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Determining the Feasibility and Effectiveness of Aircraft Pilot Mentoring Programs

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16. Abstract

In response to NTSB recommendations, the FAA drafted a Notice of Proposed Rulemaking (NPRM) to establish flight crew mentoring programs for new-hire pilots and pilots upgrading or transitioning to a pilot in command position (FAA, 2013). Before publishing this NPRM, the FAA was asked to review the mentoring research literature to assess the benefits of mentoring as it was related to flight deck training and make recommendations regarding the development of mentoring programs. This report is a summary of that research review. Findings showed two difficult problems with the use of mentoring as an effective training tool are the lack of well-established definitions of the mentoring process and the lack of scientific rigor in the mentoring research literature. It was recommended that, before proceeding with mandating mentoring programs for the airlines, clearly specified goals need to be developed for those programs. As an alternate recommendation, we believe that other forms of pilot training, such as accelerated expertise (Hoffman, Ward, Feltovich, DiBello, Fiore, & Andrews, 2013) might prove more effective than mentoring. A third recommendation is to look at the practice of virtual or e-mentoring (Zev, 2014).

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Executive Summary

On February 22, 2009, a Colgan Air, Inc., Bombardier DHC-8-400, operating as Continental Connection flight 3407, was on approach to Buffalo-Niagara International Airport, Buffalo, New York, when it crashed into a residence in Clarence Center, New York, killing the two pilots, two flight attendants, all 45 passengers aboard the airplane, and one person on the ground. As part of the accident report, the NTSB made recommendations to the Federal Aviation Administration (FAA) for improving the professionalism, flight skills, and decision-making abilities of air carrier pilots (NTSB, 2010).

In response to these recommendations, the FAA drafted a Notice of Proposed Rulemaking (NPRM) that would, among other actions, "establish flight crew mentoring programs for new-hire pilots and pilots upgrading or transitioning to a pilot in command position," (FAA, 2013). Before publishing this NPRM, the FAA Civil Aerospace Medical Institute, Human Factors Research Laboratory, was asked to review the mentoring research literature to assess the benefits of mentoring as it was related to flight deck training. In addition, we were asked to research the effectiveness of mentoring programs across a range of occupations and make recommendations regarding the development of mentoring programs, the selection and training of mentors, and the expected benefits to mentors and protégés. This report is a summary of that research review.

To organize the review, the potential benefits of mentoring to pilots were separated into three parts. These parts were improving pilot airmanship, decision-making, and professionalism. While there are numerous studies in the literature that support the effectiveness of mentoring programs for a variety of professions, there are very few that directly support the expectation that mentoring will improve pilot airmanship, decision-making, and professionalism. Two difficult problems with the use of mentoring as an effective training tool are the lack of well-established definitions of the mentoring process and the lack of scientific rigor in the mentoring research literature.

In concluding the report, several recommendations were provided. 1) Before proceeding with mandating mentoring programs for the airlines, clearly specified goals need to be developed for those programs. 2) As an alternate recommendation, we believe that other forms of pilot training might prove to be more effective than mentoring. For example, a form of accelerated expertise (Hoffman, Ward, Feltovich, DiBello, Fiore, & Andrews, 2013) emphasizes efforts to focus more clearly on the development of scenarios that could be used to train workers regarding decision-making on complex events. 3) A third recommendation is to look at the practice of virtual or e-mentoring (Zev, 2014). For

complete descriptions of the recommendations, please refer to the “Recommendations” section of this document.

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Table of Contents

Executive Summary i

Acknowledgments iii

Table of Contents iv

List of Tables vi

Introduction 1

Need for an Aircraft Pilot Mentoring Program 1

Pilot Training as a Continual Process 1

Results 2

Establishing a Definition of Aircraft Pilot Mentoring 2

A Review of the Effectiveness of Mentoring Programs 6

Characteristics of a Good Mentor 7

Characteristics of a Good Protégé 9

Relating These Results to Airline Piloting Goals 10

Challenges for Pilot Mentoring 11

Mentor Program Recommendations 12

Conclusions 14

Recommendations 17

References 19

Appendix A – Summary of Workplace Mentoring (Meta Analyses)* 1

Appendix B – An Evidence-Based Approach to Workplace Mentoring 1

Planning and Providing Infrastructure 1

Participant Recruitment and Selection 2

Matching Mentors and Protégés 2

Training 2

Mentoring Structure and Process 3

Monitoring and Program Evaluation 3

Action Plan 4

References – Appendices 7

List of Tables

Table 1. A comparison of differences between informal and formal mentoring.* 2
Table 2. Comparison of the mentor-protégé relationship to other training paradigms. From Eby, Rhodes, and Allen (2007). 4
Table 3. How mentoring supports protégé development.* 5
Table 4. Key Conceptual and Methodological Issues in Studies of Mentoring and Protégé Career Outcomes (from Dougherty and Dreher, 2007) 16

Introduction

Need for an Aircraft Pilot Mentoring Program

On February 22, 2009, a Colgan Air, Inc., Bombardier DHC-8-400, operating as Continental Connection flight 3407, was on approach to Buffalo-Niagara International Airport, Buffalo, New York, when it crashed into a residence in Clarence Center, New York, killing the two pilots, two flight attendants, all 45 passengers aboard the airplane, and one person on the ground. The National Transportation Safety Board (NTSB) determined that the probable cause of this accident was the captain's inappropriate response to the stall warning that eventually led to a stall from which the airplane did not recover. Contributing to the accident were (1) the flight crew's failure to monitor airspeed, (2) the flight crew's failure to adhere to sterile cockpit procedures, (3) the captain's failure to effectively manage the flight, and (4) Colgan Air's inadequate procedures for airspeed selection and management during approaches in icing conditions. As part of the accident report, the NTSB made recommendations to the Federal Aviation Administration (FAA) for improving the professionalism, flight skills, and decision-making abilities of air carrier pilots (NTSB, 2010).

In response to these recommendations, the FAA drafted a Notice of Proposed Rulemaking (NPRM) that would, among other actions, "establish flight crew mentoring programs for new-hire pilots and pilots upgrading or transitioning to a pilot in command position," (FAA, 2013). Before publishing this NPRM, the FAA Civil Aerospace Medical Institute, Human Factors Research Laboratory, was asked to review the mentoring research literature to assess the benefits of mentoring as it was related to flight deck training. In addition, we were asked to research the effectiveness of mentoring programs across a range of occupations and to make recommendations regarding the development of mentoring programs, the selection and training of mentors, and the expected benefits to mentors and protégés. This report is a summary of that research review.

Pilot Training as a Continual Process

As pilots move from student to certified pilot, several requirements must be met along the way. This progression is illustrated by the test of a pilot's knowledge in a written exam, simultaneous acquisition of flight skills while receiving instruction, and culminates with the successful completion of a practical test. As pilots train to proficiency, they do so with a certified flight instructor (CFI) in the right seat. Instructors provide immediate feedback on student performance and the best decisions to make in hypothetical situations (FAA, 2002). CFIs guide student pilots as they become comfortable and proficient within the cockpit. At a very broad level, this instruction is the foundation of the pilot's flight skills and decision-making ability and can establish a basis for their proficiency throughout their flying career. This initial exposure sets the stage for the understanding of aerodynamics, risk-based decision making, and emergency preparedness within aviation.

After receiving their flight certification, pilots must still undergo a periodic assessment of skills and additional training to remain current (Title 14 Code of Federal Regulations (CFR) Part 61.56 Flight Review). For airline pilots, this usually involves assessments and training sessions using flight simulators, as well as classroom instruction. In 2012, the International Federal Air Line Pilots Association (IFALPA) highlighted the importance of on-going training of both technical and nontechnical skills to establish the requisite competencies for a professional pilot (IFALPA, 2012). They suggested that a portion of the

training should be acquired through a mentoring relationship with a more experienced pilot. One reason for this may be the recent introduction of the Multi-Crew Pilot License (MPL) that has been adopted in Europe and other countries. Another reason may be the perceived similarity of the CFI-student relationship to the mentor-protégé relationship, essentially extending the training experience of the pilot that occurred during initial flight training. However, no research to support the effectiveness of this type of training was provided within the IFALPA report.

Although airlines have many options for the training of their pilots, the FAA sought to explore the practice of mentoring as a way to improve aeronautical decision-making, airmanship, and professionalism. Mentoring programs have been recommended in most governmental organizations (OPM, 2008). Mentoring has also been recommended as a successful approach in implementing operational training for several other professions, including pilots (ALPA, 2009; FAA, 2009; IFALPA, 2012); however, the methodology for tailoring mentoring to airline pilots with established criteria that demonstrate success has yet to be accomplished.

Results

Establishing a Definition of Aircraft Pilot Mentoring

At a broad level, mentoring consists of a more experienced individual (the mentor) offering advice, encouragement, guidance, and support to a less experienced individual in the same field (the protégé). The expectation is that the benefits that occur in this relationship happen faster than if the less experienced individual had struggled through phases of trial and error on their own (Bell & Goldsmith, 2013). While this definition is helpful, it is not complete or precise enough for our review.

The first task in the assessment of the research on mentoring is to establish a useful definition of mentoring. One problem with the mentoring literature is the possibility that one researcher's definition of mentoring could differ from another researcher's definition. If this discrepancy is too great, a comparison of the research results is meaningless because even though on the surface both research studies are looking at the same concept, in reality they are measuring different activities.

A review of mentoring research by Haggard, Dougherty, Turban, and Wilbanks (2011) underscores this problem. In this article, the authors state that the construct of mentoring has changed over the past three decades. The authors found approximately 40 different definitions of mentoring. This raises serious questions concerning what the construct means across studies because few authors clearly defined the mentoring process (what does a mentor do?). There is a similar lack of specificity in boundary conditions, including "(a) the mentor's place within the organizational hierarchy, (b) supervisory versus nonsupervisory mentoring, (c) inside versus outside mentors, and (d) the level of relationship intimacy" (p. 287).

One factor that determines the level of relationship intimacy is whether the mentoring is established formally or informally (Inzer & Crawford, 2005). The magnitude of the problem of defining mentoring can be illustrated by looking at the large number of differences between informal and formal mentoring programs. Table 1 shows a comparison of differences between informal and formal mentoring.

Table 1. A comparison of differences between informal and formal mentoring.*

Informal Mentoring	Formal Mentoring
Driven more by developmental needs of the protégé and similarity of interests.	Ideally, the approach is based on an organizational needs assessment.
Unstructured – structure is determined by the mentor and protégé.	Structured to ensure that the process is consistent with the corporate goals and objectives such as managerial talent development, skill building, diversity development and new employee socialization (Eddy, et al. 2001).
Individuals who seek mentoring need to find their own mentor – the only screening involves the need for mutual compatibility.	Participation of protégés may be restricted to a specific group. A screening process is often used to identify and match mentors and protégés.
Differences in organizational level between mentor and protégé are undefined.	Differences in rank between the mentor and protégé and whether the mentor comes from the same department are typically predetermined.
Mentors and protégés are not formally trained prior to initiation of the relationship.	Best practices call for training of mentors and protégés.
Goals and objectives for the mentoring are determined by the nature of the relationship.	Best practices call for the establishment of expectations, goals, and boundary conditions for the relationship.
Meeting frequency and duration of the mentoring is defined by the participants. Informal mentoring relationships often last 3-6 years.	The meeting frequency and duration of the mentoring are typically structured as part of the overall program. Typically, 1-2 hour meetings are held monthly and are designed to continue for 6 to 12 months.
Less likely to be monitored by the organization.	Best practices call for a monitoring process to identify potential problems and to ensure success.
Evaluation of formal mentoring by the organization is rare.	Best practices call for an evaluation of the program. This helps determine if the program is meeting the established goals and objectives.
Informal mentoring has a greater impact on career planning, psychosocial support, and long-term career goals.	Some research suggests that formal mentoring is likely to have its primary impact on psychosocial support.
Some research suggests that formal mentoring is superior to informal mentoring.	Some research suggests that formal mentoring is better than no mentoring.

* The table structure has been built around the best practices for designing workplace mentoring programs (Allen, Finkelstein, & Poteet, 2009).

Haggard et al. (2011) point out that much of the mentoring research literature does not specify whether the mentoring was formal or informal. Given the numerous differences between these two approaches, it is problematic to suggest that they are actually the same type of training activity.

Before we can properly define mentoring, we must compare and contrast the mentor-protégé relationship to other forms of training. In Table 2, Eby, Rhodes, and Allen (2007) provide a comparison of the mentoring-protégé relationship as compared to other types of training relationships.

Table 2. Comparison of the mentor-protégé relationship to other training paradigms. From Eby, Rhodes, and Allen (2007).

Type of relationship	Relational dimension						
	Context	Primary scope of influence	Degree of mutuality [1]	Relationship initiation	Relational closeness[2]	Interaction required	Power difference
Mentor–protégé	Academic, community, workplace	Academic, social, career, personal	Low–high	Informal or formal	Low–high	Yes	Large–small
Role model-observer	Academic, community, workplace	Academic, social, career, personal	None	Informal or formal	None	No	Large–small
Teacher–student	Academic	Academic, career	Low–moderate	Formal	Low–moderate	Yes	Moderate–small
Advisor–advisee	Academic	Academic, career, personal	Low–moderate	Formal	Low–moderate	Yes	Large
Supervisor–subordinate	Workplace	Career	Low–moderate	Formal	Low–moderate	Yes	Large–moderate
Coach–client	Workplace	Career, personal	Low	Formal	Low–moderate	Yes	Large

Note. Shading indicates where mentor-protégé relationships are similar to other types of relationships. [1] Degree of mutuality refers to how much benefit is derived from the relationship by both parties. [2] Relational closeness refers to how much value is placed on the relationship by both parties.

Looking at Table 2, we see that the role model-observer relationship is most similar to the mentor-protégé relationship, except for the requirement for interaction, compared to other forms of training relationships. In addition, the other training relationships are similar to mentor-protégé only in requirement for interaction but can differ on all other relational dimensions. However, if we assume that mentoring is formal, we find similarities with other training relationships, including how the relationship is initiated and the degree of relational closeness that can be expected.

In addition to these differences between mentoring and other types of training, there are a number of training protocols that are described as "mentoring" but do not fit the traditional mentoring template. These protocols include peer-to-peer mentoring, group mentoring, and e-mentoring. Whether these should be included as part of a mandated mentoring program will require further debate and discussion.

To establish a clear definition of mentoring for the current paper, it is necessary to specify who the mentor is in relation to the protégé as well as the goal(s) of the mentoring process. In addition to being a more experienced individual within the same field, there is a question of whether or not the mentor is within or outside of the company, in a supervisory or non-supervisory role to the protégé, is more senior or a peer of the protégé, is selected by the protégé or assigned through some other process, and other factors.

In regard to the goal of the mentoring process, two broad categories of mentoring found in the literature are career mentoring and psychosocial mentoring. Table 3 presents commonly found mentoring goals within these two categories. It should be noted that there have been efforts to include Role Modeling as a separate third function (Burke, 1984; Scandura, 1992; Scandura & Ragins, 1993; Scandura & Viator, 1994).

Table 3. How mentoring supports protégé development.*

Career Functions	Psychosocial Personal Functions
Sponsorship. The mentor opens doors that would otherwise be closed.	*Role Modeling.* The mentor demonstrates the kinds of behaviors, attitudes, and values that lead to success in the organization.
Coaching. The mentor teaches and provides feedback.	*Counseling.* The mentor helps the protégé deal with difficult professional dilemmas.
Protection. The mentor supports the protégé and/or acts as a buffer.	*Acceptance and Confirmation.* The mentor supports the protégé and shows respect.
Challenging. The mentor encourages new ways of thinking and acting, and pushes the protégé to stretch his or her capabilities.	*Friendship.* The mentor demonstrates personal caring that goes beyond business requirements.

*Adapted from K.E. Kram, *Mentoring at Work: Developmental Relationships in Organizational Life* (New York: University Press of America, 1988) and appearing in Harvard Business Essentials. *Coaching and Mentoring: How to Develop Top Talent and Achieve Stronger Performance*. (Boston: Harvard Business Press, 2004, pg. 77).

The intent of airline pilot mentoring has been defined broadly as an attempt to increase pilot proficiency (ALPA, 2009). More specifically, it is an attempt to improve airline pilot aeronautical decision-making, airmanship, and professionalism (ARC, 2010). Comparing these goals to Table 3, we can see that the intended goals of pilot mentoring include both career and psychosocial personal functions. The improvement of airmanship is most closely associated with the coaching function described in the table. Increasing professionalism is most closely associated with the role-modeling function. Improving aeronautical decision-making could be accomplished through either coaching or challenging.

For the purposes of the current paper, we defined the goal of airline pilot mentoring as improving pilot airmanship, aeronautical decision-making, and professionalism. A mentor is someone within the organization who is not a supervisor of the protégé. The mentoring will be formal in the sense that it is structured to accomplish specific objectives. The mentor will act as a coach, challenger, and a role-model for the protégé but is not prohibited from performing other functions as outlined in Table 3. Given these parameters, is there a sufficient body of mentoring research to support an expectation that an airline pilot mentoring program will improve protégé airmanship, aeronautical decision-making, and professionalism?

A Review of the Effectiveness of Mentoring Programs

In recent decades, mentoring has grown in popularity as a training tool for corporations and large organizations. As mentoring grows in the corporate world, the body of literature on mentoring also expands. The literature has described mentoring functions that provide both career and psychosocial support. These mentoring functions have been described as having positive outcomes for protégés. Mentoring in the workplace has been associated with career-related outcomes for protégés that include the following improvements: 1) performance (e.g., sales performance, raw profit, and business success); 2) helping behaviors (e.g., mentoring others and organizational citizenship behaviors); 3) interpersonal relations (e.g., positive peer relations, satisfaction with coworkers, and supervisor support); and 4) motivation and involvement (e.g., career planning, job involvement, motivation, and career commitment) (Eby, Allen, Evans, Ng, & DuBois, 2008). In addition, protégés who received higher levels of mentoring from their mentors reported significantly greater organizational commitment, as well as satisfaction with communications with their supervisors (Chun et al., 2012; Madlock & Kennedy-Lightsey, 2010). Appendix A presents a summary of several meta-analyses of mentoring programs and the specific positive outcomes that were found in the literature.

Compared to those who were not mentored, protégés were more likely to be satisfied with their job and career and believe they will advance in their career, have higher political skill, and have greater compensation, salary growth, perceptions of job retention, and communication satisfaction (Allen, Eby, Poteet, Lentz, & Lima, 2004; Chopin, Danish, Seers, & Hook, 2012; Madlock & Kennedy-Lightsey, 2010; Piper, 2013; Underhill, 2006). Using a quasi-experimental design that evaluated a formal mentoring program, Seibert (1999) found that mentored protégés had higher levels of job satisfaction, but did not differ from their non-mentored colleagues with respect to role stress or self-esteem. Protégés have reported that mentoring resulted in significantly greater affective well-being, organizational commitment, leadership self-efficacy, and ratings of new skills learned (Chun, Sosik, & Yun, 2012; Fleig-Palmer & Schoorman, 2011). Peer mentoring has been shown to significantly impact the transfer of knowledge and

aid in skill acquisition/enhancement and application (Files, Blair, Mayer, & Ko, 2008; Fleig-Palmer & Schoorman, 2011).

Besides the benefit to protégés, studies have shown that mentoring relationships result in positive outcomes for mentors as well. Compared to those who have not mentored, mentors were more satisfied with their jobs and committed to their organizations. Also, mentoring resulted in higher performance at work and higher perceived career success (Ghosh & Reio, 2013). Protégés who reported receiving better mentoring coincided with mentors reporting significantly greater levels of transformational leadership, affective well-being, and organizational commitment over time (Chun et al., 2012).

Although most of the literature has focused on the benefits of mentoring, some researchers have also looked at the negative effects of mentoring. Negative mentoring experiences have resulted from distancing/manipulative behaviors (e.g., deceit, sabotage, intentional exclusion, general abuse of power, inappropriate delegation, self-absorption, neglect), and poor fit between the mentor and protégé (e.g., mismatched values, mismatched personality, interpersonal incompetence, personal problems, bad attitude, mismatched work styles, technical incompetence). Outcomes from these dysfunctional relationships resulted in increased turnover intentions, increased stress, and decreased job satisfaction (Eby & Allen, 2002). Different types of dysfunctions have been identified in mentoring relationships that include negative relations (e.g., bullying), sabotage, relationship difficulties (e.g., conflict), spoiling of the relationship (e.g., betrayal), submissiveness, deception, and harassment (Scandura, 1998). Protégé outcomes from these dysfunctions can include lowered self-esteem, decreased job satisfaction, decreased propensity to become a mentor in the future, increased stress/anxiety, increased absenteeism, and increased turnover. For mentors, dysfunctional mentoring relationships can result in increased stress/anxiety, decreased propensity to become a mentor in the future, increased jealousy, increased feelings of betrayal, increased overdependence on protégés, and increased overestimation of protégés' contributions. In addition, some types of dysfunctional mentoring have also been found to negatively relate to social exchange perceptions, intentions to leave the relationship, depressed mood, psychological withdrawal, and poor learning (Eby, Butts, Lockwood, & Simon, 2004). Individuals who reported that these negative experiences were typical of their mentoring relationship also perceived a greater impact from these experiences, which ultimately lowered their mentorship satisfaction (Eby & McManus, 2004).

Characteristics of a Good Mentor

According to Allen, Finkelstein, and Poteet (2009) employees are willing to serve as mentors due to "(1) the desire to benefit the organization and its members, (2) intrinsic satisfaction, and (3) the desire to enhance one's own standing within the organization (pg. 30)." One of the most important aspects of being a mentor is being experienced in your field, so it is no surprise that Barker (2006), Cho, Ramanan, and Feldman (2011), Ferguson (2011), and Straus, Johnson, Marquez, and Feldman (2013) found that mentors who are highly knowledgeable, skilled, and experienced in the field had more successful and more satisfied protégés.

Eddy, Tannenbaum, Alliger, D'Abate, and Givens (2001), in their survey of 143 industry organizations, found that 70% of the 30 companies that reported on mentor screening indicated that they used some form of mentor screening. Though the process was variable across organizations, most screened their mentors at least in regard to technical expertise and knowledge. In addition to having experience in the field, mentors who have previous experience with mentoring relationships and a

willingness to share their knowledge with a protégé are recommended. This is because these mentors are already familiar with the mentoring process and are not creating a negative learning environment by begrudgingly giving advice (Cho, Ramanan, & Feldman, 2011; Ferguson, 2011; Hamlin & Sage, 2011; Murray, 1991; Zerzan, Hess, Schur, Phillips, & Rigotti, 2009). Rather than a reluctant mentor, Brechtel (2004) and Hamlin and Sage (2011) found that it is very important to have a mentor who is supportive, encouraging, and works to boost their protégé's self-esteem. However, it is important to balance self-esteem boosting and challenging; therefore, mentors who are honest, especially when offering feedback and coaching, are the most desirable (Brechtel, 2004; Cho, Ramanan, & Feldman, 2011; Johnson, 2002; Straus, Johnson, Marquez, & Feldman, 2013). Although these are some of the most important and agreed upon characteristics of an effective mentor, many researchers included several other personality factors that they felt protégés should look for in a mentor such as being caring, kind, humorous, generous, enthusiastic, warm, and passionate.

While exploratory in nature, Smith, Howard, and Harrington (2005) examined the essential traits and functions of a formal mentor from the mentor's perspective. Using a nine-member Delphi panel, they developed a list of 14 mentor traits and 21 mentor functions. They then prepared a survey instrument and asked respondents to rate the importance of each trait and function on a 5-point Likert scale. Of the 741 surveys distributed, 355 were returned: 68 from an academic industry context, 102 from business, 101 from military-armed forces, and 70 from military-academia. A factor analysis of the mentor traits revealed three factors. Respectability involved honesty, integrity, high moral and ethical standards, and bearing/personal presence. Wisdom involved organizational savvy, professional competence, understanding the organization's core values, and ability to teach. Finally, sensitivity involved empathy, compassion/understanding, genuineness, and confidentiality. Respectability was viewed as most important, followed by sensitivity.

The factor analysis of the mentor functions also revealed three factors. The Training factor included broadening the protégé's professional experience, serving as a role model, coaching the protégé, offering an introduction to the academic/corporate/military culture, providing cross-functional information, and providing vision for the protégé. The Supporter factor involved fostering teamwork with the protégé, accepting the protégé, developing cooperation with the protégé, and providing support for the protégé. The final factor, Activist, included intervening on the protégé's behalf, providing exposure to peers and superiors, demonstrating networking ability, sponsoring the protégé; and disciplining the protégé when appropriate.

In assessing differences across industry contexts, the authors failed to find a significant difference in the importance ranking of the three mentor functions. There was weak evidence that the importance of the trait rankings differed across context. The authors point out some of the concerns associated with use of these scales, including significant correlations between scales and low alphas for several scales. While a majority of the traits and functions have been identified previously, we do not know if the ratings by formal mentors are fully consistent with what is important for protégés.

Although an individual's characteristics cannot always be changed, there are some behaviors and actions that a mentor can learn and incorporate into their relationships to be more effective. For example, it is imperative in any relationship to communicate, and mentoring is no different. It is important for mentors to effectively explain their goals and expectations for the protégé, provide feedback in areas the

protégé may be struggling, and listen to the protégé's needs to adjust the goals, deadlines, or relationship dynamics (Brechtel, 2004; Gheesling, 2010; Hamlin & Sage, 2011; Ramani, Gruppen, & Kachur, 2006). It is also very important for mentors to remain available to their protégés by scheduling and maintaining regular meetings (Cho, Ramanan, & Feldman, 2011; Gheesling, 2010; Jacobi, 1991; Zerzan, Hess, Schur, Phillips, & Rigotti, 2009). Several behaviors can lead to a negative experience or a failed relationship. Barker (2006) explained that ineffective or toxic mentors are commonly overly critical of their protégé due to unrealistic expectations or they avoid having contact with them. Additionally, Hamlin and Sage (2011) found that ineffective mentors did not maintain consistent contact, let their opinions take priority, and did not provide the protégé with a purpose of the relationship.

Characteristics of a Good Protégé

Like mentors, there are certain characteristics of the protégé that are related to the likelihood of having a positive mentoring relationship. Gheesling (2010), Gibson (1998), and Green and Bauer (1995) found that protégés who appeared to have more talent or were higher performing tended to receive more career-based mentoring and were more likely (in cases of informal mentoring) to identify assigned superiors as mentors. This is likely due to mentors wanting to invest more time and energy into a protégé with higher potential as it may seem easier or will reflect well on them if the protégé is successful after the relationship concludes. Likewise, protégés with strong work ethics and higher career motivation tend to receive more psychosocial support, career mentoring, and were more likely to complete training programs (Day & Allen, 2004, Green & Bauer, 1995; Hill & Dalley-Trim, 2008; Noe, 1988; Teatheredge, 2010). Finally, protégés who are confident, positive, and proactive are more likely to have effective mentoring relationships and complete their training (Gibson, 1998; Harris et al., 2001; Hill & Dalley-Trim, 2008; Teatheredge, 2010). Additional characteristics discussed at less length in the literature included having an internal locus of control, openness, and enthusiasm. Turban and Dougherty (1994) for example, suggest that protégés with an internal locus of control and high self-monitoring and emotional stability were more likely to initiate a mentoring arrangement. In their review of the role of personality in mentoring relationships, Turban and Lee (2007) indicated that they believe that personality characteristics of both the protégé and mentor influence the overall relationship. They call for additional more rigorous research to better understand the interactive effectiveness throughout the duration of the mentoring relationship.

There are also several ways that a protégé can ensure that they get the most out of the relationship. One such way is to utilize their interpersonal skills. For instance, Harris et al. (2001) found that apprentices who had strong communication skills were more likely to complete training and Gibson (1998) found that a high amount of quality communication was related to high mentor effectiveness. These skills can be used to clarify expectations, explain learning goals, and provide honest feedback to a mentor in order to improve the relationship (Hamlin & Sage, 2011; Straus, Johnson, Marquez, & Feldman, 2013). In addition to communicating effectively, protégés should work to be open and active listeners. Straus, Johnson, Marquez, and Feldman (2013) found that both these actions related to a successful mentoring relationship. Others found that protégés should show responsibility in their work, for their own learning, and for the progress of the relationship to contribute to the learning environment (Hamlin & Sage, 2011; Hill & Dalley-Trim, 2008; Straus, Johnson, Marquez, & Feldman, 2013). There are also certain qualities a protégé can exhibit or actions they take that are related to failed relationships and dissatisfied mentors. Barker (2006) explained that protégés who are manipulative and power-seeking get into the relationship for the wrong reasons and do not see it as a learning experience; therefore, these

types of protégés do not tend to take anything away from the relationship and can create a hostile environment between them and their mentor. Actions that Hamlin and Sage (2011) found related to negative mentoring experiences included not being prepared for meetings and coming into meetings with a negative mindset.

Relating These Results to Airline Piloting Goals

Although there is evidence in the literature regarding the positive effects of mentoring programs, the critical question to be answered is whether mentoring can be expected to improve pilot airmanship, aeronautical decision-making, and professionalism. Most of the research on mentoring looked at different professions than that of an airline pilot. For example, Dougherty and Dreher (2007) report that of 47 mentoring studies reviewed, 23 of them looked at business professionals and managers, with additional groups including lawyers, accountants, educators, Army officers, nurses, and midshipmen. So we must ask whether the results from these studies are generalizable to the airline industry. To answer this question, we will address each of the mentoring goals (improved airmanship, better aeronautical decision-making, and increased professionalism) separately because they involve different types of learning and different methods for assessing performance.

Airmanship primarily involves the psychomotor skills and procedural knowledge required to pilot the aircraft. Despite the claim above that mentoring increases job skill acquisition, a review of which skills have been shown to increase did not yield sufficient data to adequately assess the extent to which a mentoring relationship might improve performance of psychomotor skills, such as those required in the control of an aircraft. For example, Eby, Allen, Evans, Ng, and DuBois (2008) measured job skill as sales performance. Egan and Song (2008) indicated that "… few studies have focused on direct measures of job performance in relation to mentoring participation and no studies have been identified which use managerial or organizational reported measures of protégé performance (p. 355)." In their randomized field experiment involving employees in health-care services, insurance, and health maintenance Egan and Song (2008) did find that mentoring had a significant effect on managerial performance ratings. Most of the research that suggests job performance had improved involved sales organizations or academic settings. This type of job skill differs significantly from the type of skills required to fly an aircraft.

Likewise, the literature does not seem to directly support the effectiveness of mentoring for improving aeronautical decision-making. Chun, Sosik, and Yun (2012) and Fleig-Palmer and Schoorman (2011) report on an improvement in leadership effectiveness but it is difficult to generalize this finding to decision-making in general and especially to aeronautical decision-making. Other literature cites the need for the mentor to provide challenging assignments (e.g., Kram, 1988), but again, the generalization to decision-making within an aeronautical setting is tenuous.

Unlike the first two goals, the literature does seem to offer some support to the notion that mentoring could increase pilot professionalism. However, professionalism is a poorly defined concept that would need to be operationally defined and measured before determining the effects of a mentoring program. The success of such a program would probably depend on both the characteristics of the mentor and the protégé, as outlined above. In addition, the type of mentoring arrangement will also have an effect on the mentoring outcome.

Challenges for Pilot Mentoring

Thus far, we have suggested that the mentoring literature provides only limited support for the notion that mentoring programs can improve a protégé pilot's airmanship, aeronautical decision-making, and professionalism that is needed to justify mandating those programs. A number of other factors need to be considered in the context of pilot mentoring. Traditional mentoring involves a one-to-one, face-to-face relationship. Given that not all pilots live near their domicile, how will this affect assignment of mentor to protégé? The National Research Council's Committee on the Effects of Commuting on Pilot Fatigue (NRC, 2011) gained information on the zip code of the pilot's home on record as well as the location of his/her domicile. Using that information, they were able to determine the approximate distance of each pilot's commute. While 45% of the mainline, 46% of the regional, 41% of cargo and 38% of charter pilots lived within 90 miles of their duty base, 22% of the mainline, 22% of the regional, 26% of cargo, and 30% of charter pilots lived 750 or more miles from their duty base. Extended commuting distances of pilots are likely to present a challenge to establishing times and opportunities for face-to-face mentoring sessions. Requiring mentoring could lead to unacceptable increases in the length of the duty day for the involved pilots. It might also lead to problems with the scheduling of mentor-protégé meetings, especially when factoring in the bid practices used by airlines to establish route assignments. In addition, if mentor-protégé meetings were assumed to occur during scheduled flights, there could be potential problems with how many times particular pairings occurred or did not occur and also might interfere with flight duties.

Another issue involves whether a mentor should be the supervisor of the protégé. While there are situations where supervisors serve as mentors, most authors do not recommend this approach. The use of the captain as a mentor also involves some challenges since this would change the nature of the relationship and possibly modify traditional CRM recommendations/procedures.

In addition to these issues, several questions arise from the requirement to establish mentoring programs. Will mentoring be required of all new pilots? Will mentoring practices need to be different for those who enter through traditional means than those who enter from a Multi-Crew Pilot License (MPL) program? Questions remain regarding the number of senior pilots who have the necessary expertise, interest, motivation, and interpersonal skills to serve as mentors. Depending on staffing levels, this may represent a significant challenge for some carriers.

As is true of any work environment, mentoring (usually informal) is already going on. At this point, we don't know how often, the extent to which it occurs, and its benefits in aviation. It is doubtful that traditional formal mentoring programs will be sufficient to address all of the potential issues involved in the proposed pilot mentoring goals. This assumption is based on data that suggest that most formal mentoring programs last a year and involve monthly or twice-a-month face-to-face meetings (Eddy et al., 2001; Hegstad & Wentling, 2004; Murray, 1991; Ragins & Cotton, 1999). It seems highly unlikely that a one-year program involving 12 meetings will be sufficient to communicate the necessary information and ensure that the performance of a younger pilot has been sufficiently enhanced. Data have consistently demonstrated greater benefits from informal as compared with formal mentoring programs. One factor that may contribute to this difference is that when a mentor selects a protégé as part of an informal approach he/she may select only high-performing individuals - individuals who are highly motivated to succeed. Another factor is that the literature on mentoring suggests that the higher the frequency of meetings the more likely the mentoring will have a positive outcome. The extent to which this imposes an additional burden on work schedules could be problematic.

Mentor Program Recommendations

If the decision is made to proceed with a mentoring program, some approaches to the mentoring process would likely increase the probability of the success of the program. This section of the report will highlight the development of a formal mentoring program. A more detailed set of information concerning best practices, as described in the book by Allen, Finkelstein, and Poteet (2009), can be found in Appendix B.

Planning and Providing Infrastructure. As with any intervention in the workplace, it is extremely important that employees can readily observe upper management's support and ownership. This can be demonstrated in how the mentoring program is developed. With regards to the development of a formal flight crew mentoring program, the impetus came from the US Congress as part of the Airline Safety and Federal Aviation Administration Extension Act of 2010 (Pub. L. 111-216) ģ206 that called for the FAA to establish an aviation rulemaking committee to provide recommendations regarding the establishment of a flight crewmember mentoring program in which experienced flight crewmembers would be paired with newly employed flight crewmembers. The goal was to provide "… specific instruction on techniques for instilling and reinforcing the highest standards of technical performance, airmanship, and professionalism in newly employed flight crewmembers." (Pub. L. 111-216). Additional efforts were to be directed toward enhancing leadership and command experience and improving professional development. Results from the MLP ARC are provided in their November 2010 report. They recommended that carriers establish a professional development committee that would be responsible for the selection and training of "career mentors" for newly hired pilots as well as initial upgrading captains. While, in some ways, this effort could be considered to be part of the needs assessment that would serve as the basis for the development of the overall goals and objectives for a formal mentoring program, it provides limited information concerning how this should be accomplished within an air carrier's organization. It is important that the goals and objectives of the mentoring program are firmly tied to the organization's culture and to other human resource strategies associated with pilot training and development. If technical performance, airmanship and professional development are the overall goals of the mentoring effort, how will this be addressed during mentoring and how can you measure those goals and ensure that the mentoring was successful? We have addressed a number of concerns surrounding these goals earlier in this document. Each air carrier will need to determine the extent to which its mentoring program can assist in improving technical performance, airmanship, and professionalism. Details concerning the mentoring process need to be defined and a program manager identified. Attention needs to be focused on the importance of confidentiality in the mentoring process. Clear standards need to be established so that both mentor and protégé understand the limits of confidentiality. The planning needs to include a description of all other aspects of the mentoring program including the monitoring process and overall evaluation.

Protégé selection. The requirement suggests that the formal mentoring will be provided to all new hires as well as to newly upgraded captains.

Matching. One solution for the conflicts that may arise due to individual differences is controlling the matching process. Rather than randomly assigning mentors to protégés, deliberate matching may be conducted to ensure that the relationship starts off on the right foot. Studies have found that perceived personality similarities or incompatibilities strongly predicted satisfaction levels and success (Gheesling, 2010; Straus, Johnson, Marquez, & Feldman, 2013; Waters, 2004). Ensher and

Murphy (1997) found that general perceived similarities were related to high satisfaction and liking for both mentors and protégés; however, later research suggested matching based on similar attitudes and values, rather than demographics, is more beneficial (Ensher, Grant-Vallone, & Marelich, 2002; Lee, Dougherty, & Turban, 2000). Lankau, Riordan, and Thomas (2005) reported that deep-level similarity (personality, interests, work values, and problem solving approach) was more important in forming a positive relationship than similarity in gender, race or other demographic characteristics. Finally, research from Boyle and Boice (1998) and Straus, Johnson, Marquez, and Feldman (2013) suggested that mismatched expectations between the mentor, protégé, and program can result in failed relationships and unmet goals. Hegstad and Wentling (2004) found that all of the Fortune 500 Companies in their review used a matching process to link protégé and mentor. Comments from company personnel suggests that this may be one of the more crucial factors involved in the mentoring process. In their review of industry mentoring programs, Eddy et al. (2001) reported that 75% of the organizations used some sort of structured matching procedure.

Training. Another simple solution for potential conflicts is to prepare mentors and protégés for the relationship. One of the most important and highly agreed-upon elements that should be included in pre-relationship training is alignment and clarification of expectations between the mentor, protégé, and program creators (Barnett, 1995; Garvey & Alred, 2000; Kasprisin & Single, 2005; Ramani, Gruppen, & Kachur, 2006). Additionally, Kasprisin, Single, Single, Ferrier, and Muller (2008) and Scielzo (2008) found that protégés who participated in pre-relationship training tended to disclose at a similar level to their mentor and had mentors who were more involved, more satisfied with the relationship, and reported holding their protégés in higher esteem.

Training mentors appeared to result in more learning for their protégés, more career support given to protégés, and higher satisfaction with their protégés (Giebelhaus & Bowman, 2002; Martin & Sifers, 2012; Scielzo, 2008). Allen, Finkelstein, and Poteet (2009) define several levels of protégé – mentoring training that should be a part of a well-designed workplace mentoring program. Hegstad and Wentling found that training was conducted in all but one of the participating Fortune 500 companies. Eddy et al. (2001) indicate that 58% of the industry companies provided “mentoring program orientations.”

In addition, mentor training should have a human relations component, which includes gender/culture issues awareness, boundaries in the mentor-protégé relationship, and increasing interpersonal skills (Barnett, 1995; Garvey & Alred, 2000; Ramani, Gruppen, & Kachur, 2006). Training should also focus on developing mentor-specific skills such as knowing how to balance challenging and supporting the protégé, keeping the focus of the relationship on the protégé, and not trying to take on mental/personal problems in the protégé’s life (Barnett, 1995; Garvey & Alred, 2000; Ramani, Gruppen, & Kachur, 2006). According to Garvey and Alred (2000), it is also important to emphasize the need for trust in the relationship as it facilitates a safe environment for the protégé to share openly.

Research has suggested that protégés should receive very similar training to their mentors regarding both structure and information (Kasprisin & Single, 2005; Scielzo. 2008). Eddy et al. (2001) found that mentor training typically emphasized the roles and responsibilities of the mentor, giving feedback, coaching, listening, and communications skills. For protégés, the emphasis was on protégé roles and responsibilities, career choices/career advising, self-awareness, and listening and communications skills. Agreed upon protégé-specific recommendations included identifying what they want to take away

from the relationship and reflecting on values, perspectives, and biases that they may bring to the relationship (Dean, 2009; Zerzan, Hess, Schur, Phillips, & Rigotti, 2009). Dean (2009) also asserted that protégés should decide what qualities they want most in a mentor and communicate expectations early to ensure their needs are not overlooked. According to Zerzan, Hess, Schur, Phillips, and Rigotti (2009), it will also be beneficial to the protégé if they identify their work and learning styles and establish learning goals with specific time increments to help keep the relationship moving forward and focused.

Monitoring and Program Evaluation. When carriers establish the new part 119 professional development position, there is a question of whether that individual as well as members of the professional development steering committee (PDSC) will be responsible for developing, monitoring, and evaluating the formal aircrew mentoring program. Someone needs to be designated as the responsible individual for the formal mentoring program. If you do not establish a process to monitor the mentoring program you will be unable to determine whether the participants are meeting as required and/or whether there are problems with some of the mentoring relationships. Periodic follow-ups are required. It would be advisable to obtain feedback from the mentor and protégé within the first few weeks of the program concerning how the relationship is developing and whether there are any issues that need to be resolved.

Without a formal evaluation, one will be unable to determine if the program objectives are being met. This evaluation can be accomplished in a variety of ways. As indicated in Appendix B, Kirkpatrick has described four levels of measurement: (1) reactions to the training, (2) learning what resulted from the training, (3) behavior or performance change, and (4) business results for the organization. These metrics can be collected through face-to-face meetings, surveys, or group feedback sessions. The last two levels of measurement are often left out during program evaluations and are also the most difficult to measure. It is often difficult to determine the extent to which behavioral or performance changes can be attributed to the intervention or to other factors that have occurred. It will also be difficult to determine the extent to which the formal mentoring process may have impacted the organization because the effects of any intervention take time to show results.

Conclusions

While there are numerous studies in the literature that support the effectiveness of mentoring programs, there are very few that directly support the expectation that mentoring will improve pilot airmanship, decision-making, and professionalism. Two difficult problems with the use of mentoring as an effective training tool are the lack of well-established definitions of the mentoring process and the lack of scientific rigor in the mentoring research literature.

There is a wealth of anecdotal literature that supports the importance of mentors in the lives of influential individuals. Each of us can probably remember a teacher, colleague, supervisor, or another employee who served in some way as a mentor and, thus, supported our career choices and career development. Numerous research studies have been designed to identify the important mentor/protégé factors that support the career and psychosocial development of the protégé. However, we could not draw definitive conclusions from the literature because of the general lack of scientific rigor involved in nearly all of the investigations.

With few exceptions, mentoring studies can be described as cross-sectional field studies. This means that in the workplace, data are gathered from employees at a single point in time. Employees are asked to indicate whether or not they had a mentor and are subsequently asked to describe, define, or rate the mentoring experience and the overall outcomes, depending on the focus of the investigation. Shipp and Fried (2014a, 2014b) edited a two-volume set devoted to time and work. The articles contained in those volumes illustrate the problems associated with research that is focused on a single dimension in time and does not consider the temporal nature of events that occur in the workplace. For example, when asking employees to describe or rate their mentoring experiences at a single point in time, we know nothing about how that experience has evolved across time, difficulties that may have been encountered, or how those events have impacted the employee's mentoring experience. Another important issue is that whenever there is a change in the workplace, there is likely a time lag between what was changed or implemented and the employee's reactions. As indicated by Dougherty and Dreher (2007), most of the research attention has been focused on proximal (immediate) versus distal (long-term) outcomes. Eby et al. (2013) also addressed this point, "Currently we have virtually no understanding of the dynamic nature of mentoring relationships or how critical events in a mentoring relationship influence the trajectory of the relationship (p. 632)." We also know little about what percentage of the mentoring relationships resulted in positive outcomes, how many were positive but not particularly noteworthy, how many involved negative outcomes, and how many were primarily dysfunctional. In one study (Eby, McManus, Simon, & Russell, 2000), more than 50% of the participants reported at least one negative mentoring relationship during their career.

Ramaswami and Dreher (2010) propose a process-oriented model that can be used to better understand the process or mechanisms whereby mentoring can influence career outcomes. The model separates mentor functions into 5 "process paths". The first process path, Human Capital, captures mentor functions associated with the acquisition of knowledge, skills, and abilities that ultimately enhance the protégé's job performance. The second process path, Movement Capital, deals with mentor functions that propel the protégé to seek new (and perhaps better) jobs within or outside of the current organization. The third process path, Social/Political Capital and Signaling, includes mentor functions that help the protégé gain legitimacy and exposure. The fourth process path, Path-Goal Clarity, contains mentor functions that enable the protégé to achieve career goals or motivate the protégé to achieve those goals. Finally, the fifth process path is Values Clarity, which includes mentor functions that clarify the status of the protégé's current work-life situation and the appropriateness of chosen career and life decisions. Additional research is needed to evaluate the potential mediating processes as well as determine the relative influence of individual functions. Additional scales beyond those currently in use are needed to support this effort.

Concerns associated with the cross-sectional nature of the mentoring research are listed in a table by Dougherty and Dreher (2007, p. 85) shown in Table 4. The first concern listed in Table 4, *Definitional Variability*, refers to the definition of mentoring across studies and how those differences may influence outcomes, as was discussed earlier. Along with the definitional issues, Scandura and Pellegrini (2010) expressed concerns about the lack of integration between the mentoring literature and other psychological research, the need for improved measurement instruments, as well as improvements in the overall design of the research and the need for longitudinal investigations.

Table 4. Key Conceptual and Methodological Issues in Studies of Mentoring and Protégé Career Outcomes (from Dougherty and Dreher, 2007).

Definitional Variability	No definitions of mentor and mentoring Vague definitions of mentor and mentoring Narrow/exclusive definitions of mentor and mentoring
Criterion Limitations	Need to focus more attention on • Extraorganizational functioning and satisfaction • Positive relationships at work • Negative/unintentional effects of mentoring • The organizational perspective • Effective talent pool management
Internal Validity Problems	Ambiguous direction of causality Alternative/third-variable explanation of relationships
Method Variance Inflation	Consistency motif Illusory correlations and implicit theories Social desirability effects Positive/negative affectivity
External Validity Constraints	Interaction of selection and treatment (mentoring) Interaction of setting and treatment

Criterion problems include the need to expand the investigation of the effects of mentoring to consider the overall functioning of the organization, and whether mentoring has affected the talent pool of employees who are being considered for advancement. Positive as well as negative effects of mentoring need to be considered with this type of research.

There is a tendency for individuals to assume causality involving correlations between mentoring and outcomes. Dougherty and Dreher (2007); Eby et al. (2013); Allen, Eby, and Lentz (2006); and Turban and Dougherty (1994) raise concerns that common method bias (variance) can be explained in several ways. Thus, one should not assume that mentoring was a causal factor in the outcomes. There may be other interpretations. Dougherty and Dreher (2007) refer to several factors that may contribute to the outcomes: (1) consistency in thoughts and attitudes, (2) illusory correlations and implicit theories, (3) social desirability, and (4) positive and negative affectivity of respondents. At this point, there is an insufficient number of longitudinal or quasi-experimental studies in the literature to adequately define the

overall impact of mentoring. Eby et al. (2013, p. 24) indicated the need for "…more methodologically rigorous research…" in order to make causal inferences.

Another concern involves the wide range of time periods involved in the various studies. While formal mentoring generally involves 9 months to a year, informal mentoring may last up to 6 years or more. Given that Kram (1985) defined and demonstrated the importance of stages in the mentoring process, it is difficult to see how those stages can be adequately accomplished in formal mentoring settings with a time frame of a year or less. This issue has not been adequately addressed in the literature. The indication in several studies that mentoring relationships are more positive and outcomes are improved in informal mentoring as compared to formal mentoring should not be unexpected, given the difference in time involved in both types of mentoring.

Another difference that is often touched on when comparing formal and informal mentoring involves the approach to the selection of a protégé. Informal mentoring involves a voluntary choice on the part of the mentor. Most formal mentoring programs involve a matching process. Protégés who report receiving mentoring support often have higher ability or potential, higher motivation and commitment, strong interpersonal skills, and positive self-regard. Turban and Dougherty (1994, p. 698) found that "… individuals with internal loci of control and high self-monitoring and emotional stability were more likely to initiate and therefore to receive mentoring." Given those general characteristics of protégés, is it the mentoring, the proactive behavior of certain employees, or the selection of high-quality employees that leads to more positive outcomes? Wanberg, Kammeyer-Mueller, and Marchese (2006, p. 417) found that mentor proactivity at program onset related "…positively to both protégé and mentor reports of career-related mentoring and to mentor reports of psychosocial mentoring at the conclusion of the program."

In summary, despite a superficial resemblance to initial flight training methodologies, there is little evidence to support the effectiveness of mentoring, in general, and in achieving the goals focused on in this report, in particular. Most studies used to validate a particular training methodology involve a pre-training test of proficiencies, training, and post-training test of proficiencies, with the expectation that post-training proficiency scores will be higher and demonstrate the effectiveness of the training protocol. While even these types of studies have potential problems with confounding variables, they are more effective than other approaches at validating the effectiveness of the training. Eby et al. (2013), for example, found that the vast majority of research supporting the effectiveness of mentoring were based on cross-sectional data (93%) and none were based on data from experimental designs. The cross-sectional nature of most mentoring studies does not allow a clear validation of mentoring as an effective training technique. This, in addition to the problems with finding consistent mentoring methodologies, does not allow us to conclude that mentoring is an effective approach to improving pilot airmanship, aeronautical decision-making, or professionalism.

Recommendations

1. Before proceeding with mandating mentoring programs for the airlines, clearly specified goals need to be developed for those programs. Development of those goals should include a consideration of the potential impact of cultural differences between carriers on the implementation of the mentoring

program. Mentor selection and training requirements should be established, and the process for pairing mentors and protégés should be developed. Appendix B presents a highly structured approach to the development of a workplace mentoring program, along with recommendations for the evaluation of the effectiveness of the program. We recommend that an operational test of a mentoring program be completed within a selected airline to ensure that there is no undue imposition on the workloads of mentors or protégés and that flight-scheduling activities are not negatively affected. Pre- and post- mentoring measures of pilot performance (airmanship, decision-making, professionalism), with the inclusion of a control group that is tested twice but does not participate in a mentoring program, should be used to establish the effectiveness of the mentoring process. Other details, such as the length of the mentoring program, would also need to be specified prior to the operational test. The airline needs to determine whether a different approach to mentoring may need to occur for newly hired pilots that enter through traditional means (1,500 hours) versus those who enter via MPL training programs (10 hours solo, 240 hours log time).

2. As an alternate recommendation, we believe that other forms of pilot training might prove to be more effective than mentoring. For example, a form of accelerated expertise (Hoffman, Ward, Feltovich, DiBello, Fiore, & Andrews, 2013) emphasizes efforts to focus more clearly on the development of scenarios that could be used to train workers regarding decision-making on complex events. Cases would be developed and focused around problems or events workers had encountered that challenged their decision-making abilities. Hoffman et al. (2013) indicate that the events that are identified should involve "…cases from their own experience that caused them great difficulty and stretched their professional capacity" (p.159). A case library of these events would then be constructed and used to develop specialized computer-based scenarios or simulations that could be presented to trainees to improve their ability to identify and respond to unusual events. The cases/scenarios contained in the database should be ranked by the level of knowledge required to respond appropriately. This will guide their use at the appropriate time during training. Examples of accelerated approaches to training include the use of Intelligent Tutoring Systems, an approach to the training of "perceptual-cognitive" skills in athletes (the ability to rapidly perceive patterns that non-experts cannot perceive), and use of the Decision-Making Exercise Method (DMX – which was initially used to train military commanders).
3. A third recommendation is to look at the practice of virtual or e-mentoring. The increasingly global nature of business, along with the widespread geographic locations of co-workers in many large corporations, has resulted in an increased interest in what Zey (2014) calls virtual mentoring where "… electronic-based communication is the primary format for mentor-protégé interaction (p. 2.)." This form of mentoring has been described in many ways - "…e-mentoring, e-coaching, computer-mediated mentoring, telementoring, e-mail mentoring, internet mentoring, online mentoring, cybermentoring, virtual mentoring, electronic mentoring, distance mentoring, Web-enabled coaching, and Web-based mentoring (p. 3)." Communication between mentor and protégé can take many forms including use of the telephone, video conferencing, email, online chat sessions, knowledge bases, texting, instant messaging, Skype, Webex, and other forms of Web-conferencing software. Zey (2014) indicates that Intel was one of the pioneers in online mentoring. Since then, a number of other Fortune 500 companies have utilized online mentoring. Single and Muller (2001) describe the development and implementation of MentorNet ((www.mentornet.net)) as a means of providing a nationwide structured e-mentoring program for women engineering and science students that was designed to "…encourage retention and advancement for women students in engineering and related

science fields (p. 110).” This effort has been in place since 1997 and can serve as a model for structured mentoring. A Cybermentor program involving the University of Calgary, the University of Alberta, and the Alberta Women’s Science Network has similar goals and objectives (Kenter, 2010) While these programs have many of the same issues and concerns associated with traditional face-to-face mentoring programs, one advantage is that the mentor and protégé do not have to be physically at the same place, and with some forms, the communications can be asynchronous. Shrestha, May, Edirisingha, Burke, and Linsey (2009), while identifying a number of commonalities between e-mentoring and traditional mentoring, also identified some challenges that are particular to e-mentoring in an academic environment in the United Kingdom.

While there is limited research available regarding best practices and the overall benefits from e-mentoring, it could resolve concerns in aviation regarding the need for face-to-face meetings between mentor and protégé. Angstman, Adamson, Furst, Houston, & Rohrer (2009) surveyed the extent to which primary care physicians in a large multispecialty clinic utilized a form of e-mentoring called virtual consultation (VC) and their level of satisfaction with virtual consultations with specialists. While 30% of those surveyed had not tried the VC system, 73% felt that VCs provided good medical care and 81% indicated that they were an efficient use of their time. Use of knowledge bases and other technology tools (part task simulations) that could be used to present technical challenges to protégés could lead to increased training opportunities and could challenge and enhance pilot decision-making. Efforts are needed to see how these opportunities are utilized in other professions.

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Appendix A – Summary of Workplace Mentoring (Meta Analyses)*

Article	Population	Time frame of review	Aspect of mentoring studied	Variables studied in relation to mentoring	Key findings/conclusions
Underhill (2006)	Employed Adults	1988-2004 (14 individual studies)	Mentored vs non-mentored	Outcomes: income, tenure, number of promotions, job satisfaction, self-esteem, intent to stay, promotion/career advancement, organizational commitment, alternative employment opportunities, work stress, work-family conflict	Positive effect on job satisfaction, organizational commitment, self-esteem, lower work stress, work-family conflict, and perceptions of promotion or career advancement; informal mentoring had larger effects than did formal mentoring
Allen, Eby, Poteet, Lentz, & Lima (2004)	Employed Adults	References from 1985-2004 43 individual studies	Mentored versus non-mentored; protégé perceived career and psychosocial mentoring	Outcomes: Objective and subjective career success, satisfaction, relationship quality	Small but positive relationships with compensation and number of promotions, greater satisfaction with career and jobs, more likely to advance and more committed to their career

Eby, Allen, Evans, Ng, & DuBois (2008)	Youth, academic, employed adults	1985-2006 116 independent samples	Mentored versus non-mentored	Outcomes: behavioral, attitudinal, health-related, relational, motivational, career	Effect sizes were generally small, largest effect sizes were between mentoring and helping others, school attitudes, and career attitudes, smallest were between mentoring and psychological stress and strain, effect sizes for youth ranged from .03 to .14, for academic and workplace mentoring they ranged from .11-.36 and .03-.19 respectively
Kammeyer-Mueller & Judge (2008)	Employed Adults	1987-2007 120 unique samples	Mentored versus non-mentored; protégé perceived instrumental and psychosocial mentoring, overall mentoring quality or satisfaction with mentor	Predictors and outcomes: demographic, core self-evaluations, performance, promotions, salary, job satisfaction, career satisfaction	Benefits of mentoring are modest. Positive effect on job and career satisfaction after controlling for demographics, human capital, and core self-evaluations
O'Brien, Biga, Kessler, & Allen (2010)	Employed Adults	1984-2007 40 published articles and 1 conference paper	Mentored versus not mentored; protégé perceptions of instrumental and psychosocial mentoring	Predictors: mentor and protégé gender	Very small in magnitude gender differences (e.g., no gender difference in reported experience as a protégé and report of career development; women perceive more psychosocial mentoring; men are more likely to serve as mentors). Further research is needed to assess the influence of potential moderators.)

Eby, Allen, Hoffman, Baranik, Sauer, Baldwin, Morrison, Kinkade, Maher, Curtis, & Evans (2013)	Youth, Academic, Workplace	1985-2010 173 independent samples (14 youth, 36 academic and 117 workplace)	Protégé perceptions of instrumental and psychosocial support and protégé perceptions of relationship quality in relation to each other, as well as to potential antecedents, correlates, and consequences	Predictors and Outcomes: antecedents (demographics, human capital, relationship attributes) correlates (interaction frequency, relationship length, performance, motivation, social capital), consequences (attitudinal outcomes, behavioral outcomes, career-related outcomes, health-related outcomes)	**Potential Antecedents:** Deep-level similarity was related to protégé perceptions of instrumental, psychosocial support and relationship quality; experiential similarity was positively related to instrumental support and relationship quality; **Potential Correlates:** interaction frequency was positively related with instrumental support, psychosocial support, and relationship quality; longer durations resulted in greater perceived psychosocial support and higher relationship quality; **Potential Outcomes:** Perceived greater instrumental support, psychosocial support, and higher relationship quality also reported higher situational satisfaction and sense of affiliation; higher reports of instrumental support and psychosocial support reported greater socialization/learning; small effect relations greater instrumental support to reported higher compensation, greater instrumental support and higher relationship quality were related to career success, only weak relationships

					evident for any of the health-related outcomes

*This table is an expansion of the table included in Eby, Allen, Hoffman, Baranik, Sauer, Baldwin, Morrison, Kinkade, Maher, Curtis, and Evans (2013).

Appendix B – An Evidence-Based Approach to Workplace Mentoring

The information contained in this section is based primarily on the work of Allen, Finkelstein, and Poteet (2009), that provides "evidenced-based guidance" to organizations regarding the development of formal mentoring programs. As part of the introduction, they caution organizations that one mentoring program approach will not necessarily fit all organizations. Each organization needs to develop their approach based on their particular needs and objectives. Following an introduction, the book chapters are devoted to what the authors feel are specific elements of any mentoring program (Planning and providing infrastructure, Participant recruitment and selection, Matching mentors and protégés, Training, Mentoring structure and process, and Monitoring and program evaluation).

We have elected to provide a brief summary of the information provided in each chapter along with the action plan that concludes each of the chapters. In their book, Allen, Finkelstein, and Poteet (2009) include forms in Appendices "A" through "O" that can be used by an organization to support program development and evaluation. In the introduction, the authors indicate that, until recently, there was insufficient empirical research to help guide the development of workplace mentoring programs. The recommendations provided are based, to the extent possible, on a synthesis of available research evidence.

Mentoring provides two primary forms of support, career-related support and psychosocial support. Mentoring differs from other relationships at work in that it is a two-person relationship, while asymmetrical, the relationship is mutual, as well as being dynamic. While mentoring may include elements of teaching and skill-based instruction that are the focus in coaching, it is broader since it encompasses elements that involve extending the protégé's contacts and assists him/her in better understanding the organization so as to help advance professional development. Examples of the mentoring efforts from several larger organizations are illustrated throughout the book.

Planning and Providing Infrastructure

Without sound planning and an infrastructure that demonstrates strong managerial and organizational support, a formal mentoring program is likely to fail. To develop the mentoring program, management needs to conduct a formal needs assessment to identify the overall basis for mentoring. This will assist in identifying the objectives of the program. The needs assessment can involve employee surveys, individual interviews, or focus groups. The authors also indicate that the effort needs to be fully integrated into the organization's human resources (HR) system as well as the organization's overall mission, values, and philosophy. The implementation effort needs to demonstrate how upper-level management is behind the initiative. Based on Eddy, Tannenbaum, Alliger, D'Abate, and Givens' (2001) review of 127 formal mentoring programs across industries, the objectives most frequently cited for formal mentoring programs included managerial talent development, skill building, diversity development, and new employee socialization. Hegstad and Wentling (2004), in their qualitative review of the mentoring programs from 17 Fortune 500 Companies, reported that their mentoring programs were first initiated for retention (53%), diversity initiative (53%), and career management or development (47%).

Participant Recruitment and Selection

Based on the program objectives, who should be the targeted participants? It may not be impossible to have sufficient mentors for all potential protégés. Research suggests that mentoring programs often target new hires, anyone in the organization, high potential employees, and those in professional and managerial ranks. Of Hegstad and Wentling's (2004) 17 Fortune 500 Companies, 9 programs were for all employees, 4 were for high potential employees, 3 were for new hires, several focused on "new hires of color," and 1 was for women (p. 435). Eddy et al. (2001) reveal that over half of the formal mentoring programs screen employees on factors that include potential for advancement, desire to participate, tenure, and interest and goals. A sample of protégé screening criteria includes skill-based, motivation-based, and personality-based criteria. One of the first issues involves guidelines for participation. Most programs do not require mandatory participation either by the mentor or protégé. While research from the mentoring literature is not clear-cut, evidence from most training programs suggests that voluntary participation leads to improved outcomes.

Screening is also required for mentors since the relationship between mentor and protégé is, according to research by Matthews (2003), the most important factor affecting the overall quality of the experience. Beyond interest and motivation, the authors include empathy, ability to role model appropriate behavior, confidence, listening and communications skills, technical knowledge, credibility, commitment, patience, and other types of knowledge, skills, abilities, and characteristics.

Matching Mentors and Protégés

Typically, a matching process is used for mentors and protégés. Given the criticality of the relationship, the matching process is highly important. In their meta-analytic review, Eby et al. (2013) revealed that what they called perceived deep-level similarity between mentor and protégé exhibited "the strongest and most positive association" with protégé perceptions of instrumental support, psychosocial support, and ratings of the relationship quality. As noted earlier, perceived deep-level similarity is most often based on self-reports. Research does not support any single approach to matching. Approaches vary from some organizations where protégés identify their own mentor to situations where a computer algorithm is used to match the two. In any case, the company needs to develop a standardized process for making the decision. Most companies appear to use a structured matching procedure. Similarity along some dimension appears to be most relevant. Eby et al. (2013) would recommend that attempts should be made to identify mentor-protégé commonalities in values, beliefs, personality, and other characteristics. Specific suggestions by Allen, Finkelstein, and Poteet (2009) include (a) base the matching process on the program's objectives, (b) base the matching process on the company's culture, (c) pair mentors and protégés in close physical proximity, (d) pair mentors and protégés not in direct line of supervisory relationship, (e) base the matching decision on multiple factors, (f) ensue rationality and consistency of matching decisions, and (g) include some level of "similarity" even for "dissimilar" mentor-protégé relationships.

Training

Nearly all organizations require training before employees enter into a new assignment. All but one of the Fortune 500 Companies examined had a required training program. Recent research suggests that mentors and protégés appear to benefit from the training, and outcomes tend to be more positive. The training should be built around the program objectives and goals of the mentoring. While there appears to be little research surrounding the content of the training, Allen, Finkelstein, and Poteet (2009) recommend

that the following be included: (a) a definition of mentoring, (b) an outline of the program objectives, (c) a review of responsibilities of both mentors and protégés, (d) a preview of the role of the program staff, (e) clear expectations for what the program can and cannot do, (f) established structure and boundaries for the mentor-protégé relationship, (g) a description of the potential relationship challenges, and (h) a description of the structure of the formal mentoring program (pg. 63). It is recommended that the training itself should be evaluated.

Mentoring Structure and Process

Since trust is an important part of the mentoring process, all parties need to be aware of what the standards are in terms of confidentiality. You may want to recognize that there may be circumstances where it is appropriate to share feedback with other individuals. Establishing expectations, goals, and boundaries for the relationship are an important first step in the mentoring process. There is some evidence that this contributes to protégé satisfaction. Another component involves the frequency of the interactions and the method for meeting. While meeting frequency across organizations varies, the most common involves monthly interactions. This should be addressed in the organizational guidelines. While face-to-face meetings are often preferred, there are numerous other approaches that have been used (e-mail, video-conferencing, and e-mentoring). Kram (1985) conducted a qualitative investigation of "developmental relationships" at work (mentoring). The process often lasted from 6-8 years and involved four states (initiation, cultivation, separation, and redefinition). Formal mentoring relationships are typically much shorter. Guidelines for the Fortune 500 Companies examined included 14 where the formal relationship lasted a year, 1 was 9 months in length, and 2 left the length of the relationship up to the participants (Hegstad & Wentling, 2004). Participants were allowed to continue beyond the guidelines if they so desired. In the Fortune 500 companies examined, guidelines for meeting frequency was varied from two times a month, once a month, six times in a year, to leaving that detail to the participants. There is weak evidence in the research literature, which suggests that protégés experience more benefits from longer relationships. Eby et al. (2013), in their meta-analysis of 173 programs, found that an increase in interaction frequency led to an increase in protégé perceptions of instrumental support, psychosocial support, and relationship quality.

Monitoring and Program Evaluation

The only way you can ensure that the mentoring program is achieving the goals and objectives is through a monitoring and evaluation process. A monitoring process will help identify problems that may arise. Monitoring will provide an opportunity to determine if meetings are being held regularly and if progress is being made. Monitoring can be accomplished in several ways (surveys, face-to-face meetings, phone contacts, group meetings). Without a proper evaluation, the organization has no way of knowing the program's return-on-investment. Kirkpatrick (1994) has provided extensive guidance regarding the evaluation of training programs that can be adapted to evaluating mentoring programs. Many times evaluations are focused primarily on reactions to the training and what participants learned from the training. Kirkpatrick describes four levels of measurement: (1) reactions to the training, (2) learning what resulted from the training, (3) behavior or performance change, and (4) business results for the organization. There are a number of approaches to gathering the necessary data from face-to-face meetings to more elaborate surveys and questionnaires. A tracking system will need to be established to assess longitudinal performance. The information gained from the evaluations can be used to revise and improve the mentoring program.

Action Plan

Planning and Providing Infrastructure

- Determine the relevant questions to be addressed in a needs assessment (including organizational and person analysis).
- Determine the methods to be used for conducting the needs analysis.
- Conduct the needs analysis.
- Conduct an external scan of the environment.
- Based on the results of the needs assessment, decide whether a formal mentoring program is appropriate. If so, proceed with following actions.
- Determine whether there is an adequate level of upper-management and front-line support for the program.
- Determine specifically how this support will be behaviorally demonstrated to potential participants.
- Based on the results of the needs assessment, clearly state (in writing) the specific objectives of the program.
- State the specific measurable outcomes that you would like to achieve.
- Develop a program evaluation plan.
- Review current HR systems and leadership development strategies, and determine how mentoring fits into the HR strategy.
- Determine the level of structure and formality that will best fit the organization's culture.
- Select a program administrator, ensuring he or she has the motivation and time for the position.
- Decide if there will be a steering committee, determine the types of people to be represented on the committee, and recruit committee members.
- Determine the specific responsibilities of the program administrator and members of the steering committee, and determine how often they will meet.
- Set a date and an agenda for the initial steering committee meeting.

Participant Recruitment and Selection

- Narrow down the pool of potential protégés depending on the goal of the program and the target number of protégés desired, given resources.
- Within this pool, determine if protégé selection will be voluntary or mandatory.
- Determine protégé screening criteria and how to measure those criteria.
- Screen protégés and select final pool.
- Determine the qualities needed in mentors based on the goal of the program.
- Determine number of mentors needed based on the number of protégés.
- Recruit potential mentors.
- Determine mentor screening criteria and how to measure those criteria.
- Screen potential mentors.
- At this stage, consider retaining more than the number of mentors you will ultimately need, to provide more flexibility at the matching stage.

Matching Mentors and Protégés

- Once the pool of mentors and protégés is determined, the mentoring steering committee should discuss the goals of the program, the cultural expectations of the organization, and the resources available to determine a matching strategy.
- Determine what specific characteristics will be used for the match, and measure (or gather information) on those characteristics.
- If multiple characteristics will be used in matching, determine a weighting system.
- Determine if a computer algorithm will be used for the match if so, put in place (in-house or through the use of a consultant).
- If input from the mentor or protégé will be used, determine how those individuals will garner information about potential partners (e.g., through written information, social function, or individual interviews).
- Determine a time frame for completing the matches and schedule all needed meetings/interviews/events.
- Decide how the match information will be communicated to the participants.
- If more potential mentors were recruited than actually needed, determine how to inform those not chosen of your decision.

Training

- Determine the resources available to devote to training in terms of cost (e.g., for training materials) and time (for preparation as well as mentor, protégé, and trainer time away from work).
- Given the resources at your disposal, clearly state (in writing) your training objectives and determine how many layers of training would best suit your needs.
- Make an outline of the topics and specifics to be covered in the first layer of training (e.g., foundational topics such as objectives, roles, expectations). Create any needed presentation slides.
- Make an outline of the topics and specifics to be covered in the second layer of training (e.g., topics specific to your organization and the goals of your mentoring program). Create any needed presentation slides and practice activities.
- If including a third layer of training topics (knowledge and skill development), determine the specific knowledge and skills to be covered for mentors and protégés. Determine if this will be done in separate training sessions. Create or find relevant experiential exercises and create any needed presentation slides.
- Do a “dry run” of the training sessions, possibly with the mentoring steering committee, to work out any problematic issues.
- Create a training evaluation strategy and any forms of materials to be used to evaluate the training program.
- Determine whether all participants will take part in one big training session or if there will be several for them to choose from. This may depend on the size of the program and the flexibility of schedules.
- Schedule and conduct the training.
- Evaluate the training and determine if improvements should be made.

Mentoring Structure and Process

- Make decisions about the level of confidentiality required of the mentors and protégés; communicate this to them and decide if it should be part of a written mentoring agreement. If it is determined that mentors will share information on protégés to supervisors/organizational leaders, the nature of the information that will be shared should be clarified to all parties.
- Decide whether a mentoring agreement will be used and design the template of an agreement to include information to guide goal setting, boundary setting, and expectations.
- Determine whether the meeting frequency guidelines will be mandated by the committee, only suggested by the committee, or fully determined by the pairs. Communicate this to the pairs.
- Determine if the mode of conduct will be only in person, or in person combined with phone and/or electronic communication, or if this will be decided by the pairs. Communicate this to the pairs.
- Determine whether the length of the relationships will be set by the mentoring committee or set by individual pairs; if by committee, decide on the length and communicate this to the pairs.
- Communicate to the pairs what the expected roles are of protégés and mentors for driving the process.
- Decide if a protégé development plan will be used by the pair and, if so, design a template to include whatever components make sense for the goals of the program.
- Decide on the type of planned activities to be included in the program.

Monitoring and Program Evaluation

- Plan how often you will check in with the mentors and protégés throughout the mentorship.
- Decide whether these check-ins will involve surveys, individual meetings, or group meetings (or a mix of these methods).
- Create a list of questions to be used for the check-ins.
- Determine a step-by-step plan for handling problems within matches. Ideally this is something that the pairs will be informed of during orientation.
- Decide how the data gathered will be tracked and analyzed, who will be responsible for that, and who will see the data.
- Based on the program objectives, select or create the appropriate program evaluation criteria.
- Determine whether measures will be qualitative, quantitative, or both.
- Decide what measures should focus on the individual level and what should focus on the organizational level.
- Determine what reactions you would like to garner from participants and create appropriate reaction measure.
- If learning was a measurable objective determined at the outset, create or select a measure to assess the level of learning. Ideally, there will be a pre- and post-measure to look for change.
- If specific behavior/performance change was a measurable objective determined at the outset, create or select a measure to assess that behavioral change. Ideally, there will be a pre- and post-measure to look for change.
- If organizational-level business results were a measurable objective determined at the outset, decide which business metrics will be examined and how the impact of other business factors on those metrics will be controlled.

- Decide the method for collecting these evaluations (e.g., individual meetings, focus groups, surveys). Ideally, if methodological control is feasible, assignment of participants to groups should be considered earlier on in the process.
- Create a timeline or when various measures will be taken, and task individuals on the mentoring committee with carrying out the process.

References – Appendices

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