a century. While some differences were found in mathematical ability and spatial performance tasks (Hyde, 1996), for the most part the effort has been fruitless. Despite the dearth of empirical evidence to support this stance, it can still be found in the highest reaches of academia. In 2005 Harvard President Lawrence Summers set off a firestorm of controversy when he stated that part of the reason for the underrepresentation of female scientists at America's elite universities may be due to "innate" differences between men and women (Hemel, 2005). Nobel Prize winning biochemist Tim Hunt faced a similar backlash when he opined that men and women should work in segregated laboratories. "Let me tell you about my trouble with girls ... three things happen when they are in the lab ... you fall in love with them, they fall in love with you and when you criticize them, they cry" (Ratcliff, 2015, n.p.) .
2. **Lack of academic preparation among females:** Some researchers believe that the underrepresentation of women in STEM can be traced to academic preparation in K-12. This notion is highly controversial and by no means

accepted across the board. What is acknowledged is that fewer females take calculus and physics in high school which places them at a disadvantage if they choose to pursue a STEM career in college. Why fewer females take calculus or physics has not been adequately explored. This lack of preparation does not explain why once women are enrolled in STEM programs at the undergraduate level, more women than men drop out, despite equal preparation and no differences in Grade Point Average (Blickenstaff, 2005).

3. **Poor attitudes toward science by female students:** It has long been hypothesized that part of reason for the chronic underrepresentation of women in STEM careers is women simply do not like science as much as men. Like biology and academic preparation, this argument does not withstand scrutiny. What may be a contributing factor is how young women define science. Young women tend to gravitate towards life sciences: biology and zoology rather than physical sciences such as physics or chemistry. In one study by Baker & Leary (1995) the young women differentiated between “a ‘scientist’ who studies biology or zoology and a ‘scientist scientist’ who uses chemicals or works with rockets” (p. 18). One of the most common reasons the girls gave to explain their interest in life science as opposed to physical science “was their desire to care for people or animals” (Blickenstaff, 2005, p. 375).
4. **Lack of female role models:** This critique is valid and more profound than many people realize. In discussing her career as a professional airline pilot, one participant in this author’s research related how when she found a female flight instructor she “stuck to her like glue,” even though she was a less than perfect

instructor. “I was just so happy to find a woman who flew. I looked at her and I knew I could do it too” (Mc, 2016). It is a Catch 22 Situation. People need role models they identify with to consider a career, yet without the people in need already in the profession, those being sought after will not join. In our case, “a low proportion of women in a discipline probably sends a message to girls that the discipline is unattractive to women, and they should avoid it too” (Blickenstaff, 2005, p. 376).

5. **Science curricula viewed as being irrelevant towards women:** Sex bias in older textbooks is well documented. In one English Science text, there were only four pictures of females. In three out of the four pictures the women were sunbathing or swimming. None showed the women participating in the subjects being discussed. While the situation has improved since the 1970s and 1980s, depictions of women performing science (rather than observing) in school textbooks remains problematic (Blickenstaff, 2005).
6. **The pedagogy of science classrooms favor male students:** There is a perception among some educators that “science is simply a boys’ subject, there is nothing wrong with that and there is nothing to be done about” (Blickenstaff, 2005, p. 378). This innate bias disadvantages women in these classrooms from the outset. If underperformance is expected, underperformance will be received. Additionally, teachers who hold this belief will favor male over female students in a myriad of ways from the amount and quality of attention the female student receives to the grades issued. “Student–teacher interactions are qualitatively different for boys and girls. While boys are asked follow up questions and

comments on the ideas represented in their work, girls are more frequently complemented for their looks or for the neatness of their work” (Blickenstaff, 2005, p. 379).

These six areas show a systematic disenfranchisement of women seeking to succeed in STEM careers. What is not discussed is how many of these behaviors are intentional versus unconscious; a reflection of the subordination of women found in the culture at large?

As with the perennial underrepresentation of women in aviation, the question becomes not how we got here, but how do we move forward? According to Leavey (2016) both formal and informal mentoring relationships increase recruitment and retention in STEM occupations. “Mentoring is an effective way to enhance knowledge acquisition and to sustain the pursuit of STEM professionally” (p.16).

One example of how formal mentoring can facilitate the retention of women and minorities in STEM fields can be found at Bowling Green State University. In a program entitled “Academic Investment in Math and Science” (AIMS) students are paired with faculty in a relationship that lasts throughout the student’s undergraduate career. Twenty students are accepted each year into the program (60% female, 40% male) and the results are impressive.

The AIMS cohort earned on average .5 higher GPAs than the control group and AIMS students graduated in an average of eight semesters while the control group graduates in nine semesters. Students in the study specifically report enjoying mentors, as one student noted, “I like the mentor program. By getting paired with a professor in your major, you get advice on the do’s and don’ts from someone who has already gone through the process” (Leavey, 2016, p. 17)

Women in aviation, STEM, and the military all share several significant similarities, not the least of which is trying to find their own space in what had formally been predominantly male undertakings. Mentoring has been shown to be effective in these circumstances in increasing both recruitment and retention in these fields.

Summary

As shown above, mentoring is much more than a simple pairing between coworkers. It is a multifaceted relationship that can influence both party's career and personal life. When effective, the mentoring relationship has positive benefits for both people. When destructive, both the mentor and protégé can pay a steep price in terms of lost productivity, career advancement, and damage to their reputation.

Mentoring relationships are also evolving. As societally mediated gender roles change, women are taking a more dominant role in the workforce. This increases the number of female role models and mentors available to young women in the early stages of their career while also setting the stage for more cross gender mentoring relationships where the woman is the mentor and the man is the protégé, disabusing the idea that in relationships of power, the man is always supreme.

Mentoring can be effective tool for both personal and professional growth. The literature indicates that mentoring relationships are most effective when they develop organically, but that does not mean formal mentoring programs are without merit. Any relationship that improves communication between levels of an organization has value.

CHAPTER III

METHODOLOGY

This study uses a cross sectional survey design to examine the role mentoring has played in the lives of successful women aviators. This chapter addresses the key elements of the methodology used to conduct the study, including the survey instrument, participant population, data collection, data preparation and data analysis.

A cross sectional survey design, also known as a snapshot, is a design where the researcher gathers data at one point in time. These surveys are the mainstay of research efforts in the social sciences. Although it is not possible to prove causation using this method, their appeal lies in their ability to provide descriptive information regarding the target audience as well as provide a limited amount of generalizability to the larger population (Carlin & Hocking, 1999; Creswell, 2005).

Survey Instrument

In order to explore whether or not mentoring has played a role in the lives of successful women aviators, this author has chosen to use the Mentor Role Instrument (MRI) developed by professors Ragins & Cotton (1999). This instrument measures ten key functions or roles associated with mentoring. It uses an expanded 100 point Likert Scale ranging from zero (strongly disagree) to 100 (strongly agree) and each of the ten characteristics are assessed using three questions.

The instrument was validated using confirmatory factor analysis and independently measures each of the ten functions. The coefficient alphas (Cronbach's Alpha) range from .63-.91 (Ragins & Cotton, 1999, p. 535). "Alpha was developed by Lee Cronbach in 1951 to provide a measure of the internal consistency of a test or scale; it is expressed as a number between 0 and

1. Internal consistency describes the extent to which all the items in a test measure the same concept or construct and hence it is connected to the inter-relatedness of the items within the test” (Tavakol & Dennick, 2011, p. 53). Although values between .7 and .95 are considered acceptable (Tavakol & Dennick, 2011), it is important to make clear that Cronbach’s Alpha is a test that is specific to one time and one group of test takers. Therefore, a low number (.63 in our case) does not necessarily disqualify that question or group of questions. The complete survey, including demographic questions that are not part of the original MRI can be found in Appendix A.

Participants

Participants were all female aviators who hold a Airline Transport Pilot (ATP) certificate from the Federal Aviation Administration (FAA), or the international equivalent issued by the International Civil Aeronautics Organization (ICAO). The ATP is the “FAA’s highest certificate and includes training in: aerodynamics, automation, adverse weather conditions, air carrier operations, transport airplane performance, professionalism, and leadership and development” (Federal Aviation Administration, 2013). Under 14 CFR 61.159 “Aeronautical experience: Airplane category rating” an ATP must:

1. Be 23 years’ old
2. Hold a Commercial Pilot Certificate with an Instrument Rating
3. Complete an ATP Certification Program
4. Pass an ATP knowledge and practical test
5. Have at least 1500 hours of total time

The ATP certificate is required by law to act as either the Pilot in Command (PIC) or Second In Command (SIC) on a commercial air carrier authorized under 14 CFR Part 121 (14

CFR Part 121, Subpart M-Airman and Crewmember Requirements). Part 121 air carriers are more commonly known as commercial or regional airlines. They provide scheduled service within the National Airspace System (NAS).

The ATP was chosen as the entry point for this study because those who have achieved this milestone have established themselves in their career and are among the upper eschelons of the profession. Since the total population we are dealing with is small – out of the approximately 157,000 ATP in the FAA database as of December 31, 2015, 6,554 or roughly 4.1% are female (FAA, 2016) – attempts to contact these women is, by necessity, very focused. “The International Society of Women Airline Pilots,” a selective group of female aviators who must be CFR Part 121 pilots and hold an ATP to join, posted our announcement on their website and social media. The University of North Dakota Alumni Association also sent out an email to over 1100 female alumni asking for their participation.

Data Collection

Data collection occurred between November 1, 2016 and December 28, 2016. Data was collected via the University of North Dakota Qualtrics© online survey tool. A unique URL was generated for this study and was included in the information asking for participation.

Once a subject accesses the website, the first screen explains the purpose of the study as well as giving a brief definition for the mentoring relationship. The subject is then asked to confirm that they are a female aviator who holds an ATP or ICAO equivalent. If the participant answers yes, they continue on to the Institutional Review Board (IRB) consent information and demographics section of the survey. If the participant answers no, they are taken to the final screen of the survey thanking them for their time. In this way only those who self report as being eligible to participate in the research study are allowed to continue.

Following the demographics portion of the survey, each respondent is asked to answer the question “How successful do you view yourself in your profession?” using a 100 point Likert Scale. Following this question are several more demographic questions relating to their industry experience.

The final decision point is a question regarding mentoring: “Are you currently or have you ever been in a mentoring relationship?” Those that answer affirmatively are taken to the Mentor Role Instrument to complete the survey. Those that answer no are redirected to the final screen of the survey thanking them for their time and efforts.

In total the survey is designed to only take fifteen to twenty minutes to complete. As per IRB guidelines, no identifying information is gathered. All responses are completely anonymous.

Assumptions and Limitations

The following assumptions were made regarding the data used in this study:

1. Those women that completed the survey made every effort to be truthful and complete in their answers. In order to encourage honesty and protect the participant’s privacy, no identifying information was gathered. All responses were completely anonymous.
2. The participants were female aviators who possessed an ATP certificate or international equivalent as evidenced by their self report.

The following limitations are acknowledged:

1. Limited sample size. Participants came primarily from the membership roles of the International Society of Women Airline Pilots and UND Alumni mailing lists. A broader sample of female ATP would be adventitious.

2. Narrow focus. Female ATPs were chosen to highlight and isolate professional women pilots from other women involved in aviation. It was not meant to imply that female air traffic controllers, airport managers, astronauts, military pilots, educators, dispatchers, human resource specialists, or corporate flight department managers are not successful or do not play a vital role in the aerospace industry.
3. Narrow window to collect data. The survey instrument was available online for 58 days. A longer window may have garnered more responses.
4. Electronic data collection. The survey was conducted entirely online. People without access to email, social media, or the ISWAP's website were not given the opportunity to participate.

Data Preparation and Analysis

The data was downloaded from Qualtrics© to IBM's Statistical Package for Social Sciences (SPSS©) statistics software Version 24 for analysis. The first task was to remove from the dataset all of the participants who had answered no to the first question. There were 247 unique responses to the survey. 189 of the respondents answered "yes I am a female aviator who holds or in the past held an ATP or Restricted ATP Certificate or international equivalent." 55 replied in the negative.

The next step was to remove those responses which were completely blank or had greater than 50% of the responses blank. After cleaning the data there were a total of 158 subjects who met the inclusion criteria

Following data preparation, descriptive statistics were run on the two main groups: those who had a mentor during their career and those who had not. An independent sample T Test was run to test for significance between the means of these two groups for question 54: "How

successful do you view yourself in your profession?" This test will determine whether the Null Hypothesis is rejected or if it must be retained.

The remainder of the statistical testing is concentrated on the mentored group. This group can be divided into two sub groups by whether their mentoring relationship was part of a formal mentoring program or more informal in nature.

Initially all thirty of Ragins' and Cotton's items were compared between the two mentoring groups using an Independent Sample T Test. Results were noted and can be found in Table 4.

The next step involves using Ragins' & Cotton's (1999) initial ten mentoring functions. New variables were created using each of the categories and their associated questions, and Independent Sample T Tests run to look for significance between the formal and informal mentor groups.

*Table 1 Mentor Role Instrument (MRI) from Ragin & Cotton
New variables by category*

Mentor Functions	Question
	My Mentor ...
Sponsor	Helps me obtain desired position (Q18) Uses his/her influence to support my advancement in the organization (Q19) Uses his/her influence in the organization for my benefit (Q22)
Coach	Helps me learn about other parts of the organization (Q23) Gives me advice on how to attain recognition in the organization (Q24) Suggests specific strategies for achieving career aspirations (Q25)
Protect	Protects me from those who may be out to get me (Q26) "Runs interference" for me in the organization (Q27) Shields me from damaging contact with important people in the organization (Q28)

Challenge	Gives me tasks that require me to learn new skills (Q29) Provides me with challenging assignments (Q30) Assigns me tasks that push me into developing new skills (Q31)
Exposure	Helps me be more visible in the organization (Q32) Creates opportunities for me to impress important people in the organization (Q33) Brings my accomplishments to the attention of important people in the organization (Q34)
Friendship	Is someone I can confide in (Q35) Provides support and encouragement (Q36) Is someone I can trust (Q50)
Parent	Is like a father/mother to me (Q38) Reminds me of one of my parents (Q39) Treats me like a son/daughter (Q40)
Role Model	Serves as a role model for me (Q41) Is someone I identify with (Q42) Represents who I want to be (Q43)
Counseling	Serves as a sounding board for me to develop and understand myself (Q44) Guides my professional development (Q45) Guides my personal development (Q46)
Acceptance	Accepts me as a competent professional (Q47) Sees me as being competent (Q48) Thinks highly of me (Q49)

Finally, to determine the validity of the survey instrument with this sample population, an exploratory factor analysis was conducted to determine which factors can be extracted from the data. Principle Axis Factoring (PAF) with a Varimax rotation is used for this task. PAF is a “least squares estimation of the common factor model ... and assumes all error is sampling error” (de Winter & Dodou, 2012, p. 696). It is better able to recover weak factors than other methods such as Maximum Likelihood Factor Analysis (de Winter & Dodou, 2012).

Cases with missing data were excluded using the listwise method. Listwise deletion removes all data for a case that has one or more missing values. The final number of factors was determined by Screeplot. All final factors had an Eigenvalue of greater than 1. Following the factor analysis the variables were transformed according to the new factors and a series of T Tests were performed to determine if there was significance between the formal and informal mentoring group among the new variables.

By using this three step process this author is attempting to examine the data in increasingly more specific ways to determine what effect mentoring has played in the lives of these successful women aviators.

Summary

This chapter provided a detailed description of the research design, instruments for data collection, data collection, and procedures. Specifics on the statistical tests and the results of the survey are presented in the next chapter

CHAPTER IV

RESULTS

The purpose of this study was to determine what effect, if any, mentoring had played in the lives and careers of successful woman aviators. The following research questions guided this study:

1. **Null Hypothesis (N0):** Mentoring plays no role in the development of successful women in aviation
2. **Hypothesis # 1 (H1):** Informal mentoring is more effective than formal mentoring in enhancing the protégé's feelings of confidence.
3. **Hypothesis # 2 (H2):** Formal mentoring results in more career oriented advice and assistance than informal mentoring

This chapter provides the necessary statistical analysis to answer each of the research questions. An alpha level of .05 was used for all statistical tests. An abbreviated narrative of the results, and corresponding tables are provided where appropriate.

Participant Demographics

As discussed in Chapter III, there were 158 eligible participants in this study. All members of the study shared similar demographics. The only clear difference was between the overall years of experience and mean number of turbine engine time. The non mentored group reported being slightly older and having more turbine engine time, a fact that makes sense given the nature of commercial aviation in the jet age.

Table 2: Mentoring Relationship

Have you ever been in a Mentoring Relationship?	
Yes	84
No	74
Total	158

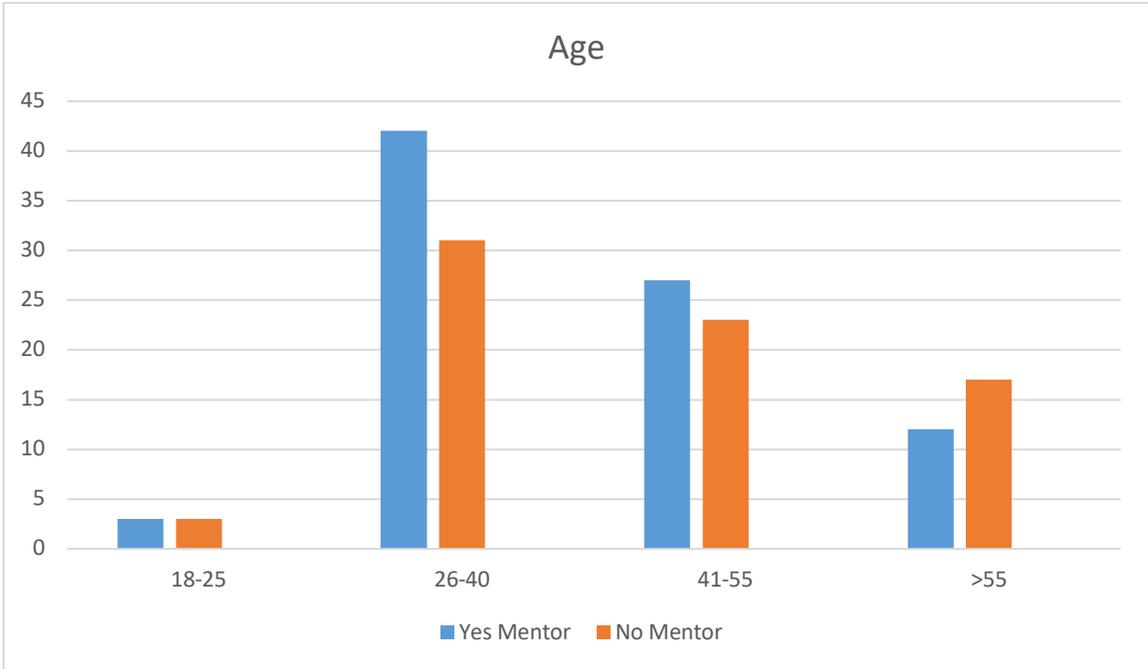


Figure 1: Age of Participants

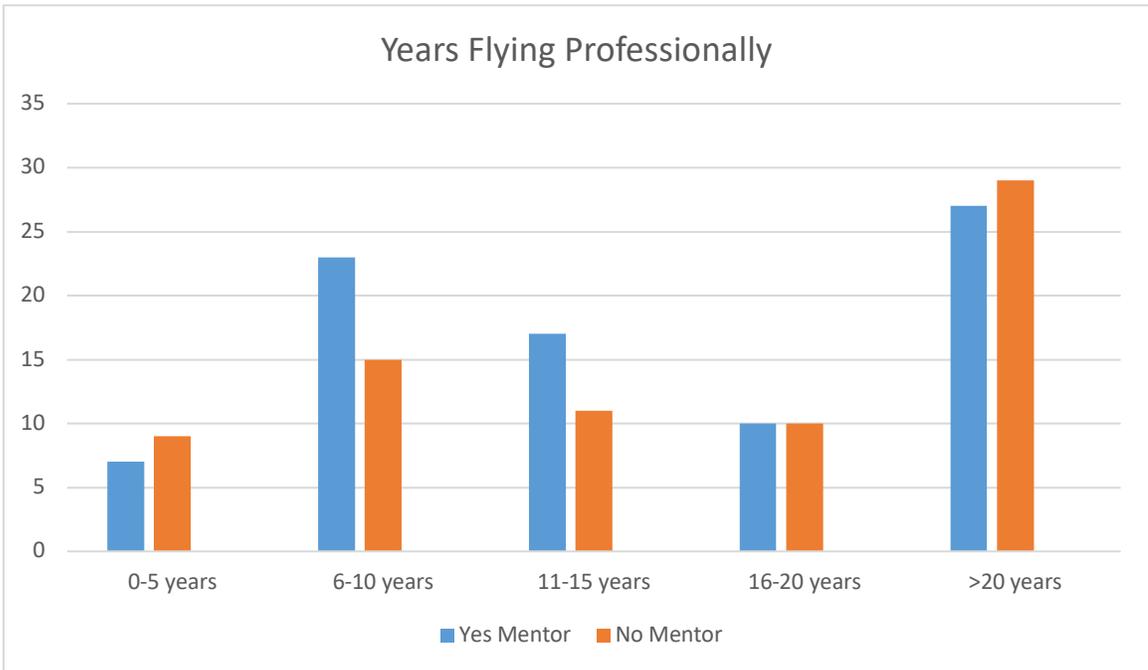


Figure 2: Years Flying Professionally

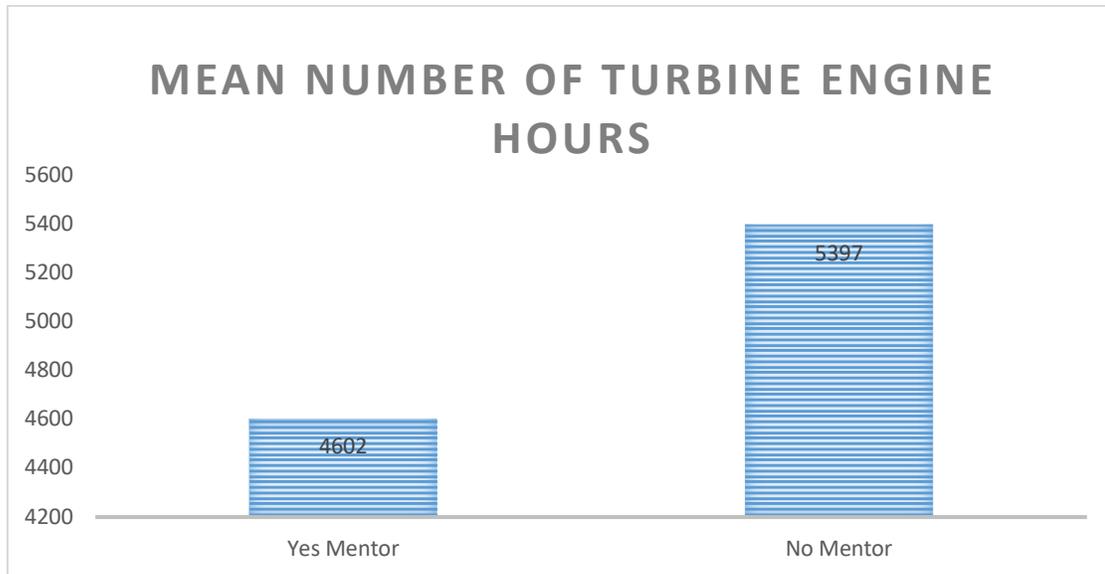


Figure 3: Mean Number of Turbine Engine Time

Power Analysis

An A priori power analysis for a 2 tailed t Test when looking for moderate effect (.3) with an alpha of .05 and a .95 beta showed the need for 134 total participants. A post hoc power analysis using the same criteria but with a sample size of 158 subjects reveals a beta (Type II Error) of .975. Post hoc testing using the same alpha and effect level but 84 participants (number of participants involved in the mentor group) resulted in a reduction in the beta to .887.

Challenging the Null Hypothesis

The Null Hypothesis states that mentoring plays no role in the development of successful women aviators. To test this hypothesis participants were divided into two groups: those that reported having a mentoring relationship during their careers and those that did not. The dependent variable for this question was “How successful do you view yourself in your profession?” Using a slider, the subject chose a number between 0 and 100 to indicate their response. The means between the two groups were evaluated using an Independent Sample T Test to check for significance.

Table 3: Null Hypothesis T Test

Function	<i>n</i>	M	SD	M Diff	<i>t</i>	<i>df</i>	<i>p</i>
Mentoring Relationship				-15.83	-.063	144	.950
Yes	78	85.07	16.78				
No	68	85.23	13.26				

Homogeneity of variance was assessed for both groups by Levene’s Test for Equality of Variances. An independent t-test was run on the data with a 95% confidence interval (CI) for the mean difference. It was found that there was no significant difference in the means of the two groups $t(144) = -.063, p = .950$. Given these findings the Null Hypothesis must be retained.

Mentor Role Instrument (MRI)

All thirty items of the MRI were compared between the two subgroups: those who had been involved in a formal mentoring relationship and those whose experience with mentoring was more informal. Homogeneity of variance was assessed for both groups by Levene’s Test for Equality of Variances. Where Levene’s test was significant, the degrees of freedom were adjusted using the Welch-Satterthwaite method as calculated by SPSS©. An independent t-test was run on the data with a 95% confidence interval (CI) for the mean difference. The results are displayed in Table 4.

Table 4 MRI T Test

	<i>n</i>	M	SD	M Diff	<i>t</i>	<i>df</i>	<i>p</i>
Question 32				-8.56	-.909	79	.366
Formal	14	46.00	33.38				
Informal	67	54.56	31.80				
Question 33				-24.30	-2.49	77	.015*
Formal	13	29.92	34.42				
Informal	66	54.22	31.65				
Question 34				-27.29	-2.63	74	.010*
Formal	13	30.38	34.54				
Informal	63	57.68	33.91				

Question 35 ($\neq V$)				-16.06	-1.82	14.63	.089
Formal	13	68.46	30.22				
Informal	68	84.52	22.43				
Question 36 ($\neq V$)				-21.24	-2.25	13.58	.041*
Formal	14	71.42	34.91				
Informal	68	92.67	11.46				
Question 50 ($\neq V$)				-13.23	-1.84	14.02	.086
Formal	14	79.35	26.26				
Informal	68	92.58	11.40				
Question 47 ($\neq V$)				-10.11	-1.32	14.39	.205
Formal	14	82.42	27.80				
Informal	68	92.54	14.05				
Question 48 ($\neq V$)				-11.34	-1.51	14.13	.152
Formal	14	81.78	27.45				
Informal	69	93.13	12.62				
Question 49 ($\neq V$)				-17.66	-2.24	12.98	.043*
Formal	13	74.92	27.81				
Informal	68	92.58	12.77				
Question 38				-22.40	-1.95	71	.055
Formal	11	29.45	31.25				
Informal	62	51.85	35.61				
Question 39 ($\neq V$)				-26.70	-2.99	16.17	.009*
Formal	10	22.10	24.25				
Informal	60	48.81	35.32				
Question 40 ($\neq V$)				-32.61	-3.58	14.88	.003*
Formal	10	21.30	25.30				
Informal	62	53.91	34.17				
Question 41 ($\neq V$)				-12.96	-1.55	13.01	.145
Formal	13	75.15	29.55				
Informal	66	88.12	13,57				
Question 42				-8.40	-1.21	77	.228
Formal	13	74.00	26.61				
Informal	66	82.40	22.02				
Question 43				-25.13	-4.43	78	.000*
Formal	13	58.92	21.47				
Informal	67	84.05	18.17				
Question 44				-30.12	-3.47	75	.001*
Formal	13	46.30	31.61				
Informal	64	76.43	27.88				

Question 45					-38.70	-4.63	76	.000*
Formal	12	36.83	27.97					
Informal	66	75.57	26.39					
Question 46					-31.33	-3.56	74	.001*
Formal	12	26.33	19.81					
Informal	64	58.67	30.13					
Question 26 (\neq V)					-40.40	-4.22	15.56	.001*
Formal	11	15.72	28.31					
Informal	61	56.13	33.63					
Question 27 (\neq V)					-26.42	-3.16	19.43	.005*
Formal	11	16.00	23.28					
Informal	59	42.42	33.63					
Question 28								
Formal	9	16.66	31.43		-26.14	-2.25	64	.028*
Informal	57	42.80	32.48					
Question 25 (\neq V)					-34.40	-3.04	12.52	.010*
Formal	12	45.08	37.84					
Informal	62	79.48	22.32					
Question 18					-30.90	-3.05	70	.003*
Formal	12	31.50	35.90					
Informal	60	62.40	31.22					
Question 19					-27.68	-2.70	71	.008*
Formal	12	22.08	30.65					
Informal	61	49.77	32.69					
Question 29					-35.15	-2.94	66	.004*
Formal	11	22.45	31.96					
Informal	57	57.61	36.93					
Question 30					-28.45	-2.34	64	.022*
Formal	11	28.00	35.17					
Informal	56	56.45	36.96					
Question 31 (\neq V)					-39.72	-4.73	22.30	.000*
Formal	11	20.90	22.46					
Informal	55	60.63	36.65					
Question 22					-31.21	-2.57	63	.012*
Formal	10	19.60	32.06					
Informal	56	50.81	35.71					
Question 23					-26.58	-2.55	67	.013*
Formal	13	36.76	39.91					

	Informal	56	63.35	32.32				
Question 24					-36.19	-3.29	62	.002*
	Formal	10	23.10	31.81				
	Informal	54	59.29	31.89				

* Indicates statistical significance, $p < .05$
 ≠V = Equal Variance Not Assumed

Twenty Two out of thirty items displayed significance between the two groups. What is remarkable about these items is the distance between the two groups on certain indices. The range of mean difference was 8.40 to 40.40 with an average mean difference of 25.37. There were eleven items (fully one-third of the MRI) which had differences of greater than 30 points.

Ten Mentoring Functions

Ragins & Cotton (1999) designed the MRI to explore the ten main functions of a mentor originally outlined by Kram (1985). In this instrument, each of the functions is evaluated by three Likert style questions. Only those participants who stated that they had had a mentoring relationship during their careers completed the MRI.

For this study, the answers for each question in the MRI were grouped per their function as identified by Ragins and Cotton. This resulted in ten new variables (see Table # 1). The means for each of these new variables was compared between the two main subgroups of mentored participants: those that had a formal mentoring relationship compared to those whose relationship was more informal in nature by Independent Sample T Test.

Table 5 Ragins' and Cotton's Function Group T Test

		<i>n</i>	<i>M</i>	<i>SD</i>	<i>M Diff</i>	<i>t</i>	<i>df</i>	<i>p</i>
Sponsor					-96.28	-3.07	62	.003*
	Formal	10	67.60	94.82				
	Informal	54	163.88	90.38				
Coach					-93.19	-3.44	60	.001*
	Formal	10	110.00	99.54				
	Informal	52	203.19	73.98				

Protect					-92.75	-2.78	63	.007*
	Formal	9	44.22	77.4				
	Informal	56	136.98	94.64				
Challenge					-106.15	-2.97	62	.004*
	Formal	10	72.60	92.16				
	Informal	54	178.75	105.42				
Exposure					-64.92	-2.42	73	.018*
	Formal	13	106.15	95.46				
	Informal	62	171.08	86.04				
Friendship ($\neq V$)					-51.25	-2.06	12.87	.060
	Formal	13	218.53	88.08				
	Informal	68	269.79	38.26				
Parent					-82.99	-2.50	66	.015*
	Formal	10	74.80	79.25				
	Informal	58	157.79	99.37				
Role Model					-47.46	-3.14	76	.002*
	Formal	13	208.07	72.28				
	Informal	65	255.53	44.12				
Counseling					-105.44	-4.88	73	.000*
	Formal	12	108.75	71.25				
	Informal	63	214.19	68.03				
Acceptance ($\neq V$)					-41.64	-1.77	12.92	.100
	Formal	13	236.38	83.09				
	Informal	67	278.08	36.66				

* Indicates statistical significance, $p < .05$

$\neq V$ = Equal Variance Not Assumed

As with the previous grouping, homogeneity of variance was assessed for both groups by Levene's Test for Equality of Variances. Where Levene's test was significant, the degrees of freedom were adjusted using the Welch-Satterthwaite method as calculated by SPSS©. An independent t-test was run on the data with a 95% confidence interval (CI) for the mean difference. Levene's test was not significant in any mentor functions except for "Friendship" and "Acceptance." There was no significant difference in means of these groups when equal variance was not assumed: Friendship $t(12.879) = -2.061, p = .060$; Acceptance $t(12.920) = -1.774, p = .100$.

In each of the eight remaining functions, there was a significant difference in the means between the Informal and Formal mentoring groups. Sponsor $t(62) = -3.072, p = .003$; Coach $t(60) = -3.445, p = .001$; Protect $t(63) = -2.788, p = .007$; Challenge $t(62) = -2.976, p = .004$; Exposure $t(73) = -2.428, p = .018$; Parent $t(66) = -2.502, p = .015$; Role Model $t(76) = -3.147, p = .002$; Counseling $t(73) = -4.885, p = .000$.

Factor Analysis

All thirty of Ragins' and Cotton's statements were evaluated using Principle Axis Factoring (PAF) with a Varimax rotation as discussed in Chapter III. Initially, the factorability of all thirty items was examined. Several well-recognized criteria for the factorability of a correlation were used. First, all thirty items correlated at least .3 with at least one other item, suggesting reasonable factorability. Secondly, the Kaiser-Meyer-Olkin measure of sampling adequacy was .793, above the recommended value of .6, and Bartlett's test of sphericity was significant ($\chi^2(435) = 1924.768, p = .000$).

Table 6: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.793
Bartlett's Test of Sphericity	Approx. Chi-Square	1924.768
	df	435
	Sig.	.000

Finally, the communalities were all above .3, further confirming that each item shared some common variance with other items. Given these overall indicators, factor analysis was conducted with all 30 items.

Initial Eigenvalues suggested a total of five factors could have been acceptable (Eigenvalues > 1). However, a careful review of the Scree Plot shows a maximum of four factors is more appropriate.

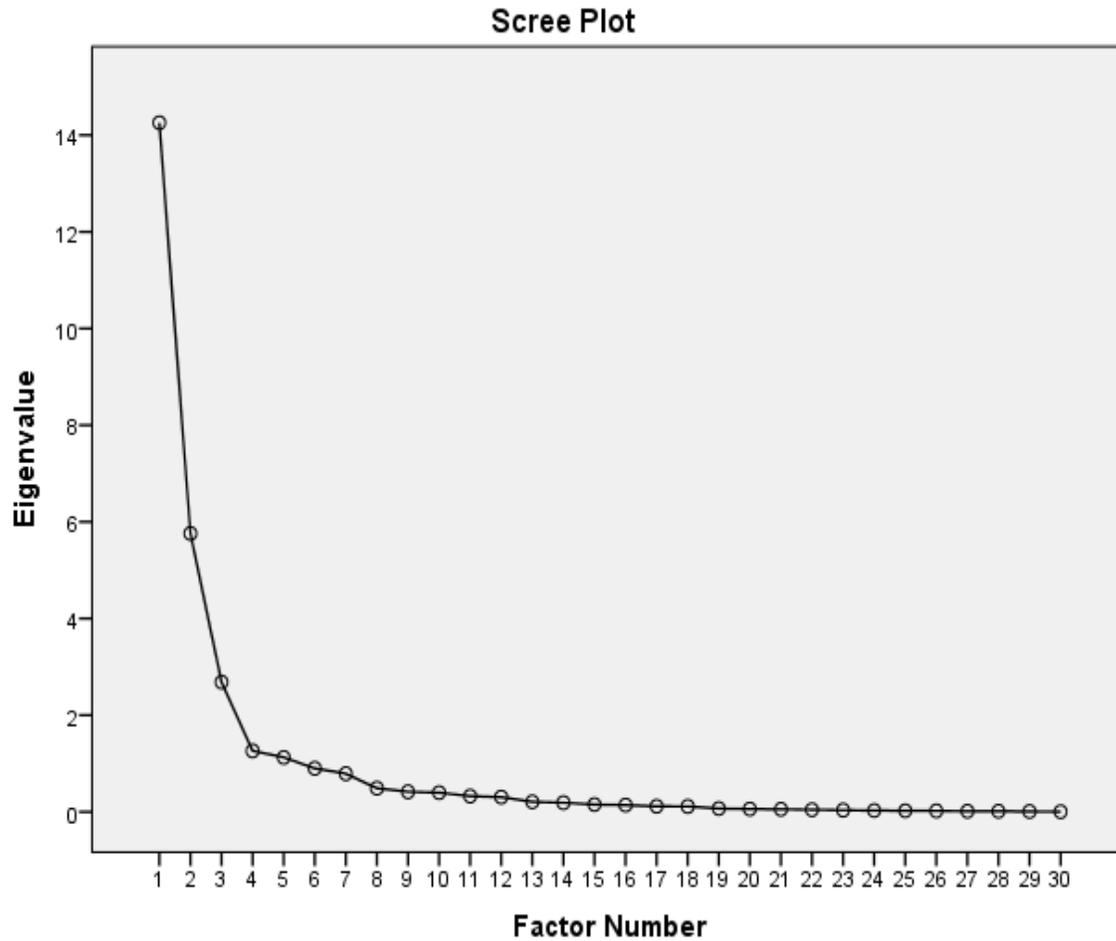


Figure 4: Scree Plot

An initial factor matrix with four variables showed that items loaded onto the fourth variable all had higher loadings in the first three variables. For this reason, a three-factor extraction was done. Using a three-factor extraction, 73% of the total variance can be explained.

Table 7: Total Variance Explained

Factor	Percent of Variance	Cumulative Percent
1	32.537%	32.537%
2	27.511%	60.048%
3	13.337%	73.385%

The rotated factor loadings lined up under three main categories. Factor One contained all items associated with exposure (32,33,34), protection (26,27,28), sponsorship (18,19,22),

challenge (29,30,31), and coaching (23,24,25). It also contained two out of three items associated with counseling 45 & 46).

Similarly Factor Two contained all items associated with friendship (35,36,50), acceptance (47,48,49), Role Model (41,42,43), and the final item associated with counseling from Factor One (44). Chapter Three incorporated all the items associated with parenting (38,39,40).

These final three factors were combined into three new variables titled Career, Interpersonal, and Parenting. The means for each of these new variables was compared between the two main subgroups of mentored participants and Independent Sample T Tests performed.

Table 8 Three Factor T Test

	<i>n</i>	M	SD	M Diff	<i>t</i>	<i>df</i>	<i>p</i>
Factor One (≠V)				-735.54	-7.20	13.78	.000*
Formal	7	269.00	217.36				
Informal	46	1004.54	411.66				
Factor Two (≠V)				-184.02	-2.18	10.41	.053
Formal	11	703.18	276.54				
Informal	58	887.20	91.17				
Factor Three (≠V)				-82.90	-2.93	14.37	.011*
Formal	10	74.80	79.25				
Informal	58	157.79	99.37				

* Indicates statistical significance, $p < .05$

≠V = Equal Variance Not Assumed

As with all previous groupings, homogeneity of variance was assessed for both groups by Levene's Test for Equality of Variances. Where Levene's test was significant, the degrees of freedom were adjusted using the Welch-Satterthwaite method as calculated by SPSS©. An independent t-test was run on the data with a 95% confidence interval (CI) for the mean difference. Factor One: Career $t(13.789) = -7.201, p = .000$; Factor Two: Interpersonal $t(10.416) = -2.185, p = .053$; Factor Three: Parenting $t(14.373) = -2.937, p = .011$.

Hypothesis # 1 and # 2

Hypothesis # 1 (H1): Informal mentoring is more effective than formal mentoring in enhancing the protégé's feelings of confidence.

Hypothesis # 1 (H1): Significance was found in three out of five of Ragins' and Cotton's factors concerning interpersonal relationships (Role Modeling, Counseling and Parent). Acceptance and Friendship did not demonstrate significance when the smaller degrees of freedom were used to address the significant Levene's Test. Even though significance was not observed in the combined factor of Interpersonal ($p = .053$), the consistently larger mean scores reported by the informal mentoring group leads this author to conclude Hypothesis # 1 is true. Informal mentoring is more effective than formal mentoring in enhancing the protégé's feelings of confidence.

Hypothesis # 2: Formal mentoring results in more career oriented advice and assistance than informal mentoring is less clear. Significance was found in all of Ragins' and Cotton's factors dealing with career advancement (Exposure, Counseling, Protection, Coaching, Sponsorship and Challenge) as well as Factor One (Career). While there is an undeniable statistically significant difference between the groups, the direction of the difference favors the informal mentor group.

As with hypothesis number one, in each case the mean scores are higher for the informal mentor group, indicating that they felt these factors affected them more strongly than the formal mentor group. This is most obvious in the areas of protection (Question 26), guidance (Questions 45 & 46), using the mentor's influence for the protégé's benefit (Questions 18 & 22), assigning difficult and meaningful tasks (Questions 29 & 31) and offering advice (Question 24); all of which had mean differences above 30 points.

Because of this Hypothesis # 2 must be rejected. Formal mentoring does not result in more career oriented advice and assistance than informal mentoring. In the case of the successful women aviators who participated in this study, the opposite is true.

Summary

Chapter IV discussed the three research questions. The Null Hypothesis was retained. No statistically significant difference was found between successful female aviators that had been involved in a mentoring relationship and those that had not. Hypothesis #1, women who were in an informal mentoring relationship received more psychosocial support than those in a formal mentoring relationship was found to be true. Hypothesis # 2 was rejected. There is no evidence that successful women aviators involved in a formal mentoring program received more career associated support or advice. Chapter V will provide further discussion of the results, implications for the profession, and future research.

CHAPTER V

DISCUSSION

This chapter will provide an overview of the results in relation to the studies theoretical framework, literature review, and this researcher's observations. This study set out to answer three research questions: do successful women aviators who have been mentored feel more successful than those who have not been mentored? Are successful women aviators who have had an informal mentoring relationship more likely to report a greater amount of confidence than those who were involved in a formal mentoring relationship? Conversely, are successful women aviators who were involved in a formal mentoring relationship more likely to report having received more career oriented advice and assistance than those in an informal mentoring relationship?

Null Hypothesis

This study explored what effect, if any, mentoring had had on the lives of successful women aviators. A successful woman aviator was defined as one who possessed an ATP certificate or international equivalent. The Null Hypothesis states "Mentoring plays no role in the development of successful women in aviation." As detailed in Chapter IV, there was no statistically significant difference in the responses between the mentored and non-mentored group of pilots, so the Null Hypothesis was retained.

One possible reason for this result is the subject group of pilots themselves. Many of the respondents were members of The International Society of Women Airline Pilots. This is a very selective group of women pilots who all hold an ATP. According to the data, as the age and years of experience increased, so did the amount of turbine engine time. Commercial pilots are

allowed to fly 1000 hours per year. It stands to reason that the more experience the participant had, the greater number of hours flying turbine engine aircraft they would report.

The women who reported not having a mentoring relationship had a larger amount of turbine engine time when compared to those who did have a mentoring relationship. This indicates that these women were older and experienced than their younger, mentored counterparts. These older women were the trailblazers. They broke the glass ceiling. They literally and figuratively turned a cockpit into a flight deck. These women were hired in the late 1970s and early 1980s. They began flying at a time when their presence was a spectacle. There were only 480 female ATP in the FAA Database in 1980 (Douglas, 2015, p. 218). These women did not have more senior women to act as role models; they were the first. They broke new ground for those that followed.

The participants in this study were by definition established professionals with a proven track record of success. The majority have between ten and twenty years of professional flying experience and over 5000 hours as Pilot in Command. Because of this, not finding significance between the two groups is not unexpected. A future study involving younger, less established professionals may yield different results.

Hypothesis # 1

Hypothesis # 1 (H1): Informal mentoring is more effective than formal mentoring in enhancing the protégé's feelings of confidence.

The preponderance of evidence points towards this hypothesis being true, but there remains room for discussion. This finding is consistent with the literature. Mentoring relationships that grow organically tend to be more intense, are more satisfying, and last longer

than those that are assigned as part of a formal mentoring program (Johnson & Andersen, 2010; Kram, 1985; Ragins, 2012a; Ragins & Cotton, 1999; Ragins & Kram, 2008).

What was striking about this data was the degree of separation between the two test groups. As discussed in Chapter IV, in many instances the mean difference between the formal and informal mentoring groups was over 30 points. This was a surprising level of passion given that both subgroups had been involved in mentoring relationships.

The significant preference for informal mentoring relationships can be clearly seen the results of the Ragins' and Cotton's ten functional categories (Table 5). Eight out of the ten functions showed a significant difference in the means between the formal and informal mentoring groups.

What was not expected was the lack of significance in the Acceptance and Friendship categories as well as the lack of significance in the Interpersonal factor derived from the Exploratory Factor Analysis. This shows that the women in both groups felt accepted and valued by their mentors; a genuinely positive finding.

A contributing factor for this may very well be the pilot lifestyle. Airline pilots lead two separate lives: one nomadic and one stationary. While flying the pilot is gone from home for three to seven days on average. During that time they may be with several different flight and cabin crews. Working with the same group of people on a routine basis is not the industry norm. For this reason work relationships are harder to develop and maintain than those experienced in a more geographically confined profession. Rather than looking to a mentor or colleagues for acceptance and validation, these functions may be met while at home.

Additionally, as mentioned above, these women are experienced professionals with a track record of success. While the need for acceptance and friendship does not disappear as you

mature in your profession, it does diminish. These women are accepted. Their need for external validation may very well be less than a novice pilot flying the line for the first time.

Finally, part of the reason for the lack of significance was problems with homogeneity of variance with the data. Not being able to assume equality of variance forced this author to go with statistical calculations that relied on a lower number of degrees of freedom, which protects the findings from unintentional Type I error by lowering the likelihood of achieving a significant result.

Hypothesis # 2

Hypothesis # 2 (H2): Formal mentoring results in more career oriented advice and assistance than informal mentoring

This hypothesis was soundly and unequivocally rejected. Twenty Two out of thirty of the original Ragins' and Cotton's items showed statistically significant differences between the means of the formally and informally mentored groups. In the ten mentor functions, all six factors dealing with career functions were statistically significant, as were the two Exploratory Factor Analysis factors, Career and Parenting.

Both Kram (1985) and Ragins (2012) have intimated that formal mentoring programs are more likely to include more career oriented advice and assistance because of their occupational nature and the fact that many formal mentoring programs have formal evaluations and benchmarks that must be achieved. Those concerns were not born out by the participants in this study.

In all instances, there was a preference for informal mentoring relationships. This result is consistent with the findings of Johnson & Andersen (2010), who found no evidence of the

“efficacy of formal ... mentoring” (p. 117). Additionally, the top 5 items with the largest mean difference on the thirty item MRI, all relate to career type functions.

Table 9 Top 5 Mean Difference Items

Question	Mean Difference
Q26 My Mentor: Protects me from those who may be out to get me	40.40
Q31 My Mentor: Assigns me tasks that push me into developing new skills	39.72
Q45 My Mentor: Guides my professional development	38.70
Q24 My Mentor: Gives me advice on how to attain recognition in the organization	36.19
Q29 My Mentor: Gives me tasks that require me to learn new skills	35.15

The business implications of this are profound. Mentoring is a concept embraced by “71% of Fortune 500 companies” and “75% of executives credit their mentors with helping them reach their current positions” (Bryant, 2015, p. 1). There is a tremendous amount of dissonance here. On the one hand mentoring is embraced and promoted in both the military and corporate worlds, yet there is very little evidence that formal mentoring programs are effective.

Limitations and Implications for Future Research

Small sample sizes limit the generalizability of this research. Not every participant answered every question. Those that did not answer were not included in the calculations for that question (decreasing the *n*). The effect of these dropped subjects becomes more apparent as you proceed through the statistical testing. When dealing with all thirty items on the MRI, the *n* for formal mentoring was 10-14. It was 54-69 for the informal group. Similarly, for the ten function tests the *n* for the informal group was 52-67 and 9-13 for the formal group. Finally, the number of participants in the final three factor testing was 7-10 for the formal mentoring group and 46-58 in the informal mentor group. Dwindling sample sizes hamper generalizability.

In addition to larger sample size it would be beneficial to have a more longitudinal approach with any future data. What stage of their career is the pilot in? How are the mentoring needs of a new line pilot different from those of a Senior Captain nearing retirement? What are the unique challenges faced by younger women pilots with children compared with those who do not have children or their children have left the home? Are the mentoring needs of women pilots the same as men or are there gender based differences?

With a pilot shortage looming, is encouraging female pilots who have left the flight deck for whatever reason to return a viable strategy for airlines (this is a common tactic in several industries facing a shortage of qualified applicants)? Would a formal mentoring program help these returnees have a smoother transition?

Another limitation is the specificity. While important to prevent compounding variables from invalidating the study results, restricting the study to only women pilots ignores the larger aerospace industry as a whole. Air Traffic Control, airport management, maintenance, flight ops, cabin crew, dispatch, corporate management, etc. all are areas where women are making contributions to the industry. How are their mentoring needs different from female pilots? Are their concerns similar or widely divergent? Without further research there is no way to tell.

Finally, given the direction of this data, how can an organization encourage the development of informal mentoring relationships? What behind the scenes steps can be taken to encourage potential mentors and protégés to meet and make a connection? Given the obvious benefits of such relationships, how far can and should an organization go to stimulate their creation?

Summary

This study dealt with the effect of mentoring on the lives and careers of successful women in aviation. Using female ATPs as a study group it was determined that there was no overall statistically significant difference between women who had been mentored and those who had not.

That is not to say mentoring was not beneficial. One possible reason for the lack of significance lies in the study participants themselves. These women are established professionals with a proven track record of success. There was no statistical difference in their feelings of success because both groups were successful. Additional research dealing with the mentoring needs at different stages during a female pilot's career would be beneficial.

Of the pilots who had been mentored, those who were in an informal mentoring relationship were more satisfied with almost all facets of the relationship. This is in keeping with the results found in the literature. There exists a gray area in the data dealing with interpersonal relationships and feelings of acceptance. While a preponderance of the evidence points towards the participants favoring an informal mentoring arrangement, it is not conclusive.

As discussed above, this may very well be due to the maturity of the participants. These women may very well be at a point in their lives where external acceptance and validation may not be as important as it was during an earlier stage in their careers. It is also possible that these women are in fact accepted and respected by their peer groups, so the influence of an older, more experienced mentor is lessened. Given the experience level of many of the participants, it would have been equally valid to study their experience as mentors, not just protégés.

While this research is only the starting point for examining the effect of mentoring on the lives and careers of successful women aviators, it does confirm previous research while pointing to several areas that demand further study. This information can be used by the industry to help develop programs that promote the development of informal mentoring relationships among their employees in the hopes of improving the underrepresentation of women on the flight deck.

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APPENDIX A

Survey Instrument

This survey is intended for professional female aviators (pilots) who presently hold or in the past have held an ATP or Restricted ATP Certificate or international equivalent. It is designed to determine what effect mentoring has played in their career.

Mentoring is a developmental relationship that pairs a more experienced and knowledgeable mentor with a less experienced protégé. The relationship supports the protégé's career, but also offers important benefits for the mentor. Both members may learn, grow, and develop from the mentoring relationship.

Some mentoring relationships develop spontaneously and informally, whereas others are part of a formal mentoring program. In formal mentoring programs, mentors and protégés are matched and assigned in some way.

Are you a female aviator (pilot) who presently holds or has in the past held a ATP or Restricted ATP Certificate or international equivalent?

- Yes I am a female aviator who presently holds or has in the past held an ATP or Restricted ATP Certificate or international equivalent. (1)
- NO I AM NOT female aviator who presently holds or has in the past held an ATP or Restricted ATP Certificate or international equivalent. (2)

If NO I AM NOT female aviator ... Is Selected, Then Skip To End of Survey

Q1 What is your age?

- 18-25 (1)
- 26-40 (2)
- 41-55 (3)
- > 55 (4)
- I prefer not to answer (5)

Q53 Military Service

- I AM or WAS a military aviator (1)
- I AM NOT or WAS NOT a military aviator (2)
- I prefer not to answer (3)

Q5 What is your total number of hours as pilot in command?

- 0-500 hours (1)
- 501-1,000 hours (2)
- 1,001-2,500 hours (3)
- 2,501-5,000 hours (4)
- 5,001-10,000 hours (5)
- > 10,000 hours (6)

Q8 What is your total turbine engine flight time? (Short Answer)

Q9 What is your highest level of education?

- High School Diploma (1)
- Associate Degree (2)
- Bachelor Degree (3)
- Master Degree (4)
- Doctorate or Professional Degree (5)

Q10 If you have a college degree, is at least one of your degrees in aviation or related field?

- Yes (1)
- NO (2)

Q54 How successful do you view yourself in your profession?

_____ Zero (not successful) to 100 (very successful) (1)

Q55 How would you describe your position within your organization?

- Line Employee (1)
- Supervisor (Responsible for day to day operations) (2)
- Middle Management (Department level authority. I have hire/fire authority) (3)
- Senior Management (Multiple department or location responsibility) (4)
- Executive Leadership (Strategic planning and budget. Organization wide authority) (5)
- I am retired (6)

Q56 How long have you been in your present position? If you are retired, use your last position.

- 0-5 years (1)
- 6-10 years (2)
- 11-15 years (3)
- 16-20 years (4)
- > 20 years (5)

Q57 How long have you been with your current employer? If you are retired, use your last position. .

- 0-5 years (1)
- 6-10 years (2)
- 11-15 years (3)
- 16-20 years (4)
- > 20 years (5)

Q58 How long have you been flying professionally?

- 0-5 years (1)
- 6-10 years (2)
- 11-15 years (3)
- 16-20 years (4)
- > 20 years (5)

Q11 Are you currently or have you ever been in a mentoring relationship? If you have had more than one mentoring relationship, please answer the following questions in terms of your strongest relationship.

- Yes (1)
- No (2)

If No Is Selected, Then Skip To End of Survey

Q13 Was this relationship assigned as part of a formal mentoring program?

- Yes, it was assigned (1)
- No, it was not assigned (2)

Q49 How long did this mentoring relationship last?

- 1-6 months (1)
- 6 months to 1 year (2)
- 2-4 years (3)
- 5 years (4)
- 6+ years (5)

Q14 Was your mentor of the same sex (gender)?

- Yes (1)
- No (2)
- I prefer not to answer (3)

Q64 Do you still correspond/are you still in contact with your mentor?

- Yes (1)
- No (2)

Q50 For each of the following questions, answer in terms of your STRONGEST mentoring relationship.

Q32 My Mentor: Helps me be more visible in the organization
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q33 My Mentor: Creates opportunities for me to impress important people in the organization
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q34 My Mentor: Brings my accomplishments to the attention of important people in the organization
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q35 My Mentor: Is someone I can confide in
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q36 My Mentor: Provides support and encouragement
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q50 My Mentor: Is someone I can trust
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q47 My Mentor: Accepts me as a competent professional
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q48 My Mentor: Sees me as being competent
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q49 My Mentor: Thinks highly of me
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q38 My Mentor: Is like a father/mother to me
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q39 My Mentor: Reminds me of one of my parents
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q40 My Mentor: Treats me like a son/daughter
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q41 My Mentor: Serves as a role-model for me
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q42 My Mentor: Is someone I identify with
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

- Q43 My Mentor: Represents who I want to be
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q44 My Mentor: Serves as a sounding board for me to develop and understand myself
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q45 My Mentor: Guides my professional development
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q46 My Mentor: Guides my personal development
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q26 My Mentor: Protects me from those who may be out to get me
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q27 My Mentor: "Runs interference" for me in the organization
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q28 My Mentor: Shields me from damaging contact with important people in the organization
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q25 My Mentor: Suggests specific strategies for achieving my career aspirations
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q18 My Mentor: Helps me attain desirable positions
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q19 My Mentor: Uses his/her influence to support my advancement in the organization
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q29 My Mentor: Gives me tasks that require me to learn new skills
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q30 My Mentor: Provides me with challenging assignments
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q31 My Mentor: Assigns me tasks that push me into developing new skills
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q22 My Mentor: Uses his/her influence in the organization for my benefit
_____ 0 (strongly disagree) to 100 (strongly agree) (1)
- Q23 My Mentor: Helps me learn about other parts of the organization
_____ 0 (strongly disagree) to 100 (strongly agree) (1)

Q24 My Mentor: Gives me advice on how to attain recognition in the organization
_____ 0 (strongly disagree) to 100 (strongly agree) (1)