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Flight Instructor Socio-Communicative Orientation and Perceptions of Cockpit Assertiveness

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FLIGHT INSTRUCTOR SOCIO-COMMUNICATIVE ORIENTATION AND PERCEPTIONS OF COCKPIT ASSERTIVENESS

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This thesis, submitted by Julie C. Hall in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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This thesis meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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To those who inspire the future of aviation

ABSTRACT

Little research has been conducted regarding communication in flight instruction settings. Additionally, much research has been conducted in the area of communication scholarship, however little empirical work has been done to apply communication theoretical frameworks to the study of communication in aviation. This survey of flight instructors (n = 102) sought to relate flight instructor socio-communicative orientation with perceptions of assertive communications constructed using Besco's (1995, 1999) PACE framework of assertive cockpit communication. Relationships between flight instructor experience and perceptions of assertive cockpit were also explored. In addition, open-ended questions were asked to gather data about flight instructors' perceptions of communication and crew resource management (CRM) training and experiences.

No statistically significant relationships were found between flight instructor experience and perceptions of assertive cockpit communication, and no statistically significant relationships were found between flight instructor socio-communicative orientation and perceptions of assertive cockpit communication. Qualitative data gathered from open-ended survey questions yielded opinions about training and experiences in communication and CRM. This research has implications for further applications of communication theory in aviation research as well as curriculum design for training flight instructors and professional pilots.

CHAPTER I

INTRODUCTION

In 2007, there were a grand total of approximately 92,175 active flight instructors in the United States (Federal Aviation Administration [FAA], 2007). In 2008, a total of 4,415 people earned their certified flight instructor (CFI) certificate from the U.S. Federal Aviation Administration (FAA), granting them the privileges of training and endorsing new student pilots to fly (FAA, 2009b; Federal Aviation Regulations, 2009a). In addition to the responsibility for ensuring that a flight student acquires the necessary skills, knowledge and attitudes to successfully function as a pilot, flight instructors are responsible for endorsing students for operating privileges, endorsing students for practical tests to earn certificates and ratings, and providing recurring biennial flight reviews for the maintenance of pilot currency (Federal Aviation Regulations, 2009a).

In the United States, flight instruction is typically one of the first professional flying positions that a pilot has in their career progression. Most airlines have hiring requirements with flight time minimums far above the time required to obtain the certificates and ratings needed to serve as a professional pilot. One of the popular ways of gaining the flight time experience needed to meet the minimums to be considered by an airline is flight instructing.

The role of a flight instructor is an important one; he or she is responsible for building solid foundations of airmanship in each of their flight students. In addition to

learning the physical skills involved with manipulating the airplane, students must learn aeronautical decision making, risk management, resource management, and aviation-specific behaviors to enhance safety such as proper visual scanning (FAA, 2008; FAA, 2009a). Flight instruction tends to be a one-on-one activity, and as such flight instructors are challenged to meet the unique needs of each specific student (FAA, 2008). Telfer and Biggs stated, "A flight instructor is the greatest single factor affecting a student pilot's learning" (1988, p. 147). With such emphasis on the flight instructor's role in the success of training future aviators, properly equipping flight instructors with knowledge and skill could positively impact the aviation teaching and learning processes, and positively impact the next generations of aviators.

While much research has been conducted regarding the communication and interactions of professional multiple-person flight crews, very little research has been conducted regarding the interactions of flight instructors. Knowing more not only could impact a flight instructor's relationship with a student, but could also benefit their long term career. The purpose of this study is to begin to examine the communication interactions of flight instructors through the combined theoretical lenses of communication theory and aviation crew resource management (CRM) theory. This study will specifically examine the relationships between a flight instructor's socio-communicative orientation, flight experience, and perceptions of the assertiveness of cockpit communications.

Theoretical Basis

This study utilizes survey methodology and draws from two separate broad scholarship arenas: the area of communication scholarship and the area of aviation

scholarship, including CRM scholarship. Communication theory about interpersonal communication competence (McCroskey & Richmond, 1996; Richmond, 2002) and a framework for assertive cockpit communication proposed by Besco (1995, 1999) are two specific conceptions utilized in this study. In addition to these concepts, communication scholarship and aviation scholarship have some overlap in how they are connected to personality traits.

Besco (1995; 1999) suggested a PACE framework for assertive cockpit communication that focuses on the use of key wording to create a problem-focused communication hierarchy. This tool was developed primarily for the use of subordinate crewmembers to bring to the attention of superiors information about potential hazards. Besco's (1995, 1999) PACE hierarchy is:

Probe: to better understand intentions

Alert: of anomalies or potentially dangerous items

Challenge: the suitability of the present course of action

Emergency action: a direct warning of immediate danger with assertion that control of the aircraft will be taken.

The PACE hierarchy is used as a basis of construction of statements presented in the survey.

Interpersonal communication competence is comprised of three elements: assertiveness, responsiveness, and versatility (McCroskey & Richmond, 1996; Richmond, 2002). Socio-communicative orientation refers to an individual's perception of how assertive and responsive they are (McCroskey & Richmond, 1996) and can be measured with the Socio-Communicative Orientation Scale developed and verified by

McCroskey & Richmond (1996) and Richmond & McCroskey (1990). The Socio-Communicative Orientation Scale is a 20 question self-report instrument and it is utilized in this study.

The constructs of communication assertiveness, communication responsiveness, task orientation, and relationship orientation have all been discussed to be rooted in a person's personality (Foushee, 1984; Kern, 1998; McCroskey & Richmond, 1996; Richmond, 2002). Aviation CRM scholars have agreed that the two main functions of cockpit communication are information transfer and crew relations (Foushee, 1982; Kanki & Palmer, 1993). The communication dimensions of assertiveness and responsiveness (McCroskey & Richmond, 1996; Richmond, 2002) have defined communication behaviors roughly equivalent to the communication behaviors manifest by the leadership orientations of task orientation and relationship orientation in the cockpit (Foushee, 1984, Kern, 1998). Assertiveness, by definition, focuses more on what are considered masculine traits including task orientation (Bem, 1974; McCroskey & Richmond, 1996; Richmond, 2002). Responsiveness, by definition, focuses more on what are considered feminine traits including relationship orientation (Bem, 1974; McCroskey & Richmond, 1996; Richmond, 2002). Because task orientation is manifest as communication assertiveness and relationship orientation is manifest as communication responsiveness, these dimensions' overlaps rooted in personality make them especially applicable to this study.

Self-report survey methodology is used in this study. The survey asks respondents to provide information about their experience as a pilot and flight instructor, as well as responding to the Socio-Communicative Orientation Scale items. The survey also

includes 20 Likert-scale questions for survey respondents to use to indicate their perceptions of communications developed using the Besco's (1995, 1999) PACE hierarchy. Finally, the survey includes four open-ended questions to gather data about respondents' training and experiences in communication and CRM.

Hypotheses and Research Questions

The following are the hypotheses will be tested in this study:

1. Flight instructors who score high in responsiveness on the Socio-Communicative Orientation Scale will more accurately rate the video clips.
2. Flight instructors who score high in assertiveness on the Socio-Communicative Orientation Scale will less accurately rate the video clips.
3. Flight instructors with more flight instruction experience will more accurately rate the video clips.
4. Flight instructors with experience in multiple-crewmember settings will more accurately rate the video clips.

In addition to testing the above hypotheses, the following research questions will be addressed:

1. What kind of communication training does a typical flight instructor receive when completing the degree curriculum at a highly structured collegiate flight program?
2. Do experiences shape a flight instructor's ability to communicate?
3. When obtaining their flight instructor certificate, what training did flight instructors receive specifically geared toward communicating with students?
4. Have flight instructors received CRM training?

5. Do flight instructors view formal CRM training to be worthwhile, or do they believe CRM skills to be something that strictly is learned by doing?

Significance of Study

Much research has been conducted under the umbrella of CRM in aviation benefitting professional multiple-person flight crews; however there is a dearth of studies regarding communication in flight instruction. Flight instruction is a highly interactive activity, with a large amount of interpersonal communication between instructor and student. It is true that the FAA outlines basic communication principles and flight instruction has been occurring for decades with this limited guidance, however this study seeks to begin a more detailed look at the possibility of further enhancing communication in flight instruction settings to make communication even more effective and ultimately benefit flight students. Another potential benefit may be for the flight instructors themselves to be better equipped with communication skills to use throughout their careers.

Communication scholarship is filled with theories and theoretical frameworks that have much study conducted to further their acceptance into the body of communication scholarship as a whole. Assertiveness and responsiveness have been examined from the framework of communication scholarship to be beneficial in educational settings (Richmond, 2002), and currently the FAA does not include these constructs in its reference material for flight instructor applicants (2008). In addition to the possible applicability in aviation education settings, assertiveness and responsiveness constructs have been found to be important in the cockpits of multiple person professional flight crews, which is ultimately where a large number of flight instructors will find themselves

after building experience. Helmreich, Wiener, and Kanki (1993) stated that, "Early exposure to CRM could serve to build and reinforce positive habits from the beginning of an aviator's career" (p.481). Helmreich et al. (1993) have elaborated that more multidisciplinary collaboration is needed in aviation scholarship and these constructs have been chosen to add a different multidisciplinary facet from communication scholarship to aviation scholarship. Almost no communication scholars have ventured to test their theories in aviation. It is aviation researchers under the guise of CRM that have furthered most of the scholarship of communication in aviation. This study will serve as an application of communication theory forwarded by communication scholars to an aviation setting in a new way.

CHAPTER II

REVIEW OF LITERATURE

The Realm of Flight Instruction

Much research has been conducted of teaching and learning in classroom settings (McCroskey, L.L., Richmond, & McCroskey, J.C., 2002; Rubin, 2002), however flight instruction is different than classroom instruction in many ways, making full and seamless application of all educational theory difficult (Telfer, 1993b). Flight instruction does occur not only on the ground in an office or typical classroom setting, but also in the loud, fast-paced and often distracting aircraft. Flight instruction is a highly individualized activity, with the teacher to student ratio generally being one-on-one and the variations of learning styles of students being great (FAA, 2008).

Flight instructors, especially those working in structured collegiate flight programs or flight programs certified under Federal Aviation Regulations Part 141, work under conditions of limited flexibility, with a mandated syllabus and tight scheduling, not to mention financial constraints (Federal Aviation Regulations, 2009e; Telfer, 1993b). Organizational structure is not the only system factor that impacts flight training. The culture and organizational climate of the flight school drive the areas of emphasis, attitudes, level of formalized procedures, and overall training program of a flight student (Telfer & Moore, 1997). Flight instructors must impart a set of knowledge, skills and

attitudes upon their students, and are required to output maximum student competency at minimum cost (Telfer, 1993b). While some flight instructors have opted to make flight instruction a career, a far larger portion of flight instructors regard their position as a necessary transitory job enroute to their desired job as an airline pilot or some other flying job (Henley, 1991; Telfer, 1993b). Flight instruction typically fills the gap between the flight time experience requirements for earning the FAA commercial pilot certificate and associated ratings and the flight time experience requirements typically required for being hired as an airline pilot (Freeman, 2000).

Even though all flight instructors may not view their role in the flight instruction process as a long-term profession, the one-on-one nature of flight instruction puts the flight instructor in a position to potentially make a huge impact on their student. Flight instructors not only transfer information to their students, but they also act as a motivator and coach, impacting the attitude of the student (Vuksanovic & Howell, 1987). Termoehlen (1987) discussed that a flight instructor's challenge is to motivate, encourage, support and guide a student not only in the physical skills of flying, but also in areas and attitudes such as overall airmanship, work habits, self-discipline, cooperation and responsibility. Termoehlen (1987) stated:

> Especially within flying training, the role of the instructor seems to be of importance for many reasons. He seems to have a lot of influence on his student. He is a person with great power, serving as an ideal for the trainee, a sort of father figure, and a model for identification. (p. 523)

To meet the goal of effectively and efficiently transferring the necessary knowledge, skills, and attitudes to a student, Professor Don Cruickshank at Ohio State University (as

cited in Telfer & Biggs, 1988) states an effective instructor needs to be "well-organized, efficient, task-oriented, knowledgeable, verbally fluent, aware of student developmental levels, clear (not vague), enthusiastic, self-confident, confident of student abilities, holding high expectations and a can-do attitude, friendly and warm, encouraging and supportive, attentive, accepting and tolerant" (p. 148).

The flight student also has important responsibilities in their flight training. Just like the old saying that one can lead a horse to water, but cannot make the horse drink, a flight instructor can lead a student to the knowledge, skills, and attitudes required to be a good pilot but a student must be thirsty for knowledge and willing and prepared to take it in. A basic definition of learning states that it is a change in the behavior of the learner as a result of experience (FAA, 2008). Students who are embarking on the flight educational journey toward a new certificate or rating must be mentally and physically prepared to tackle the task, and conduct self-study to help commit material to memory (FAA, 2008; Gebers, 1997; Henley, 2003). Stress, whether from originating from the student or originating from the instructor's attitudes and communications, can negatively impact training (Henley, 2003). Students' personalities and learning styles vary, and students tend to lean toward instructional methods that mesh well with their personalities and learning styles (FAA, 2008). With all the variables that can exist within a single student, let alone several students, evidence supports the notion that effective aviation instruction should be student-centered (FAA, 2008; Telfer, 1993a). One of the main ingredients of effective student-centered instruction is clear and effective communication (FAA, 2008; Telfer, 1993a).

Obtaining a Flight Instructor Certificate

To greater understand a typical flight instructor's knowledge base, an explanation of the certification process for flight instructors in the United States follows. While there are certain exceptions for certain certificates and add-on ratings, the general process whereby a person earns a any pilot certificate or rating from the FAA is similar for all of the various certificates and ratings issued by the FAA (Federal Aviation Regulations, 2009a). The process begins with the applicant meeting basic regulatory requirements such as meeting the age requirement for the certificate or rating sought, obtaining an appropriate medical certificate to verify physical eligibility, and possessing proficiency in the English language (Federal Aviation Regulations, 2009a).

Each certificate or rating issued by the FAA is subject to requirements and standards specific to that individual certificate or rating sought. The FAA has specific requirements for eligibility to become a flight instructor and they are: being age 18 or older; being able to read, speak, write and understand the English language; holding a commercial pilot certificate or airline transport certificate; and logging at least 15 hours of pilot in command of the category and class of aircraft appropriate to the flight instructor certificate sought (Federal Aviation Regulations, 2009a). In addition to the basic eligibility requirements, a flight instructor applicant applying for their first flight instructor certificate must receive ground instruction or classroom training in knowledge areas specific to the certificate or rating sought and pass two appropriate written examinations, one covering fundamentals of instruction and the other covering technical information to demonstrate mastery of knowledge subjects (Federal Aviation Regulations, 2009a). Additionally, they must have received training in aeronautical

knowledge and flight skills specifically outlined in the Federal Aviation Regulations (Federal Aviation Regulations, 2009a). Once an applicant for a flight instructor certificate has logged all the required ground and flight training requirements they must be endorsed by their instructor that they are proficient in all the knowledge and skill areas of operation required of a flight instructor as outlined in the Federal Aviation Regulations (Federal Aviation Regulations, 2009a).

Once the flight instructor applicant has been endorsed as proficient in the knowledge and skill areas required to become a flight instructor, the applicant must pass a practical test consisting of an oral examination and flight test with an FAA inspector or Designated Pilot Examiner (Federal Aviation Regulations, 2009a). The FAA stipulates the procedures to be followed in the conduct of the practical test, the specific topics and maneuvers that are required to be included in the practical test, and the standards that need to be met to pass the flight instructor certificate practical test in the publication *Flight Instructor Practical Test Standards* (FAA, 2009a). The oral examination includes questioning on the areas of fundamentals of instructing, technical subject areas, preflight preparation, and a preflight lesson on a maneuver to be performed in flight (FAA, 2009a). The flight portion includes performance of flight maneuvers to specified standards, demonstration of mastery of the aircraft and aeronautical decision-making, and demonstration of instructional knowledge throughout the flight (FAA, 2009a). Once a person satisfactorily completes the flight instructor practical test, they are permitted to immediately begin teaching new flight students.

Official FAA Guidance

The *Flight Instructor Practical Test Standards* are based upon FAA-specified reference materials, including Federal Aviation Regulations and FAA-published Advisory Circulars and books (FAA, 2009a). The *Flight Instructor Practical Test Standards* states, "Publications other than those listed may be used for references if their content conveys substantially the same meaning as the referenced publications" (FAA, 2009a, p. 3). Several books and publications for training flight instructors exist such as *Flight Instructor Manual* (Kailey, 2000) and *Flight Instructor Maneuvers and Practical Test Prep* (Gleim, 2003), however the FAA's official listed reference that includes material about fundamentals of instruction is the *Aviation Instructor's Handbook*, which is published by the FAA (FAA, 2008; FAA, 2009a). This official source for information about teaching methods, *Aviation Instructor's Handbook*, provides a chapter of ten pages on effective communication (FAA, 2008). The chapter covers the following topics: basic elements of communication, barriers to effective communication, and developing communication skills (FAA, 2008). The *Flight Instructor Practical Test Standards* indicate that flight instructor applicants may be questioned on those specific knowledge areas, and additionally must show instructional knowledge of all other maneuvers and areas of operation though clear descriptions, explanations, analysis and correction of common errors (FAA, 2009a). Even though the FAA officially dedicates only ten reference pages specifically to the topic of effective communication for flight instructors, the ability to clearly and effectively communicate permeates all areas of competency that a flight instructor applicant is required to satisfactorily demonstrate on a practical test (FAA, 2008; FAA, 2009a).

Effective communication can help a student learn, especially if messages are developed to help the student encode the learning into his or her memory (Elshaw, 1993). In some parts of the world, there is even less emphasis on the communication and teaching skills of flight instructor applicants than there is in the United States. In a survey of Canadian flight instructor applicants, flight instructors teaching flight instructor applicants, and examiners, the overwhelming response was that not enough materials for instruction or evaluation of effective teaching methods exists (Henley, 1991). The general feeling was that flight instructor applicants learned to have a good grasp on the technical aspects of flying, but that teaching methods were generally limited to mimicking the patter of their instructor (Henley, 1991). The survey generally revealed a lack of instruction on teaching methods and lack of materials for a flight instructor applicant to use to learn effective teaching methods (Henley, 1991).

Crew Resource Management: CRM

Flight instructors generally serve in the capacity of a flight instructor to build experience required to apply for a position as a pilot working in a crew at an airline. While very little research has been conducted of the communication and behavioral interactions of flight instructors and flight students, aviation accidents spurred a giant area of research of the interactions and behaviors of professional flight crews and created a whole movement in CRM training. An examination of the research within the area of CRM training follows, with the intent of highlighting the research that has been conducted regarding interpersonal interaction within the realm of aviation. Additionally the following review of CRM literature is expanded upon to provide a framework as to how CRM research has moved forward, to present a picture of the wide variance of ideas

within the area of CRM, and to illustrate that this vast body of CRM literature contains very little in aviation outside of the professional multiple-crewmember environment.

CRM is a set of crew coordination concepts that originated during the 1970's largely in response to the number of aviation accidents attributed to pilot error (Lauber, 1993). More than 70% of worldwide accidents that resulted in hull losses from 1959 to 1989 were caused at least in part by flight crew error (Helmreich & Foushee, 1993). Pioneering work in CRM emerged in the 1970's punctuated by two 1979 events: a study conducted by H. P. Ruffell Smith (1979) and the first major joint workshop, "Resource Management on the Flight Deck," attended by National Aeronautics and Space Administration (NASA) and industry members (Lauber, 1993). Ruffell Smith's (1979) study discussed the need for airline captains to have leadership, resource management, and decision making skills and suggested that training in resource management and captaincy be developed and validated. The workshop acted as a springboard for the implementation of CRM training in the aviation industry; airlines, researchers, and industry have been pushing forward with the research, design, and implementation of CRM training since that time (Lauber, 1993).

What is known today as CRM began as *cockpit resource management* and was later changed to *crew resource management* to reflect the shift toward including resources found outside the cockpit (Helmreich & Foushee, 1993). An early definition of CRM was stated by Helmreich (1987):

> I feel that crew coordination is the cornerstone of resource management, by which I mean the effective coordination and utilization of all available resources in the service of the flight. These resources are both inside and outside the aircraft and

> are both material and human, including especially the knowledge, judgment and decision-making skills of all crewmembers and the ability of the crew to bring them together in optimal fashion. (p. 15)

Lauber (1984) stated, "The term 'cockpit resource management' refers to using all available resources – information, equipment, and people – to achieve safe and efficient flight operations" (p. 20). Summing up CRM, Salas et al. (1999) described, "A set of teamwork competencies that allow the crew to cope with situational demands that would overwhelm any individual crew member" (p. 163).

CRM is characterized as a multidisciplinary field drawing on the ideas in fields such as physiology, behavioral and social sciences, and engineering (Helmreich & Foushee, 1993). Some of the skills and concepts involved with effective CRM are: acquisition and communication of relevant information, leadership, team building, problem solving, situational awareness, and decision-making (Helmreich & Foushee, 1993). Because CRM is a multidisciplinary field, training has been influenced by a variety of viewpoints. With this multidisciplinary approach in mind, Salas et al. (1999) defined CRM training:

> We consider CRM training to be a family of instructional strategies designed to improve teamwork in the cockpit by applying well-tested training tools (e.g., performance measures, exercises, feedback mechanisms) and appropriate training methods (e.g., simulators, lectures, videos) targeted at specific content (i.e., teamwork knowledge, skills, and attitudes). (p. 163)

CRM's defined ultimate goal is to improve aviation safety. Helmreich, Chidester, Foushee, Gregorich, and Wilhelm (1990) outlined the overriding goal of CRM training

by stating, “The outcome usually invoked as justification for CRM training is improved aviation safety, defined as a reduction in the number of accidents caused by failures in leadership, crew coordination, decision making, and/or human information transfer” (p. 1).

Many organizations have put into use some form of CRM training, both in aviation-related businesses and in industries other than aviation such as medicine (Helmriech, Wiener, & Kanki, 1993). CRM has evolved over the years and some are at a point where CRM training processes are under scrutiny and are either undergoing adjustments to curriculum to better produce desired outcomes (Nullmeyer & Spiker, 2003) or undergoing major revamping to keep from ineffective stagnation (Fisher, 2007). Since its inception, CRM has evolved through at least five generations of training focus (Helmreich, Merritt, & Wilhelm, 1999). The first generation of cockpit resource management courses focused on psychological aspects and drew heavily from management training approaches (Helmreich et al., 1999). This original effort placed heavy emphasis on diagnosing and changing individual management styles and met with some resistance from pilots who regarded the training as “charm school” (Helmreich et al., 1999).

CRM training in its second generation ushered in a name change from cockpit resource management to crew resource management to reflect a new focus on group dynamics (Helmreich et al., 1999). Major concepts included in this generation of training were team building, briefing strategies, situation awareness, and stress management (Helmreich et al., 1999). While some detractors labeled this training as heavily laden with

"psycho-babble," courses developed in the second generation continue to be used today in the United States and in other places in the world (Helmreich et al., 1999).

Third generation CRM expanded the realm of CRM to include crewmembers and personnel outside of the cockpit such as dispatchers, flight attendants, line personnel, and maintenance personnel (Helmreich et al., 1999). In addition, this third generation broadened the scope of concepts by emphasizing specific skills and behaviors and by beginning to integrate CRM with technical training (Helmreich et al., 1999). A criticism of CRM training in this generation was that the broadening scope diluted the original focus on reduction of error in the cockpit (Helmreich et al., 1999).

The fourth generation of CRM further integrated training into comprehensive training programs by inclusion in airline Advanced Qualification Program (AQP) and Line Oriented Flight Training (LOFT) (Helmreich et al., 1999). Airlines also added specific CRM behavior items to checklists and included CRM material in company publications such as manuals (Helmreich et al., 1999). This fourth generation was not a stopping point: the fifth and most current generation of CRM training is returning to the original focus on error management in an attempt to make CRM a universally accepted set of concepts (Helmreich et al., 1999). It is hoped that by focusing on the essential rationale behind CRM, the elimination or mitigation of human errors, flight crews will better accept the training concepts as useful tools. This re-focusing places emphasis on these goals of error management: avoidance of error, trapping error before is causes larger problems, and mitigation of the consequences of error (Helmreich & Merritt, 2000; Komich, 1997; Maurino, 1999). With all the available information about human factors,

Kern (1998) emphasizes that a pilot's individual efforts to maintain the highest level of flight discipline on every flight ultimately makes the difference in safety.

FAA's CRM Requirements

The requirement to meet regulatory requirements is often a catalyst to actions, changes, and specific training programs in aviation. The following is an explanation as to which aviation organizations are bound by regulations to include CRM training in their operations. Operators certificated under U.S. Code of Federal Regulations Title 14 part 121, part 91 subpart K, and part 135 operators who conduct training in accordance with part 121 requirements are required to conduct CRM training (Federal Aviation Regulations, 2009b; Federal Aviation Regulations, 2009c; Federal Aviation Regulations, 2009d). These operators required to conduct CRM training are scheduled air carriers, charter operations, and some other commercial operators. The FAA has created Advisory Circular 120-51E (2004) *Crew Resource Management Training* as the administration's official guidance for developing, implementing, reinforcing, and assessing CRM training with the intent that the guidelines be used by operators required to implement CRM training. The Advisory Circular (FAA, 2004) also suggests that the guidelines be used by operators who are not required to implement CRM training, such as private operators of jet aircraft, so as to address potential human performance issues.

The FAA (FAA, 2004) states that CRM training should focus on situation awareness, communication skills, teamwork, task allocation, and decision making within a comprehensive framework of standard operating procedures. With regard to communication specifically, Advisory Circular 120-51E lists the following as suggested curriculum topics under the broad category of communication processes and decision

behavior: briefings, inquiry, advocacy, assertion, self-critique, conflict resolution, communications, and decision making (FAA, 2004). The advisory circular also suggests the following topics under the broad category of team building and maintenance: leadership, followership, concern for task, interpersonal relationships, group climate, workload management, situation awareness, individual factors, and stress reduction (FAA, 2004). The guidance provided by the FAA extends to suggestions for developing, implementing, reinforcing, and assessing CRM training (FAA, 2004).

While the growth of CRM has prompted many promoters, the CRM territory is far from uniform and perfect. Some have decried the FAA's guidance materials as inadequate (Komich, 1997), and in 1997 the FAA was criticized by the United States General Accounting Office for lack of oversight of CRM training development at airlines (United States General Accounting Office, 1997). The General Accounting Office's report also stated that science had not yet developed valid, reliable criteria for measuring CRM performance (United States General Accounting Office, 1997). Several have stated there is a need to research some of the underlying processes and to develop more tools for CRM training and evaluation (Besco, 1997; Komich, 1997; Salas, Rhodenizer, & Bowers, 2000; Simmon, 1997). Some have criticized the lack of implementation of existing research. Salas, Rhodenizer, and Bowers (2000) observed, "In addition, we contend that organizations (military and civilian alike) continue to implement CRM training without relying heavily on the body of knowledge available in the literature about team training, teamwork, and training" (p. 492).

CRM Training Research

To better illustrate where communication studies in aviation have primarily emerged a description of CRM research follows. Due to the early, fairly rapid onset of the need for aircrew CRM training, much effort has been focused on CRM training. The areas of research have centered on training, evaluation of training, the points of emphasis of CRM, and crew performance. Researchers and industry have developed many tools to assist in the development of CRM training. Even though the FAA provided guidelines (FAA, 2004), a large number of theories, ideas, sources have contributed to CRM training, generating a wide variance in the concepts and content of CRM training and a variety of methods used to train CRM skills (Besco, 1997; Foushee, 1984; Komich, 1997; Salas et al., 2000; Simmon, 1997; Wiener et al., 1993). Salas et al. (2000) called for the standardization of CRM training concepts and practices by stating, "In fact, there is no agreement on which skills are needed for effective CRM or on how to train CRM behaviors" (p. 490).

In a literature review of existing material about CRM, Salas et al. (2000) compiled resources with the intent that training designers could have greater access to available literature and found several resources for each of these ideas: principles of practice and feedback, training effectiveness, principles of teams and teamwork, guidelines for training specific teamwork-related skills, tools and approaches for measuring teamwork, scenario-based training, and evaluating CRM training. An additional examination of 58 published accounts of CRM revealed a variety of specific training methods utilized and training content emphasized (Salas, Burke, Bowers, & Wilson, 2001). Some of the ideas and concepts included in various CRM training

programs were: leadership and followership, team cohesion, influence of personality, situation awareness, judgment, workload management, conflict resolution, fatigue, attitudes, identification of available resources, problem solving, human error, prioritizing, delegation, decision making, assertiveness, advocacy, stress management, self-correction, feedback, risk assessment, goal-setting, hazardous thought patterns, and communication (Salas et al., 2000; Salas et al., 2001). An expanded examination of an additional 28 published accounts of CRM pointed at a lack of standardization as to what knowledge, skills, and attitudes are to be trained in CRM training and what methods are best used to train CRM skills (Salas, Wilson, Burke, & Wightman, 2006). The instructional methods used to train CRM skills also vary including methods such as workshops, lectures, videos, dissemination of training materials, reinforcement activities, multifaceted approaches, role-play, and scenario-based training in simulators (Beard, Salas, & Prince, 1995; Salas et al., 2000; Salas et al., 2001; Weiner, Kanki, & Helmreich, 1993).

Communication Studies in CRM

Now that an overview of the CRM framework in which communication fits has been described, an examination of communication-centered studies from the viewpoint of aviation CRM scholarship follows. It is important to note that studies centered on the interactions of flight instructors are rare, as most efforts are concentrated on the interactions of multi-person professional flight crews. Communication has been identified as one of the cornerstones of good CRM (Kanki & Palmer, 1993), and the FAA provides simplified general guidelines concerning communication topics recommended to be included in training programs (FAA, 2004). Many training programs include communication as a training topic, and published accounts of CRM training that describe

the specifics of content taught show a variance of communication-related topics between different courses (Salas et al., 2001; Salas et al., 2006).

Communication's two main goals in a multiple-crewmember cockpit environment are to convey important information, during which the content of the communication is most important, and to establish crew relations, during which the feelings and semantics of the communication are most important (Foushee, 1982; Kanki & Palmer, 1993). Personality as manifest in leadership orientation tends to be expressed either as task-oriented or relationship-oriented communication (Foushee, 1984; Kern, 1998). Communication affects group cohesion and attitudes (Foushee, 1982). Kanki and Palmer (1993) identified five significant functions of communication in the crew environment:

1. Communication provides information.
2. Communication establishes interpersonal relationships.
3. Communication establishes predictable behavior patterns.
4. Communication maintains attention to task and monitoring.
5. Communication is a management tool.

A single communication can be used to meet more than one of these functions.

Coding and Communication Functions

Much of the research of the interactions of flight crews in aviation has been in the framework of team interaction or CRM. There exists a body of research viewed through a communication lens specifically in multiple-person crews (Weiner et al., 1993), though work conducted through the lens of a communication scholar or within a communication theoretical framework is a sprouting area of research. Cockpit communication analysis has been examined using conversation analysis methodology (Nevile & Walker, 2005).

One analysis of conversation of an accident cockpit voice recorder transcript revealed that pilots' interactions seemed to work to maintain and emphasize individual statuses, possibly contributing to error (Nevile & Walker, 2005). Analysis of the use of pronouns showed them to be tools that pilots used to both assert individual roles through the use of singular forms and through the use of plural forms to build team partnership (Nevile, 2001). Sexton and Helmreich (2000) saw an increase in the use of first person plural pronouns over the life of a flight crew, with captains using the plural form more frequently than other crewmembers.

The timing and maintenance of order using communication have also been analyzed. Pilots coordinate talk with non-talk activities in sequences (Nevile, 2002, 2004). Changes in the pitch of a pilot's voice at the end of a communication can help signal that something is complete or that something else must follow (Nevile, 2005b). Using non-official responses like *okay* or *thank you* in response to a crewmember's official call of *checklist complete* helps to maintain a shared understanding of the crew's place in a sequence of events (Nevile, 2005a). The use of cue words helps to maintain sequence, and the tight timing between when a command is issued and a task is completed suggest that the pilot not flying often is anticipating the next items in a sequence (Nevile, 2005b). Nevile (2006) observed that the use of *and*-prefacing was a feature of pilots' talk that helped to maintain a sense of order for the flight as a whole, and that it was used by either pilot to indicate sequential events or to reengage in talk after periods of silence in cockpit conversation. The use of *and*-prefacing was also used in the cockpit to bring to attention in a nonthreatening way to the lack of action by a crewmember (Nevile, 2007a). The *and*-prefaced statements helped to keep cockpit

actions completed in a timely manner while maintaining crew coordination (Nevile, 2007a). A shared understanding of the status of sequential events in the cockpit has been inferred by an overall lack of overlapping talk where one pilot is talking while the other pilot is talking (Nevile, 2007b).

Typologies and coding schemes have been devised to describe communication in the cockpit. Predmore (1991) coded communications of two flight crews that were cited as having excellent crew coordination during emergency events. Predmore's (1991) coding scheme categorized individual communications by the function the communication served in the coordination of the crew. Shifts in the overall function of the communications revealed shifts in crew focus based upon shifts in task demands and shifts of focus on different individual crew members (Predmore, 1991). As an example, the crew coordination directed by Captain Al Haynes was lauded as excellent during the events following the catastrophic hydraulic failure of United Flight 232 (National Transportation Safety Board [NTSB], 1990). During the United Flight 232 scenario, a fourth crewmember was invited to the cockpit (NTSB, 1990; Predmore, 1991). Analysis of the cockpit communication showed that when the fourth crewmember joined the team, some social communication was exchanged to bring the new crewmember into the team (Predmore, 1991). The captain's communication focus shifted to flight control issues periodically throughout the United Flight 232 scenario, indicating continuous monitoring of the situation with periodic shifts to other foci to adjust coordination as necessary (Predmore, 1991).

Performance

Going beyond coding functions of communication, several other studies from the viewpoint of teamwork and CRM researchers have drawn connections between communication patterns and performance outcomes in flight. Nullmeyer and Spiker (2003) observed that CRM problems early in the training of military flight crews involved communication and decision making. Brannick, Roach, and Salas (1993) observed communication related to team effectiveness and saw that the evaluation of communication processes using observation of performance in a simulator was a superior method to using tapes or transcripts of communication to evaluate performance due to the ability of raters to observe nonverbal communication and crew control over the simulator. Flight crews that communicate more have been found to perform better, and total lack of communication has been connected to poor performance (Conley, Cano, & Bryant, 1991; Foushee, 1982; Foushee, 1984; Foushee & Manos, 1981; Orasanu, 1991; Predmore, 1991). Lower communication rates were observed in crews that were flying highly automated aircraft and in crews that were flying night operations (Kanki & Palmer, 1993). The quantity of communication is not the only important factor; the type and quality of communication have been deemed important (Foushee, 1982; Foushee, 1984; Foushee & Manos, 1981) as well as the precision of communication (Foushee, 1982; Foushee, 1984; Orasanu, 1991; Predmore, 1991).

Flight crews that established good communication patterns early were able to better perform on later flights in Sexton and Helmreich's (2000) study. Flight crews that established homogenous, predictable communication patterns performed better than flight crews that lacked communication conventions and exhibited great diversity in

communication (Kanki, Folk, & Irwin, 1991; Kanki, Lozito, & Foushee, 1989). Homogenous or standardized communication, such as company-prescribed standard callouts, establishes the foundation of an environment in which crews can detect anomalies more quickly (Bowers, Jentsch, Salas, & Braun, 1998). When the foundation of coordination is established with standardized statements, crews can more effectively use additional communication to improve performance. Conley, Cano, and Bryant (1991) observed that, especially during abnormal flight conditions, flight crews that moved beyond baseline standardized communication and used statements of planning and adjustment performed better than crews that communicated less and relied solely on standardized communication to coordinate.

Kanki and Foushee (1989) observed that flight crews that had flown together generated a familiarity that allowed for greater communication overall, and specifically greater information exchange and validation as well as greater participation of the first officer in task-related communications. Crews that had flown together also performed better in Kanki and Foushee's (1989) study. In a military aviation context, Leedom and Simon (1995) found that while crews that had worked together previously were able to improve coordination due to familiarity, standardized, behavior-based training produced superior coordination and performance. Crews that exhibited more agreement exhibited fewer errors in Foushee and Manos' (1981) study.

Greater use of closed-loop communications, such as a statement or question made by one crewmember followed by an acknowledgement or response by the other crewmember, was associated with higher-performing crews (Bowers et al., 1998). More statements of observations, commands, and acknowledgements were observed to be

beneficial (Foushee, 1982; Foushee & Manos, 1981; Kanki et al., 1991), and more planning, monitoring, and evaluation statements were found in better-performing crews (Conley et al., 1991; Orasanu, 1991).

A review of NASA Aviation Safety Reporting System (ASRS) reports revealed poor cockpit communication could be contributed to several factors: poor understanding and division of responsibilities, assumption that communication was received, overconfidence, complacency, lack of subordinate crewmember confidence, interference with communication, and personality conflicts (Foushee & Manos, 1981). Crews that engaged in a higher proportion of more non-task communication performed more poorly in Bowers, Jentsch, Salas, and Braun's (1998) study. Kanki and Foushee (1989) observed that flight crews who had not flown together engaged in more non-task communication, and while non-task communication can interfere with task performance, they discussed that non-task communication was part of the team-building process as crewmembers get to know each other.

Other communication patterns have been associated with flight crew performance error. While a greater number of total words used in communication was associated with fewer errors, greater use of large words was associated with increased error rates in Sexton and Helmreich's (2000) study. Statements of response uncertainty (Foushee, 1982; Foushee & Manos, 1981) and a higher amount of questions were found in crews that exhibited more flight performance errors (Kanki et al., 1991; Kanki et al., 1989). In Kanki, Lozito, and Foushee (1989) a higher number of questions that came both from captains and first officers was discussed to be as a result of insufficient organization on the part of the captain. Statements of frustration, anger, and embarrassment were more

prevalent in crews that exhibited more flight performance errors (Foushee, 1982; Foushee & Manos, 1981).

The captain plays a large role in setting the communication stage for effective flight crew communication. In Orasanu's (1991) study it was observed that captains who had high levels of communication of planning, strategizing, information gathering, predicting/alerting, and explaining communication performed better, especially during emergency flight phases. Planning and explanation statements were made by the captain more than subordinate crewmembers in Guguen, Linde, and Murphy's (1986) analysis of discourse from several aviation accidents, and planning and explanation statements occurred more during crew-recognized problems, and less during crew-recognized emergencies. Female captains were more likely to use an explanation of an objective need to motivate a subordinate crewmember to action, while male captains were more likely to make a command on basis of status to communicate to a subordinate crewmember in Fischer and Orasanu's study (1997).

Assertiveness in the Cockpit

Commands are authoritative in nature and tend to imply an asymmetric status (Fischer & Orasanu, 1997). Too many commands from the captain have been described as intimidating to subordinate crewmembers, having a negative effect on performance (Foushee, 1982; Foushee & Manos, 1981). Aggressive communication on the part of the captain can cause coordination to completely break down by forcing the first officer out of the communications loop of the cockpit (Foushee, 1982).

Discourse analysis of several aviation accidents indicated that subordinate crewmembers generally spoke with more mitigation, or tentativeness in speech, than the

captain (Goguen, Linde, & Murphy, 1986; Linde, 1988). Likewise, surveys found that captains' speech acts tended to use more direct communications such as a direct request or obligation statement, while first officers tended to use more suggestions or hints to communicate (Fischer & Orasanu, 1997; Fischer-Loss, & Knoespel, 1996). The introduction of a new topic is more likely to fail if introduced in a mitigated way (Linde, 1988). Mitigated or ambiguous speech was a factor in the failure of subordinate crewmembers to initiate the discussion of new topics and the failure to have a suggestion acknowledged by the captain (Goguen et al., 1986; Frankel, 2000; Linde, 1988). Speech was less mitigated and more direct overall in crews that recognized that they had a problem or emergency situation (Fischer & Orasanu, 1997; Fischer-Loss, & Knoespel, 1996; Goguen et al., 1986).

Kanki and Foushee (1989) observed that first officers were more likely to be active participants, to have answers, and to initiate constructive disagreements with captain's actions if the crew had flown together than if they had not flown together. Brown and Moren (2003) found that pilots tend to avoid uncomfortable social shame emotions and respond to potentially shaming situations in a manner that accentuates the self-positive with confidence, humor, or focus on achievements. Brown and Moren (2003) discussed that the avoidance of shame can cause crewmembers to avoid communicating due to the potential of the shame emotion associated with looking inadequate or stupid.

Some discussed that CRM training has caused the pendulum of assertiveness to swing too far with regard to junior crewmembers (Orasanu, Murray, Rodvold, & Tyzzer, 1999). Others differ in opinion. While differences in cockpit management attitudes on the

Cockpit Management Attitudes Questionnaire have been found to exist among different crew positions (Helmreich, Chidester, Foushee, Gregorich, & Wilhelm, 1990), it has been found that crewmembers can differentiate situations that require differing degrees of assertiveness and that junior crew members, such as first officers and flight engineers, make the differentiation more often than captains (Orasanu et al., 1999). Orasanu, Murray, Rodvold, and Tyzzer (1999) found that captains were the most assertive crewmembers overall, preserving captain's authority in the cockpit. Smith-Jentsch, Salas, and Baker (1996) examined dimensions of assertiveness within a non-aviation work-related team context using the framework of Lorr and More's (1980) four different dimensions of assertiveness, which includes directiveness, independence, defense of interests, and social assertiveness. Smith-Jentsch et al. (1996) observed that individuals apply the different dimensions in a situation-specific manner based upon the situation such as working in a team or working individually, or based upon the interpersonal relationship such as communicating with a stranger or well known person.

Several aircraft accidents have been at least partially attributed to the inability of subordinate crewmembers to assertively communicate to captains problems that arose during the flight (Besco, 1995, 1999; Frankel, 2000). Frankel (2000) mentioned that training captains to be more sensitive to indirect communication as well as training subordinates to be more assertive by using clear, unambiguous communication could be helpful. Besco (1995; 1999) discussed that subordinate crewmembers may be reluctant to speak up to captains due to company culture, fear of retaliation, or personality conflicts with the captain. As an example of how company culture can weave its way into the cockpit, Fischer and Orasanu (1997) found that the overall complexity of cockpit

communications varied between different airlines, suggesting different corporate cultures affect communication of different airlines.

Subordinate crewmembers can be placed on an uncomfortable line where on one side of the line they are expected to be assertive as part of their crew duties, but on the other side is the risk of over-assertiveness and impedance upon a captain's authority. Besco (1995; 1999) suggested a framework of communication for subordinate crewmembers to use that focused on the use of key wording and a progressive method, creating a communication hierarchy that is problem-focused rather than a personal attack with the potential of igniting personality conflict. Besco's (1995, 1999) hierarchy is PACE:

Probe

Alert

Challenge

Emergency action.

Probe refers to a statement to better understand what the captain's intentions are, often in the form of a question (Besco, 1995, 1999). Alert is factual statement of an observation of an anomaly or potentially dangerous item (Besco, 1995, 1999). Challenge is a very assertive statement of the fact that the aircraft is in immediate danger; it is a challenge of the suitability of the present course of action (Besco, 1995, 1999). Emergency action is a direct warning to the captain of critical and immediate danger, and assertion that if the captain does not change course of action, the subordinate crewmember will take control of the aircraft (Besco, 1995, 1999). The PACE hierarchy is used as a basis of construction of statements used in this study.

Bowers et al. (1998) discussed that the need to further study communication in teams, particularly in flight crews. Bowers et al. (1998) specifically outlined the need to analyze higher-order communication sequences and the effects on team performance, as well as the efficacy of training communication patterns. It has been discussed that some of the underlying issues in cockpit communication have yet to be understood (Dismukes, 1994). Helmreich et al. (1990) commented, "Although the mechanisms and dynamics of the communication process have yet to be isolated, the data provide strong evidence for linkages between communications and performance" (p.8). Kanki, Folk, and Irwin (1991) expressed some uncertainty of the root causes of speech variations in the high-error crews of their study by discussing that speech variations may have been a symptom of a problem in the flight crewmembers' communication process, or that the variations may have been due to the style particular crewmembers use to interact with each other. It was also pointed out that consideration must be made to weather a speech variation is in response to task demands or due to communication style (Kanki et al., 1991). More needs to be learned about the roots of the communication that occurs in the cockpit. Bowers et al. (1998) stated:

> Finally, it should be noted that there is a need to test the utility of training specific communication patterns. Although these studies provide useful hypotheses, there is a need to demonstrate that crews can, in fact, be trained to change their communication to include the optimal pattern. Furthermore, there is a need to determine whether such a change in communication will actually result in improved performance. It might be that case that team member communication is simply a manifestation of an underlying team cognitive process and that changing

> the communication does not change the cognition. However, this approach provides a new set of hypotheses that might help to guide an area of research that is somewhat stagnant. (p. 676)

Helmreich et al. (1990) discussed that the study of interpersonal communication principles could lend a greater understanding of crew performance and that application of principles of interpersonal communication could be useful in the training and evaluation of flight crews. The study of interpersonal communication and other underlying theories may help to grow the generic knowledge Dimukes (1994) argued was needed to help solve a greater amount of human factors problems.

Collegiate Flight Training Environments

Beyond most flight instructors' transitory roles in their position as flight instructor, communication skills have been valued as important skills for a person embarking on a career in aviation. Collegiate flight training programs are a reflection of industry demands. As an example, Pippin (1993) explained that The Ohio State University incorporated coursework in the required aviation curriculum to develop students' communication and problem-solving skills, as well as to develop more people skills for an increasingly globalized industry. A survey of collegiate aviation flight educators indicated that communication skills were important, and while a variety of communication skills were viewed as important, oral communication skills were valued most highly (Ruiz, 2004). Ruiz's (2004) survey of collegiate aviation flight educators also indicated that the educators generally agree that students who arrive at college do not possess the communication skills necessary for a career in aviation, that the collegiate aviation programs provide the skills necessary for an aviation career, and that there is

room for improvement in the preparation of students to communicate in the aviation industry. The survey respondents were all members of the University Aviation Association (UAA), a body responsible for promoting and furthering aviation programs (Ruiz, 2004; University Aviation Association [UAA], 2009). The UAA develops curricula for two and four year collegiate aviation programs and UAA member schools are among the most widely recognized for excellence in aviation education (UAA, 2009).

In a study of the Indiana State University aerospace administration program, graduates considered management skills and oral communication skills the top two essential skills for the current job, and graduates recommended additional courses including speech and writing (Schwab, 2005). Employers hiring recent graduates of the Indiana State University program suggested adding additional coursework including interpersonal and leadership skills and commented that more emphasis should be placed on speaking and briefing skills (Schwab, 2005).

University aviation programs, such as the one at Purdue University discussed by Young (1995), have implemented courses in CRM to develop interpersonal skills and communication skills necessary for graduates to function as crewmembers in a two or more person flight crew. Young (1995) discussed that while the simulator provides the ideal learning platform for CRM skills, interactive and innovative classroom techniques can be used to teach skills such as communications, decision-making, self-critique, conflict resolution, team building, leadership, followership, workload management, planning and preparation, and distraction avoidance.

A survey of aviation human factors research at U.S. universities yielded much evidence of reasons why universities can be an excellent source of aviation human factors

research (Dismukes, 1994). Dismukes' (1994) survey also unearthed a substantial number of reasons to support the view that much work is yet to be done to advance aviation human factors research at universities. A research need expressed was a need for generic human factors knowledge to provide a solid foundation for aviation human factors research (Dismukes, 1994). It was discussed that while many strides have been made in the area of aviation human factors research, Dismukes (1994) found that "Several of the senior university scientists I interviewed expressed concern that AHF research has spent much effort on the nuts and bolts of particular operations problems and relatively little effort on getting at the underlying causes of those problems" (p. 326). Dismukes (1994) stated, "Much work is still required in the fundamental disciplines of psychology, sociology, and neuroscience to develop powerful, relevant models of human behavior that can be applied in aviation human-factors work" (p. 321). Telfer (1993) pointed out that "It follows that we cannot simply take instructional research from schools and apply it to aviation without critical scrutiny" (p. 212). Telfer (1993) explained, "From a scientific viewpoint, there is much that we do not know about aviation instruction" (p. 213).

It has been discussed that though great advances have been made in training hardware such as the development of sophisticated simulators, comparatively little advance has been made in the practice of flight instruction (Elshaw, 1993). Elshaw (1993) stated, "It is not usually recognized that being a good teacher has its own skills and knowledge which are generalizable and independent of the subject domain. There persists a belief that the good instructor develops insight into the mysteries of instruction spontaneously through experience" (p. 254). There are many psychological issues that

instructors need to be aware of and instructors can help mitigate some of those issues by using effective instructional techniques (Elshaw, 1993; FAA, 2008).

Interpersonal Communication Scholarship

Theoretical development of interpersonal communication in the United States began in the 1930's (Webb & Thompson-Hayes, 2002). Since that time, much has been learned about a large number of facets of interpersonal communication, and entire journals, courses, and areas of scholarship have been devoted to studying the many aspects of interpersonal communication (Webb & Thompson-Hayes, 2002).

Communication scholars have stated that classroom teachers benefit from communication education, as the training received in communication helps teachers to successfully complete their day-to-day activities (Hunt, Simonds, & Cooper, 2002). In contrast to the FAA's 10 pages of required communication material for flight instructor applicants (FAA, 2008), Hunt, Simonds, and Cooper (2002) suggest that all teaching education majors in all disciplines be required to take an entire college course in communication specifically geared to improving the interpersonal communication skills necessary to successfully teach. Communication scholars have also expressed the need for communication scholarship to move beyond the boundaries of the classroom, adding a "real world" focus to research and education activities that can positively impact the careers and civic lives of educated students (Clark, 2002; Daly, 2002).

A content analysis of interpersonal communication textbooks revealed an extensive list of theoretical ideas presented in popular interpersonal communication textbooks including the following: attribution theory; empathy; metacommunication; relational dialectics; self-concept; self-disclosure; self-fulfilling prophecy; social

exchange theory; Spitzberg's communication competence; Watzlawick, Beavin, and Jackon's axioms of communication; Altman and Taylor's social penetration theory; Berger and Calabrese's uncertainty reduction theory; Cooley's reflected appraisal and looking glass self; the Johari window; Laing's confirming and disconfirming; Laing's spirals of communication; Sapir and Whorf linguistic determination; self-monitoring; self-serving bias; equity theory; Gibb's supportive and defensive climates; Goffmans' attenuation, face work, and impression management; Hall's dimensions of culture; Hart's rhetorical sensitivity; Infante's verbal aggression; Knapp's relational stages; Maslow's hierarchy of needs; rule theory; Shutz's interpersonal needs inclusion, control, and affection; social comparison; transactional communication; Vocate's self-talk; and Wilmot's dyadic communication (Webb & Thompson-Hayes, 2002). The preceding list is not all-inclusive; it is merely a representation of the most popular ideas presented in the most popular interpersonal communication textbooks (Webb & Thompson-Hayes, 2002). The list only begins to shed light on the vastness of interpersonal communication theories, ideas, and scholarship. For the purposes of this study, the communication theoretical framework of focus is socio-communicative orientation.

Socio-Communicative Orientation

Basic communication competence, the communication competence required to be understood by another, requires three elements: a cognitive understanding of the communication process, the psychomotor ability to produce communication behaviors such as writing or speaking, and a positive affective orientation or desire to communicate (McCroskey & Richmond, 1996; Richmond, 2002). In summary, basic communication competence is the possession of the knowledge, behaviors, and drive required to

communicate in a way that another would understand. Humans generally desire to use communication to go beyond merely being understood, communicating to build relationships (McCroskey & Richmond, 1996; Richmond, 2002). To express feelings, influence others, and build relationships, interpersonal communication competence is required (McCroskey & Richmond, 1996; Richmond, 2002).

Built on a foundation of general communication competence, interpersonal communication competence is comprised of three elements: assertiveness, responsiveness, and versatility (McCroskey & Richmond, 1996; Richmond, 2002). Assertiveness refers to the communicator's ability to make requests, disagree, express feelings, initiate, maintain or disengage from conversations, and stand up for oneself without attacking (McCroskey & Richmond, 1996; Richmond, 2002), in other words, it is the effort a person makes to influence the thoughts and actions of others (May &Gueldenzoph, 2003). Assertiveness focuses on the task dimension of relationships (Richmond, 2002), or as Bem (1974) labeled the dimension masculinity, an instrumental orientation with a cognitive focus on completing tasks. Assertive communicators talk faster and louder, make more eye contact, use more gestures, and tend to lean in more (Merrill & Reid, 1981).

Responsiveness is the ability to be sensitive to others, to listen, to make others comfortable communicating, and to recognize others' needs and desires (McCroskey & Richmond, 1996). Responsiveness is summarized as the extent to which a person reacts to influence or stimulation with a display of feelings (May & Gueldenzoph, 2003). Responsiveness focuses on the needs of others (Richmond, 2002), or as Bem (1974) labeled the dimension of femininity, an expressive orientation with affective concern for

the welfare of others. Responsive communicators use open body gestures, show animated facial expressions, and tend to speak with greater inflection (Merrill & Reid, 1981).

Versatility is the capacity to be appropriately assertive or responsive depending on context (McCroskey & Richmond, 1996). Terms associated with the versatility construct are adjustability, accommodating, and flexibility, while words associated with a lack of versatility are rigid, bossy, arrogant, domineering, harsh, inflexible, unyielding, and uncompromising (Richmond, 2002). Versatile communicators choose which assertive or responsive communication behaviors are effective for a given situation (Richmond & Martin, 1998).

An early definition of *communicator style* was conceived by Norton (1978) as the way one verbally and paraverbally interacts to signal how literal meaning should be taken, interpreted, filtered, or understood. Since that time, much work has been done to better understand and define communicator style. Bem (1974) and Snavely (1981) both noted that individuals can be high or low in either or both the dimensions of assertiveness and responsiveness or as Bem (1974) labeled them, masculinity and femininity. Richmond and McCroskey (1990) saw measures of assertiveness and responsiveness as uncorrelated with one another. The potential combinations of assertiveness and responsiveness have been labeled as four styles: expressives who are high in both assertiveness and responsiveness, analyticals who are low in both assertiveness and responsiveness, drivers who are high in assertiveness and low in responsiveness, and amiables who are high in responsiveness and low in assertiveness (Richmond, 2002; Snavely, 1981). Using these four styles as a framework, Anderson and Martin (1995) found that expressives were motivated to communicate for affection, pleasure, and

inclusion more than the other three styles and Myers and Avtgis (1997) found that expressives used more nonverbal immediacy behaviors effectively than the other three styles.

An individual's communication competence tends to be reflected similarly across many contexts as a person's level of communication competence is rooted in personality (Cole & McCroskey, 2000; McCroskey & Richmond, 1996; Snavely, 1981). Socio-communicative orientation refers to an individual's perception of how assertive and responsive they are, while socio-communicative style refers to others' perceptions of a communicator's assertiveness and responsiveness behaviors (McCroskey & Richmond, 1996). Socio-communicative orientation in particular is substantially genetically based (Richmond & Martin, 1998). It is possible for a person's socio-communicative orientation and socio-communicative style not to be highly correlated, as a person may not accurately perceive their own communication traits, or that person could behave differently when in different situations or in the company of different individuals (Richmond & Martin, 1998). While the third component of interpersonal communication competence, versatility, is also rooted in personality, it is more malleable as people who have more rigid personalities can learn to communicate in a versatile manner (McCroskey & Richmond, 1996).

Measures of Interpersonal Communication Competence

Two 20-item scales have been developed by McCroskey and Richmond (1996) to measure assertiveness and responsiveness. The Socio-Communicative Style Scale is used to assess others' perceptions of a communicator's assertiveness and responsiveness behaviors (McCroskey & Richmond, 1996; Richmond & McCroskey, 1990). The Socio-

Communicative Orientation Scale is used as a self-assessment of an individual's perception of how assertive and responsive the individual is (McCroskey & Richmond, 1996; Richmond & McCroskey, 1990). Both the Socio-Communicative Style Scale and the Socio-Communicative Orientation Scale have been found to be internally reliable, and assertiveness has been found to be uncorrelated with responsiveness (Richmond & McCroskey, 1990).

Versatility is not included in either the Socio-Communicative Orientation Scale or Socio-Communicative Style Scale measures. While the versatility construct has been moved forward as a construct that is separate from assertiveness and responsiveness yet part of overall interpersonal communication competence, no measure of this versatility construct has been created that has not been largely correlated with responsiveness (Cole & McCroskey, 2000). Because of the difficulty in creating a valid versatility measure, most previous research has omitted this dimension when measuring dimensions of interpersonal communication competence (Cole & McCroskey, 2000).

Assertiveness and Responsiveness in Teaching and Learning

Assertiveness and responsiveness both have many studies that point to their impacts on interpersonal communication, particularly how assertiveness and responsiveness can positively impact teaching and learning in the classroom. While being versatile and able to adjust to different situations can be beneficial for students, Richmond (2002) discussed that the predictability of teachers helps students know how best to communicate with their teachers. Students are fairly accurate in guessing a professor's level of assertiveness and responsiveness based upon cues from both in and outside the classroom (Schlee, 2005). Regarding out of class informal communication,

responsiveness has positively associated with informal out of class communication and the student satisfaction with out of class communication (Aylor & Oppliger, 2003). McCroskey, Valencic, and Richmond (2004) found that teacher temperament was reflected in communication behaviors observed by students, and that communication behaviors shaped students' perceptions of source credibility and task attractiveness which in turn were associated with positive instructional outcomes such as learning retention, affective learning and positive teacher evaluation.

Students who perceived their teachers to be higher in responsiveness trusted their teachers more (Wooten & McCroskey, 1996). Teachers perceived to be higher in assertiveness were also trusted more by all students; and highly assertive students perceive highly assertive teachers as more trustworthy than less assertive teachers (Wooten & McCroskey, 1996). Students have more affect toward the teacher and the course material when the teacher is high in either assertiveness or responsiveness (Wanzer & McCroskey, 1998). Instructors were viewed to be more credible when higher in assertiveness and responsiveness (Martin, Chesebro, & Mottet, 1997), while teacher assertiveness and responsiveness were each negatively correlated with teacher misbehaviors (Wanzer & McCroskey, 1998).

Instructor immediacy has been strongly associated with positive instructional outcomes, and responsiveness and assertiveness have both been positively correlated with immediacy (Thomas, Richmond, & McCroskey, 1994). With respect to immediacy, another study found that teachers who were more assertive, responsive and nonverbally immediate produced more positive instructional outcomes (McCroskey, Valencic, & Richmond, 2004).

Instructors who were perceived by their students to be both verbally and nonverbally clear and easy to understand were positively related to both assertiveness and responsiveness (Sidelinger & McCroskey, 1997). Instructor clarity also enhanced student affect toward the course and the instructor (Sidelinger & McCroskey, 1997). Overall, research of the assertiveness and responsiveness of teachers has pointed to teachers who are more assertive and responsive producing more positive educational outcomes (McCroskey et al., 2002).

The assertiveness and responsiveness of students has also been found to impact communication in the classroom. Students who are responsive, and to a greater degree assertive are more motivated to communicate in class for different reasons (Myers, Martin, & Mottet, 2002). The assertiveness and to a greater degree the responsiveness of instructors can help motivate students to communicate and engage in the classroom (Mottet, Martin, & Myers, 2004; Myers et al., 2002). Teachers observed students who were more responsive in the classroom more positively (Mottet, 2000), and Mottet, Beebe, Raffield, and Paulsel (2004) found that teachers liked their students more and were more likely to submit to student requests when students were more nonverbally responsive. Students who reported being more effective communicators, including assertiveness and responsiveness, tended to indicate greater affective learning, learning indicators, motivation to study, and greater satisfaction with communication with their instructor (Frymier, 2005).

Beyond the classroom, assertiveness and responsiveness have been shown to be beneficial. In a study of physicians, assertiveness and responsiveness were both associated with physician credibility (Richmond, Smith, Heisel, & McCroskey, 2002).

Physician credibility and responsiveness were both associated with patient satisfaction (Richmond et al., 2002). Assertiveness has been positively related to individuals who identify with an upwardly mobile orientation in organizations (McCroskey, Richmond, Johnson, & Smith, 2004).

Perspective

Perspective has been an important ingredient in the assessment of personality and communication style (Leung & Bond, 2001; May & Gueldenzoph, 2003; Wooten & McCroskey, 1996). Because different sets of perceptions are used in determining socio-communicative style and socio-communicative orientation, an individual's socio-communicative style and socio-communicative orientation may not be highly correlated (Cole & McCroskey, 2000; Wooten & McCroskey, 1996). While socio-communicative style may be colored by another's perceptions of one's communication, the links between socio-communicative orientation, the Eysenck Personality Inventory and the Five-Factor model indicate the socio-communicative orientation is rooted in one's personality, making it more substantially genetically based than socio-communicative style (Cole & McCroskey, 2000). Other studies have corroborated the ultimately genetic basis of socio-communicative orientation based upon the connections between socio-communicative orientation dimensions of assertiveness and responsiveness to personality traits (McCroskey, Heisel, & Richmond, 2001; Wahba & McCroskey, 2005). One's socio-communicative orientation could be viewed as a glimpse of an individual's innate genetically predisposed communication patterns based upon the connections formed with personality traits.

Perceptions from the self perspective and the viewpoint of others can alter the preferences a person has for interactions. In a study of students that self-reported social styles, students with the same reported social style rated each other higher in group work than students with opposite social styles (May & Gueldenzoph, 2003). It has been discussed that socio-communicative style and socio-communicative orientation of teachers may differ due to teachers adjusting to the needs of students (Richmond, 2002). Students were shown to be less able to pin down a professor's exact social style, however students rated professors whose styles were similar to their own more favorably (Schlee, 2005).

In a study of Chinese participants, only observable communication behaviors were commonly rated by both the self and others (Leung & Bond, 2001). Other personality factors were rated differently by the self and others, supporting the existence of two communication worlds; the world perceived by the communicator and the world perceived by others who experience the communicator's communications (Leung & Bond, 2001). Beyond the differences between the self and others, it is also interesting to note that levels of communication assertiveness and communication responsiveness have been found to differ between groups of people from different world countries (Richmond & Martin, 1998).

Personality Factors

Interestingly, much study points to the connection between socio-communicative orientation and innate personality factors. Cole and McCroskey (2000) examined the relationships of socio-communicative orientation assertiveness and responsiveness with temperaments on Eysenck's three-factor and the Five-Factor model. Cole and McCroskey

(2000) found that assertiveness and responsiveness scores were predictable by dimensions on both the three-factor and the Five-Factor models, suggesting that socio-communicative orientation is genetically based. It was discussed that the genetic basis of socio-communicative orientation may account for the difficulty in training people to be more assertive and responsive (Cole & McCroskey, 2000).

Some definitions related to personality are explored here to better explain how assertiveness and responsiveness are related to personality. Eysenck and Eysenck (1985) defined a personality trait as a group of correlated behavior acts, and a personality type is a group of correlated traits. While the interaction of a trait with external situational factors creates transient states, Eysenck and Eysenck (1985) found that social behaviors are reflections of personality as it is inappropriate to regard situational factors as a greater influence on behavior than personality. The three umbrella personality types defined by Eysenck and Eysenck (1985) that contain groups of traits that are largely genetically determined and permanent are labeled psychoticism, extraversion, and neuroticism. Psychoticism is made up of these traits: aggressive, cold, egocentric, impersonal, impulsive, antisocial, unempathetic, creative, and tough-minded (Eysenck & Eysenck, 1985). Extraversion is comprised of these traits: sociable, lively, active, assertive, sensation-seeking, carefree, dominant, surgent, and venturesome (Eysenck & Eysenck, 1985). Neuroticism contains the following traits: anxious, depressed, guilt feelings, low self-esteem, tense, irrational, shy, moody, and emotional (Eysenck & Eysenck, 1985). Another often used model called the Five-Factor model includes these three dimensions and adds two more (John, 1990; McCrae & John, 1992). Much of Eysenck's dimension of psychoticism is housed under the dimension labeled agreeableness in the Five-Factor

model (John, 1990; McCrae & John, 1992). The two additional types in the Five-Factor model are conscientiousness and openness to experience (John, 1990; McCrae & John, 1992). Conscientiousness encompasses traits such as: efficient, organized, planful, reliable, responsible, and thorough (John, 1990; McCrae & John, 1992). Openness to experience has the following traits: artistic, curious, imaginative, insightful, original and wide interests (John, 1990; McCrae & John, 1992).

Several connections have been observed between socio-communicative orientation dimensions of assertiveness and responsiveness and dimensions of Eysenck's three-factor model. Extroverts have been associated with high levels of socio-communicative orientation assertiveness and responsiveness (Cole & McCroskey, 2000; McCroskey et al., 2001; Wahba & McCroskey, 2005). Neuroticism has been negatively connected to socio-communicative orientation assertiveness (Cole & McCroskey, 2000; McCroskey et al., 2001; Wahba & McCroskey, 2005). Psychotics have been negatively correlated with socio-communicative orientation responsiveness (Cole & McCroskey, 2000; McCroskey et al., 2001). Extraversion and neuroticism dimensions have been discussed to be better predictors of assertive communication traits than some other measures (Wahba & McCroskey, 2005).

The factors on the Five-Factor model are extraversion, neuroticism, openness to experience, agreeableness, and conscientiousness and have also been found to have connections to socio-communicative orientation dimensions of assertiveness and responsiveness. Cole and McCroskey (2000) also examined the Five-Factor personality model. They noted the extraversion and openness to experience dimensions both positively correlated with both socio-communicative orientation assertiveness and

responsiveness (Cole & McCroskey, 2000). The conscientiousness dimension had low positive correlations with socio-communicative orientation assertiveness and responsiveness (Cole & McCroskey, 2000). The Five-Factor model dimensions of neuroticism and agreeableness were negatively correlated with socio-communicative orientation assertiveness, however agreeableness positively correlated with socio-communicative orientation responsiveness (Cole & McCroskey, 2000).

Personality, Aviation and Education Outcomes

Personality serves as an intersection between communication and aviation scholarship. Both aviation and communication scholars have conducted research connecting aspects to common dimensions of personality. Personality has been connected to communication patterns and styles by communication scholars (McCroskey & Richmond, 1996). Personality factors have been examined in relation to communication assertiveness and educational outcomes. Teacher-reported extroversion was found to be significantly associated with student-perceived teacher assertiveness (Valencic, McCroskey, & Richmond, 2005), and teacher assertiveness has been linked to several positive classroom outcomes (Martin et al., 1997; McCroskey, Valencic et al., 2004; Sidelinger & McCroskey, 1997; Thomas et al., 1994; Wanzer & McCroskey, 1998; Wooten & McCroskey, 1996).

Personality factors on the Five-Factor model have been studied in the flight training environment. Herold, Davis, Fedor, and Parsons (2002) saw that openness to experience and emotional stability positively impacted the ability of students to successfully attain a private pilot certificate in fewer hours. Students who were high in the dimension of conscientiousness and experienced early difficulties in training fared

better than students who were low in conscientiousness and had early difficulties in training, suggesting conscientiousness may compensate for early learning difficulties (Herold, Davis, Fedor, & Parsons, 2002).

In the aviation arena captains that exhibited beneficial communication patterns have tended to fit into similar personality types (Orasanu, 1991). A personality analysis of pilots on the basis of instrumental personality attributes or achievement orientation, and expressive personality attributes or interpersonal orientation, indicated that pilots high in both of the dimensions or achievement orientation and interpersonal orientation performed better than other pilots (Gregorich, Helmreich, Wilhelm, & Chidester, 1989). Foushee (1982) discussed that captains with personalities that are high in both goal orientation and group orientation were more effective in working to establish warmer, more pleasant and effective working relationships with other crewmembers.

CHAPTER III

METHODOLOGY

In order to test the hypotheses and possibly begin to explain some of the quantitative findings, quantitative and qualitative research methods were employed. An anonymous self-report survey with open and closed questions was used to collect data. In addition to gathering demographic and experience data, one section of the survey was based on the Socio-Communicative Orientation Scale (McCroskey & Richmond, 1996; Richmond & McCroskey, 1990), and another section utilized Besco's (1995,1999) PACE operational framework. Initial University of North Dakota (UND) Institutional Review Board (IRB) approval for the study was obtained on April 27, 2009 and data collection occurred from Monday, May 25, 2009 until Friday, May 29, 2009 in a computer lab located at UND airport Flight Operations complex in Grand Forks, North Dakota. The survey content was displayed on the papers that also served as response sheets and on PowerPoint presentations on the computers in each of the five computer cubicles in the lab. Quantitative data were analyzed using PASW Statistics software for statistical analyses, and qualitative data were analyzed using content analysis.

Population and Sample

The population target of this study is certificated flight instructors. In 2007, there were approximately 92,175 active flight instructors in the United States (FAA, 2007). Approximately 300 flight instructor certificate holders were either employed at or

students of UND at the time of the survey and eligible to participate. One hundred two individuals took the survey.

In order to be eligible to become a flight instructor, the FAA stipulates some minimum requirements. Flight instructors must be age 18, must be able to read, speak, write and understand the English language, and must possess either a commercial pilot certificate or airline transport pilot certificate (Federal Aviation Regulations, 2009a). Possession of a commercial pilot certificate with an airplane rating indicates that a person possesses at least approximately 250 hours flight experience, as the FAA's required minimum flight experience for a commercial pilot in airplanes is 250 hours (Federal Aviation Regulations, 2009a). Some of the survey participants may have possessed slightly fewer than 250 hours of flight time due to the highly structured flight program at UND that is additionally monitored and certificated by the FAA under Federal Aviation Regulations Part 141 (Federal Aviation Regulations, 2009e). It can be inferred that the sample of flight instructors are the caliber of pilots most commonly recruited to entry-level positions in aircraft that require multiple crewmembers. While some flight instructors make a career out of flight instructing, many view flight instruction as a transitory job at the beginning of their professional pilot career. Flight instruction for many serves as a method of logging the flight experience necessary to qualify for entry-level positions as first officers at airlines or other professional pilot positions. This study could potentially generalize to people who are near the beginning of their professional pilot careers.

The FAA outlines its minimum requirements for the training of flight instructors, and variance exists from school to school as to what and how flight instructors are taught.

Some learn in the highly structured environment certificated under Federal Aviation Regulations Part 141, while others learn in the more flexible environment allowed by Federal Aviation Regulations Part 61 (Federal Aviation Regulations, 2009a; 2009e). By sampling from one location, the potential for confounding the study by introducing the variable of varied learning experiences is reduced. Indeed, of the 102 respondents, 98 survey respondents indicated that they had obtained all of their flight instructor certificates at the UND, three survey respondents indicated that they had obtained some of their flight instructor certificates at UND, and one respondent indicated that they had obtained all flight instructor certificates at places other than UND. This indicates that the overwhelming majority of the sample was subjected to similar training curricula and experiences when obtaining their flight instructor certificates. Some variance may exist due to slight changes that were made to the university's curriculum over the years, but overall it can be assumed that the sample was subjected to a similar level of structure, rigor, and enhanced curriculum available at a FAA-certificated Part 141 and UAA-accredited collegiate aviation program.

Because the program is scrutinized by both the FAA and an UAA accreditation body, it can be assumed that the training offered to the flight instructors is of some of the highest quality available in the United States. In addition to the flight instructor course that includes practice instruction experiences, the comprehensive college curriculum outlined in the *University of North Dakota 2005-2007 Academic Catalog* for a person majoring in commercial aviation at UND includes coursework in public speaking, writing, crew resource management, interpersonal communication, and a course in flying the Canadair Regional Jet (CRJ) that requires crew interaction (University of North

Dakota, 2005). It can be assumed that a large number of the flight instructors who responded to the survey completed or were in the process of completing this curriculum, as the flight instructor course is completed after the completion of five other flight courses that require an academic term to complete and data was gathered in May 2009. This complete curriculum is well above and beyond basic FAA requirements to obtain a flight instructor certificate.

Approvals, Facilities, and Study Processes

The UND IRB initially approved the study's procedures on April 27, 2009, and an extension of approval was made on October 7, 2009. Data collection occurred from Monday, May 25, 2009 until Friday, May 29, 2009 at the UND Flight Operations complex located at the Grand Forks, North Dakota airport.

In compliance with IRB procedures, study advertisements were made via mass email distributed to aviation faculty, flight instructors employed by UND, and students of UND's aviation department. A reminder email containing the same content as the original email was sent to the same individuals. Poster-sized signs were posted in high-traffic areas at the flight operations complex during the week of data collection as additional reminders.

A computer lab at the flight operations complex was used to conduct the study. Five computers surrounded by office cubicle partitions were used. All five computers had the same software and processing capability. The video clips for the study were embedded in a PowerPoint presentation due to the principal investigator's limited computer programming ability and the software limits of the computer lab. The computers' video processors were slow providing a slow-motion video output. All five

computers' audio processors were capable of providing the audio recordings in real-time. As all of the computers' video processors were identically slow, all participants experienced the same stimuli, providing a standardized format that had lower than expected fidelity.

Volume-adjustable headsets were connected to each computer and provided for additional participant privacy and comfort. At the beginning of the video slides, one practice video was provided for participants to familiarize themselves with the buttons and features of the survey, as well as allow for adjustment of headset volume to a comfortable level. Two pens and several sheets of blank white paper were provided at each cubicle computer station.

When survey participants arrived at the computer lab to participate in the survey, they were given an IRB-approved information sheet to review. After reading the information sheet conditions and agreeing to them, each was given a paper copy of the survey and shown to a cubicle to complete the survey. All respondents were verbally informed about the slowness of the video processors. The survey took approximately 20 minutes to complete and survey participants were compensated $5.00 for their time. Survey forms were both disseminated and collected by the principal investigator in the computer lab according to approved procedures. At the completion of data collection, data was entered into an Excel spreadsheet for analysis, and survey paper forms were stored in accordance with IRB approved procedures.

Instruments

The anonymous self-report survey used to collect data was comprised of four sections (see Appendix A). The first section consisted of several closed questions

regarding gender, total flight experience in hours, total flight instruction experience in hours, instructor certificates held, whether or not all flight instructor certification training was obtained at the university, and the quantity of experience obtained as a crewmember in an aircraft requiring more than one flight crewmember. The first section also included open questions that survey respondents could use to list flight instructor ratings obtained at places other than the university, and to list and explain additional ratings and multiple-crewmember experience.

The next 20 questions on the survey comprise the section that is the Socio-Communicative Orientation Scale developed and verified by McCroskey & Richmond (1996) and Richmond & McCroskey (1990). The Socio-Communicative Orientation Scale measures a person's perceptions of how assertive and responsive they are. The 20 items on the Socio-Communicative Orientation Scale contain 10 items to measure assertiveness and 10 items to measure responsiveness. The items allow participants to respond on a five-point continuum with 1 as *strongly disagree* to 5 as *strongly agree*. To score the instrument, the 10 items for each dimension are summed. A total score above 30 is considered high, while a score below 30 is considered low (Richmond & Martin, 1998). In this study, scores of exactly 30 were treated as low scores in statistical analyses. The predictive validity of the Socio-Communicative Orientation Scale has been demonstrated in numerous studies (McCroskey, n.d.). The alpha reliability of the assertiveness dimension has been reported at .88 and the alpha reliability of the responsiveness dimension has been reported at .93 (Richmond & McCroskey, 1990). The dimensions of assertiveness and responsiveness are totally uncorrelated to only

marginally correlated with a reported r = -.027 (McCroskey, n.d.; Richmond & McCroskey, 1990).

The next 20 questions are Likert-scale response items to record perceptions of 20 video clips. The scale is a nine-point scale ranging from *extremely submissive* to *submissive* to *neutral* to *assertive* and *extremely assertive*. When scored, the four points on the assertive end of the scale correspond to Besco's (1995, 1999) increasingly assertive Probe, Alert, Challenge, and Emergency action statements. The submissive end of the scale was developed as a way for survey respondents to indicate the submissive statements included in the 20 videos, and was also established to create a balanced-looking scale to avoid prompting responses to be made to the assertive.

The last section contains four open-ended questions at the end of the survey to gather qualitative data. The questions attempt to gather response about experiences, courses, and training that respondents believe impact their ability to communicate and interact. In addition, one question centers on respondents' opinions about CRM and CRM training.

Before launching the use of the survey, the survey was reviewed by experts. One professional pilot unfamiliar with the research methods reviewed the survey for clarity and ease of use by respondents. In addition, one professional pilot who is also a graduate student familiar with research methods and two graduate professors reviewed the survey. These three reviewers offered suggestions for clarity, ease of response, and enhanced survey validity.

Videos

A total of 20 video clips were scripted and filmed for this study. Besco's (1995, 1999) PACE operational scheme was used to develop 12 of the video scripts by using key elements from each level. Besco (1995) succinctly defined each level in this manner:

Probing for a better understanding;

Alerting Captain of the anomalies;

Challenging suitability of present strategy;

Emergency action due to critical and immediate dangers.

The Probing statements were designed for the speaker to attempt to gain more information and understanding, generally through an interrogative statement or a declaration of lack of understanding. The Probing statement is the first level of assertiveness as it is used to initially bring to attention potentially dangerous issues. In this study, all three scripted Probing statements were interrogative statements.

The Alerting statements are the next level and contain declarative statements of fact with a speculation regarding how the fact negatively impacts the safety of flight. Besco (1995) likened an Alerting statement to shedding light on one person's blind spots. In this study, the three Alerting statement scripts were developed with a statement of an observed fact combined with a statement of how that particular observed fact could negatively impact the safety of flight.

The Challenging statements in this framework are meant to challenge the present course of action. Additionally, the Challenging statements are meant to state that another course of action must immediately begin. In this study, the three Challenging statements contain a firm declarative statement that the present course of action is not a good course

of action combined with either a command or declaration of a defined alternate course of action.

The Emergency action warnings are designed to warn the crewmember that the safety margins are completely depleted and that the speaker will take control of the aircraft if another course of action is not immediately taken. It is designed to be a warning given as a last spoken course of action before emergency assumption of control of the aircraft. In this study, each of the three Emergency action warnings contains the key words *take control of the airplane*.

In addition to the 12 scripted videos that fell within Besco's (1995, 1999) PACE framework, eight additional videos were added. Three contain neutral statements that occur on a daily basis in the cockpit such as acknowledgement of an air traffic control radio call. Three videos contain submissive statements that are statements of yielding to another's suggestion. The final two videos contain ambiguous comments that are neither entirely submissive nor do they fit neatly into Besco's (1995, 1999) PACE framework. These two ambiguous videos contain the key word *comfortable*, which has been touted by some CRM courses as a key phrase to call attention to something without eroding a crew environment. These additional videos were added in an attempt to prevent survey respondents' rating bias due to too many videos reflecting assertive behaviors.

Besco's (1995, 1999) PACE framework was created specifically for interactions in multiple-crewmember settings, and was primarily intended for use by a junior crewmember to assertively communicate safety concerns to a senior crewmember. For this study, the scripts that were created were lines that most likely would be stated in the context of a multiple-crewmember setting, but could also be used in training situations.

To further generalize the statements to flight instructors and make them relatable to the sample, technical airplane type-specific systems terminology was deliberately omitted from the language. The limited systems references, such as a reference to the airplane's battery, could be related to any size airplane from a four-seat single-engine plane powered by a reciprocating engine to a something as large and complex as a jet. The only specific references used were items like an airplane's call sign and runway numbers, which can be accurately interpreted by an individual with a private pilot certificate and therefore should be well understood by the sample of certificated flight instructors. Video scripts were reviewed by one professional pilot and one professor for clarity, realism, and conformity. See Appendix B for a list of the scripts.

Two volunteer actors agreed to be filmed acting out 10 videos each in a Learjet 31a cockpit. The jet's owner company approval was obtained to use the cockpit for filming with the aircraft's specific tail number omitted and blocked. Actors were compensated with movie theatre gift certificates for their time and effort in producing the videos. The volunteer actors were both professional pilots with experience flight instructing and experience as both first officers and captains of aircraft requiring more than one crewmember. One actor was male, and the other actor was female. Some procedures were employed during filming in order to have the videos appear and sound as naturalistic and real-life as possible. First of all, the videos were shot in a cockpit that both actors used as their day-to-day work environment as a way to place them in as naturalistic an environment as possible. Before filming each individual video script, an actor was given a small slip of paper with that particular video's lines printed clearly on it. The actor was given a few minutes to process what the lines said and think about how

they would say it. When they indicated that they were ready to speak, the principal investigator filmed the video. A digital camera was used to film the videos, and most videos were shot in only one take.

Other measures were employed to prevent the introduction of bias by survey respondents during final video viewing. The videos were randomized so that no two videos of the same level of assertiveness were played adjacent to each other in the final video screening for the survey participants. In addition, the videos were shown with alternating male and female clips in the final screening, and the male and female actors were given roughly equal numbers of scripts from each level of assertiveness. The videos were embedded in a PowerPoint presentation for final dissemination to survey participants. Because the PowerPoint software was installed on the computers in the computer lab, the presentation was easily placed on the computers in the computer lab. The PowerPoint format also allowed for written viewing instructions to be included to make the survey easier to use by the participants.

Limitations

There are some limitations associated with the study design. First of all, the video and audio stimuli could have been more synchronized, and were limited by the speed of all of the computers' processors. The study design is a self-report survey, and self-report surveys are limited by the biases of the respondents. In particular, one potential bias identified is the potential for respondents to respond to the Socio-Communicative Orientation Scale while viewing themselves strictly through the lens of an aviation professional. Because the study was advertised and open only to flight instructors, it is

possible that survey respondents further narrowed their view to be through an even narrower viewpoint as flight instructor.

The video content may introduce bias in survey responses. Besco's PACE (1995, 1999) framework was developed for multiple-crewmember settings instead of flight instruction settings. While all of the language employed in this study was carefully constructed to make it potentially applicable to different situations including flight instruction, the statements may not be seen specifically in everyday flight instruction settings. Each of the statements could be highly important and useful in the next career step for most instructors, which is generally serving as a junior crewmember in a multiple-crewmember setting. Besco developed the PACE framework as a means for junior crewmembers to capture the attention of captains and save face, and in many ways this study is a test for the framework as no studies currently exist to test its usefulness and applicability (1995, 1999). While this framework is generally untested and aimed at multiple-crewmember settings, it is useful for this study, as the purpose of this study is for the respondents to assess communication. In many ways, this study is a starting point from which to grow additional scholarly research regarding communication studies in aviation in general and flight instruction in particular.

Data Analysis

Data gathered from the surveys was entered into an Excel spreadsheet for analysis using PASW Statistics software. The dependent variable for each of the hypotheses was the overall accuracy of rating video clips. The independent variables included Socio-Communicative Orientation Scale assertiveness scores, Socio-Communicative

Orientation Scale responsiveness scores, experience as a flight instructor, and experience in multiple-crewmember settings.

Some raw data and some summations were used to create independent variable groups. Raw numerical data for responses to the survey item regarding the total flight hours of experience as a flight instructor was used and the survey respondents were divided into two groups, the group with more experience and the group with less experience. With regard to experience in multiple-crewmember settings, survey respondents were divided into groups based upon a "yes" or "no" response to the survey question. Responses to the 10 assertiveness items on the Socio-Communicative Orientation Scale were summed, and responses to the 10 responsiveness items on the Socio-Communicative Orientation Scale were summed. The summed assertiveness and summed responsiveness scores were used in inferential statistic calculations. A summed score above 30 is considered high, and a summed score below 30 is considered low (Richmond & Martin, 1998). For purposes of this study, a score of exactly 30 was included in the low group. Assertiveness scores and responsiveness scores were considered independently.

To form a numerical value for the dependent variable of accuracy in rating video clips, the survey responses to the Likert-scale responses were first entered in the spreadsheet as a numerical value corresponding to placement on the scale. A response of *Neutral* was recorded as 0, a response of *Extremely Assertive* was recorded as 4, a response of *Extremely Submissive* was recorded as -4, and intermediate responses were recorded as either positive or negative 1, 2, or 3 on the respective end of the scale. In the coding of the statements, Yielding statements were equal to -1, Neutral statements were

equal to 0, Probing statements were equal to 1, Alert statements were equal to 2, Challenge statements, were equal to 3, Emergency action statements were equal to 4, and Ambiguous statements were given a default value of 0 and not included in the overall scoring summation. The absolute value of the difference between the coded value of each statement and each survey respondent's actual response was recorded. The deviation scores for all statements except the ambiguous statements were summed for each survey respondent. Lower deviation scores indicated greater accuracy in rating the assertiveness level of video clips.

Once the initial responses were coded and summed as described, several descriptive statistics were calculated, including frequency distributions, means, standard deviations, skewness, ranges, maximums, and minimums. The dependent variable for each of the four hypotheses was the total deviation score associated with the accuracy of rating the video clips. For each hypothesis, two independent groups of independent variables were compared. Hypothesis 1 compares high and low assertiveness score groups, Hypothesis 2 compares high and low responsiveness score groups, Hypothesis 3 compares high and low flight instruction experience levels, and Hypothesis 4 compares groups with and without multiple-crewmember setting experience. To test each of these hypotheses, an independent samples t-test was utilized. Because the data used to test Hypothesis 1, Hypothesis 2, and Hypothesis 3 are all continuous variables, Pearson's correlation and multiple regression tests were also conducted. An alpha level of .05 used for all statistical tests. Responses with missing data or no response are omitted from calculations.

In addition to hypothesis testing, additional post hoc statistical analysis of the videos was conducted. Descriptive statistics for the absolute value of deviation scores for each individual video were calculated. The sums of the absolute values of deviation scores for each video type were calculated, and descriptive statistics were calculated for each video type grouping.

To analyze the qualitative data obtained on the last page of the survey, content analysis methods were employed. For each of the four questions analyzed, the same framework for analysis was employed. Responses were read by the principal investigator, and the ideas and concepts included in responses were recorded in theme clusters. Theme clusters were developed based upon the data from the responses received and vary from question to question. The number of responses in each cluster was also noted to determine the cluster with the largest number of responses to each question. Quotations that typified theme clusters are noted, as well as quotations that were outliers and provide insight to different viewpoints.

CHAPTER IV

RESULTS AND DATA ANALYSIS

Quantitative Data

Descriptive Statistics

One hundred two flight instructors responded to the survey, 12 females and 90 males. Ninety nine survey respondents indicated their level of experience as a flight instructor in number of flight hours as a flight instructor. The distribution of experience level for survey respondents is positively skewed (M = 619.87, SD = 896.95, Mdn = 320), with a low level of experience reported at zero hours of flight experience as a flight instructor to a high level of experience reported at 6,000 hours of flight experience as a flight instructor.

Ninety eight survey respondents indicated that they had obtained all of their flight instructor certificates at the UND, three survey respondents indicated that they had obtained some of their flight instructor certificates at UND, and one respondent indicated that they had obtained all flight instructor certificates at places other than UND. Eighteen survey respondents indicated that they had experience as a crewmember in a multiple-crewmember flight crew, while 84 respondents indicated that they did not have experience as a crewmember in a multiple-crewmember setting. The UND commercial aviation bachelor's degree curriculum requires students to take a flight course in CRJ operations, which requires students to fly a simulator and act as a crewmember in a multiple-crewmember setting while training in simulated flight. While students in this

course do not serve as a crewmember in a multiple-crewmember setting in actual flight, they do serve as a crewmember in a multiple-crewmember setting, and the CRJ does require more than one flight crewmember. The partial overlap between the existence of the CRJ course and the wording of the survey question introduces the possibility of a potentially confounding effect on responses to the survey question regarding experience in multiple-crewmember settings.

One hundred one of 102 respondents completed the Socio-Communicative Orientation Scale items. Scores above 30 on the Socio-Communicative Orientation Scale were considered high scores in this study, while scores including 30 and below were considered low. In this sample, 98 respondents indicated that they were high in responsiveness, and 4 indicated that they were low. Overall, respondents indicated high levels of responsiveness (M = 39.62, SD = 4.52, Mdn = 40). Minimum reported responsiveness value was 26, with a maximum reported value of 49. In the dimension of assertiveness, 73 respondents indicated that they were high in assertiveness and 29 respondents indicated that they were low in assertiveness. Though not to the degree of responsiveness, respondents overall indicated high levels of assertiveness (M = 32.53, SD = 4.15, Mdn = 33). Minimum reported assertiveness value was 22, with a maximum reported value of 42.

All 102 survey respondents completed the video rating survey items. The summed absolute values of difference between the respondents' ratings and the assigned assertiveness value were calculated, with the values for the Ambiguous statements excluded from the calculation. The data were fairly normally distributed, with multiple

modes (M = 22.85, SD = 7.19, Mdn = 22). The minimum value for the summed scores was 7, with a maximum value for the summed scores of 49.

Hypotheses Analyses

Hypothesis 1

1. Flight instructors who score high in responsiveness on the Socio-Communicative Orientation Scale will more accurately rate the video clips.

The first t-test was conducted using the established responsiveness criteria of a score of 30 or less for the group low in responsiveness, and a score of greater than 30 for the group high in responsiveness. No statistically significant difference was found, $t(99) = .449$, $p = .655$. See Appendix C for statistics tables for tests conducted of Hypothesis 1.

As the scores for responsiveness were generally high for this sample, additional t-tests were conducted using the mean and the median as divisions between the group considered high and considered low in responsiveness. Using the mean value of 39.62 as a divider between the high and low responsiveness group, no statistically significant difference was found, $t(99) = -.271$, $p = .787$. Using the median value of 40 as a division between the high and low responsiveness group, no statistically significant difference was found, $t(99) = -.271$, $p = .787$.

The responsiveness scores and total score for rating the video clips were not significantly correlated, $r(99) = .006$, $p = .956$. Multiple regression analysis indicated that responsiveness, assertiveness, and experience in hours of flight instruction did not significantly explain the variance in ability to accurately rate video clips, $R^2 = .020$, $F(3, 94) = .649$, $p = .586$. Responsiveness did not significantly contribute to explaining the

variance in the ability to accurately rate video clips $\beta = .002$, $p = .982$. In all statistical tests conducted, the null hypothesis is retained.

Hypothesis 2

2. Flight instructors who score high in assertiveness on the Socio-Communicative Orientation Scale will less accurately rate the video clips.

The first t-test was conducted using the established assertiveness criteria of a score of 30 or less for the group low in responsiveness, and a score of greater than 30 for the group high in responsiveness. No statistically significant difference was found, $t(99) = -.311$, $p = .756$. See Appendix C for statistics tables for tests conducted of Hypothesis 2.

As the scores for assertiveness were generally high for this sample, additional t-tests were conducted using the mean and the median as divisions between the group considered high and considered low in responsiveness. Using the mean value of 32.53 as a divider between the high and low responsiveness group, no statistically significant difference was found, $t(99) = .153$, $p = .879$. Using the median value of 33 as a division between the high and low responsiveness group, no statistically significant difference was found, $t(99) = .153$, $p = .879$.

The assertiveness scores and total score for rating the video clips were not significantly correlated, $r(99) = -.042$, $p = .674$. Multiple regression analysis indicated that responsiveness, assertiveness, and experience in hours of flight instruction did not significantly explain the variance in ability to accurately rate video clips, $R^2 = .020$, $F(3, 94) = .649$, $p = .586$. Assertiveness did not significantly contribute to explaining the

variance in the ability to accurately rate video clips β = -.037, p = .721. In all statistical tests conducted, the null hypothesis is retained.

Hypothesis 3

3. Flight instructors with more flight instruction experience will more accurately rate the video clips.

The mean level (M = 619.87) of flight instruction reported in hours of flight instruction experience was used as a division between groups with higher levels of flight instruction in the t-test. Results indicated no statistically significant difference, $t(97)$ = -.706, p = .482. See Appendix C for statistics tables for tests conducted of Hypothesis 3.

As the reported levels of flight instruction experience in hours are positively skewed, another t-test was conducted using the median (Mdn = 320) number of hours of flight instruction experience. Results indicated no statistically significant difference, $t(97)$ = -.164, p = .870.

The amount of flight instruction experience in flight hours and total score for rating the video clips were not significantly correlated, $r(97)$ = -.137, p = .175, however this correlation was the most statistically significant finding calculated during statistical testing. Multiple regression analysis indicated that responsiveness, assertiveness, and experience in hours of flight instruction did not significantly explain the variance in ability to accurately rate video clips, R^2 = .020, $F(3, 94)$ = .649, p = .586. The amount of flight instruction experience in flight hours did not significantly contribute to explaining the variance in the ability to accurately rate video clips, β = -.137, p = .184. In all statistical tests conducted, the null hypothesis is retained.

Hypothesis 4

4. Flight instructors with experience in multiple-crewmember settings will more accurately rate the video clips.

The group of respondents indicating experience in multiple-crewmember settings was compared to the group of respondents indicating no experience in multiple-crewmember settings in this t-test. Levene's test for equality of variances revealed that it cannot be assumed that the variances are equal ($p = .024$). The t-test results with equal variances not assumed indicated no statistically significant difference, $t(45.835) = .331$, $p = .742$. See Appendix C for statistics tables. The null hypothesis is retained.

Post Hoc Analyses: Video Differences

Descriptive statistics were calculated for each individual video and grouped video types. See Appendix D for tables of all post hoc calculations. No single video was accurately rated by all survey respondents. The single video with the lowest overall mean score for accuracy in rating ($M = .2941$) was a Neutral statement in video 8, indicating that video 8 was the most accurately rated video in this data set. The single video with the highest overall mean score for accuracy in rating ($M = 2.4706$) was an Alert statement in video 16, indicating that video 16 was the most inaccurately rated video in this data set.

There were only 2 Ambiguous statements in the total number of videos, while all other video types had 3 videos each. Due to the difference in the total number of videos of the Ambiguous type, an accurate comparison of the grouped Ambiguous mean accuracy score cannot be made with the grouped mean accuracy scores of the other video types. Excluding Ambiguous statements, when grouped together by video type Neutral statements had the lowest overall mean score for accuracy in rating ($M = 1.6373$). The

middle scores for video type groups in ascending order were: Emergency (M = 2.2549), Challenge (M = 3.4902), Yielding (M = 4.5588), and Probing (M = 5.1765). When grouped together by video type Alert statements had the highest overall mean score for accuracy in rating (M = 5.7353). These mean scores indicate that the video types most accurately rated were those at the more extreme ends of the scale. The video types in the middle where more subtle cues indicated the level of assertiveness were the most inaccurately rated.

Qualitative Data

Question 1: Courses and Training in Communication

The first open-ended question on the survey was, "Please describe courses or training in communication you have received." All participants responded to the question, and content from the responses revealed common themes. Commonly-themed answers were grouped. The overwhelmingly most common answers mentioned were aviation and general education university coursework required by the aviation curriculum at UND. Other answers of common theme that had multiple respondents are also discussed.

The most common response to this question was the required courses in the aviation curriculum at UND. Ninety eight of 102 participants noted specific courses in the aviation curriculum. These courses included: Aviation Safety, CRM, Advanced Aircraft Operations/CRJ course, Flight Instructor courses including CFI, certified flight instructor-instrument (CFII) and multiengine instructor (MEI), Multiengine systems, Human Factors, Business Communication, Public Speaking, and Interpersonal Communication. A few respondents also elaborated that the group work required in

upper-level courses contributed, and that all flight courses included elements of learning how to communicate with others such as learning to "tactfully mold words" in the words of one respondent, learning how to be assertive, and as another respondent stated being "constantly told to question stuff". Other university coursework that was viewed as beneficial and mentioned were foreign language courses and psychology courses, including educational and organizational psychology.

Five respondents indicated that aviation-related training outside of UND was beneficial. Examples of these outside training sources were: airline pilot training course, airline jump seat privileges with the opportunity to observe crews, and online courses.

Leadership training courses or seminars were mentioned by five respondents. Some indicated that the leadership training was connected to UND, while others indicated they were not. Three respondents indicated that courses or training offered as parts of employment other than flight instruction were beneficial. The courses mentioned were conflict resolution, customer service training, and initial and ongoing communication training as part of employment. One respondent also mentioned training offered at the beginning of the year flight instructor workshop was beneficial.

A couple of respondents indicated that experiences in high school helped form their ability to communicate. A couple of other respondents indicated that working with a variety of students and instructors, including working with contract students, has provided the most valuable learning experience.

Due to 98 of 102 respondents writing about UND courses and based upon the analysis of the answers to this question, it can be inferred that this population sample

relied heavily upon the curriculum developed by UND for their formal communication training. Almost every respondent described courses and explained the courses' benefits.

Question 2: Communication Experiences

The second open-ended question on the survey asked, "What experiences do you believe helped improve your ability to communicate effectively?" Again, all participants responded to the question, and content from the responses revealed some common themes. Commonly-themed answers were grouped for analysis. Due to the ability of a respondent to indicate multiple responses that fall into multiple independent groups, the proportions listed will add up to more than 100%. The largest groups of responses are listed from most responses to least responses:

Experience flight instructing

Classes

Daily life interactions and extracurricular activities

Working with international flight students

Work experiences outside aviation

Work as a flight crewmember or acting as a crewmember on a training flight

Working or living in a foreign country or with people from other countries

Public speaking

Practice and experience

A few responses that did not fit neatly into the groupings: observing communication in a cockpit jump seat, self study by reading books, leadership training, UND's standardization of communication, and the idea that personality is the factor that makes people more or less expressive.

Over one half of the survey responses made reference to experience flight instructing as an experience that improved their ability to communicate effectively. Within that grouping of references, some respondents indicated that they gained comfort and confidence through their experiences. Some mentioned their increased interactions with and the task of listening to air traffic control during their experiences as an instructor, as well as radio communications. A few mentioned the high-stress environment and one expressed the need to "control their patience" while instructing. Also mentioned were the interactions with different levels and types of students as well as interactions with other flight instructors. One expressed that flying with a low time pilot forces clear and effective communication. While classes may have helped these survey respondents get off to a start, the group of individuals who responded that flight instruction was helpful had some quotes that illustrate their views on the actual experience: "Working with students on a day to day basis helps a lot, sort of a sink or swim method of learning."

"Actually flight instructing for the first time was the best experience for effectively communicating with students. Even though a flight instructor attempts to act like a student (as in a course for a flight instructor rating), it is no substitute for actually teaching someone."

"Nothing is better for learning than actually being a CFI and doing the one on one communications. You learn common mistakes, you realize some of your weak areas, some students have suggestions on how they learn, and the practice makes you better at presenting. Any type of leadership role helps because it puts you in the situation where you must be communicating with others continuously. The more you practice, the more

you succeed and become comfortable. Leadership roles – joining clubs, teaching class, tutor."

About one third of the survey responses indicated that their classes including aviation and communication coursework helped them. In particular, coursework in CRM and CRM related topics were viewed as beneficial. Aviation students are required to take a flight course during which they fly the CRJ simulator. The CRJ requires students to experience working as a two-person crew in a jet simulator, and that course was viewed as beneficial by students.

About one fourth of the respondents indicated that daily life social interactions and extracurricular activities enhanced their ability to communicate. For example, three people mentioned living with people or having roommates as experiences that have shaped their ability to communicate. Social interactions, participation in clubs and social functions, and playing sports were all mentioned. A few people mentioned that having friends with different communication styles and conversing in group settings where defense of one's own ideas were important experiences. One mentioned that being social throughout their life shaped their ability to communicate, and another added to that practice communicating in a diverse population at home helped. One elaborated that talking with others about misunderstandings or miscommunications was helpful. A few respondents had some quotations to explain their views on everyday communication: "Experiences in leadership outside of school in clubs and the (organization name) have better prepared me to communicate than any class. It is hard to teach someone to relate to people."

"I believe that the experience that best helped me to communicate effectively was living with roommates that completely annoyed me and I couldn't stand. Because we had to find a way to work things out and at least communicate on a civil level, if not a friendship level. And by learning what I was doing to stop the flow of communication (ie. not listening well enough, or talking too aggressively) I was able to work on that in all areas of my life. My advice is to find some one that frustrates you when you talk to them, because of whatever reason. There is likely a block in the communication flow. So it you can find a way to talk to that person effectively, it will help you in all of your relationships."

Roughly one fifth of the sample indicated that working with international flight students was an experience that helped improve their ability to communicate clearly. Respondents indicated that it caused them to speak clearly, eliminate slang, and at times speak more slowly. One respondent stated, "Experience with instructing international flight students has significantly improved my ability to communicate. The language barriers presented forced me to come up with new and different methods of explaining concepts. That experience alone has been more valuable than taking the university required communications classes."

Some mentioned that the actual experience working as a member of a flight crew was beneficial, and for purposes of this analysis, that interaction experience is grouped with working as a flight crewmember in the training environment since references were made to the actual flight practice in the CRJ flight course instead of the classroom coursework. Incidentally, about one tenth of the respondents indicated that working as a member of a multiple-person flight crew or flying as a crewmember on a training flight

were valuable experiences. Regarding exposure to some of the subtleties of flight crew operations one person stated, “Learn by doing, CRJ with CRM told me it good to be direct when some is making a mistake. However it might be necessary to ask question to understand what someone is thinking, or so that we are both in agreement with what we are/or should do.”

About one tenth of the respondents indicated that work experiences in jobs outside of aviation were beneficial. Those who responded with information about their jobs indicated that they dealt often with people. Three mentioned working in sales, with one of the three indicating that they educated customers about the products. Two mentioned being a sports referee. Other jobs mentioned had a high level of interaction with others, such as being a camp counselor, or stressful team environments such as being in the military or working as a firefighter.

Six respondents indicated that experiences in other countries or experiences with people from other countries were beneficial. Respondents indicated studying or working abroad forced them to improvise methods of communication to cross language barriers. Four respondents indicated that additional opportunities to engage in public speaking enhanced their ability to communicate. Four people stated that practice in general was helpful, and another four indicated that experience in general was helpful.

There were some responses that did not fit neatly into the groupings. The responses included: observing communication in a cockpit jump seat, self study by reading books, leadership training, and UND’s standardization of communication. In addition, one respondent stated, “Honestly I believe that some people just have a more

enthusiastic personality than others. I believe that staying positive and keeping a somewhat energetic tone usually gets a better response."

It is interesting to note the top three grouped responses: experience flight instructing, classes, and daily life interactions and extracurricular activities. The first question asked specifically about courses or training, and the second question asked respondents to elaborate about experiences. Even though this question asked specifically about experiences, one third of the respondents still mentioned their university courses as experiences that helped their ability to communicate, further emphasizing the reliance of this particular population sample on the university curriculum to provide the tools they need to effectively communicate. It is not entirely surprising that actually flight instructing was the top answer as everyone in this sample is a flight instructor. The fact that the third most frequent response group was daily life interactions and extracurricular involvement indicates that social activities can have an impact on a person's ability to communicate in a variety of settings, including professional settings.

Question 3: CFI Communication Training

The third open-ended question posed on the survey was, "In your training for the first flight instructor certificate you obtained, what training did you receive on communicating effectively with your students?" All participants responded to the question, and content from the responses revealed some common themes. Commonly-themed answers were grouped for analysis. Responses to this question tended to fall into one of two overarching categories: responses that elaborated on the method or delivery of the training received, and responses that elaborated on the content of the training received.

Regarding the method or delivery of the training received, 33 respondents mentioned aspects of working with their flight instructor as their training in communication including, practice flight instruction with their flight instructor, practice ground instruction, or obtaining their flight instructor's feedback. Another 22 responses mentioned learning in courses such as the ground school portion of the CFI flight course, with a few of those responses also mentioning other university courses. Eleven respondents indicated that working with students during training such as presenting material or conducting briefings with private pilot applicants or tutoring during their training was helpful. Five people stated that other people had helped them: one practiced with their girlfriend, one observed other instructors, and three sought advice from peers, colleagues and other instructors. Three mentioned a training course offered upon employment at the university. Other methods that were mentioned were: being involved in scenario-based training, presenting information and getting pointers, the course instructor, watching presentations at UND, and reading books. Seven respondents indicated that they felt the really did not receive training specifically in communication during their initial training for a CFI certificate, and three stated that actually gaining experience has been the best teacher.

With regard to the content of training, the main response was either the *Aviation Instructor's Handbook* published by the FAA (2008) or the fundamentals of instruction (FOI) material contained inside that publication. Thirty six respondents mentioned either the *Aviation Instructor's Handbook* (FAA, 2008) or FOI. The 22 responses indicating the university CFI course and other courses such as CRM were counted as methods of delivery, but have also been considered as a content category as many of the responses

did not elaborate on the content beyond listing their participation in the courses. Due to the content of the input that flight instructors provide during a typical flight lesson involving practice flight or practice ground instruction, working with a flight instructor was not only considered as a method of training delivery, but also training content. Seventeen mentioned that working with their instructor, their instructor acting like a student, and their instructor's feedback comprised much of their training content.

Several responses indicated clusters of communication ideas or theories in their content. Nineteen respondents indicated that their training included emphasis on a cluster of ideas surrounding clear and precise communication including: precise and correct communication, use of proper terms, small words, avoiding jargon or slang. Another 15 respondents indicated that emphasis was placed on the idea that students differ and that a variety of methods may be needed to meet the needs of different students. Nine respondents indicated the content included ideas surrounding attitude and demeanor including: professionalism, positive attitude and feedback, honest, trustworthy, calm, and tone. Seven indicated that importance was placed on asking the student questions and gaining and evaluating student feedback. Six people mentioned receiving either no or limited instruction on communication. Four indicated that critique was included in content. Three people mentioned content regarding working with international students, particularly at the CFI workshop conducted after they were hired as CFIs at UND. Two people mentioned each of the following ideas: nonverbal communication, the speed of speech, and differences in learning. Other ideas that received mention regarding training content were: FAA publications, books, conflict, visual communication, barriers to communication, preparation for lessons, and defensive positioning.

When this question is viewed in combined terms of delivery and content, the two most popular answers were applicants working with their flight instructors, and the FAA's publication the *Aviation Instructor's Handbook* (2008). While the FAA's *Aviation Instructor's Handbook* (2008) is a publication with a finite, defined body of content delivered to all who read it in a uniform manner, flight instructors differ with regard to the content and delivery of material taught. The following quotations illustrate some of this variance in instruction of effective instructional communication given by flight instructors: "Instructor attempted to be a difficult student, essentially not understanding things. Making me try different ways of teaching/comm. Otherwise it was based on instructors thoughts on how I did."

"Just common sense stuff. My CFI taught me how to ask of phrase questions the right way, and how to pick on clues from body language when communicating with students."

"Extremely little. Periodically my CFI instructor would 'feign' disinterest in order to force me to directly engage her with the briefing."

"When I first started CFI, I used advanced aviation terms. My instructor simply said, 'I don't know ANYTHING about airplanes/flying. What is that?' It helped me to be more careful in word choices."

"Very little, I received much more training from my CFII flight instructor. He taught me to be precise and assertive, and I learned to judge the feedback the student is giving."

"My flight instructor emphasized the need to get feedback from a student to know they really understand a concept. Also that it is important to teach something correctly the first time. The FOI communication chapter was also taught."

"The F.O.I. provides some tips on dealing with students and learning styles, but much of it seems very simplistic. The best resource is simply prior instructors who were either good or bad, and using that as a guide."

"None my instructor did not teach anything about communication, only what I need to say to teach the maneuvers, etc. Because my instructor taught me that way and I really didn't like his instruction style, I teach in the opposite of what he did. I do teach some communication, but there really isn't enough time to teach everything."

From these responses it is clear that the FAA's publications, especially the content considered the fundamentals of instruction in the *Aviation Instructor's Handbook* (FAA, 2008) are the basis of much of what this group of flight instructors considered regarding communication during their training to become a flight instructor. Flight instructors were also regarded as important sources of information as many responded that ideas and feedback provided by instructors comprised much of what was learned about instructional communication. As flight instructors vary, so the content of what was learned from flight instructors varied. While great value was placed on what flight instructors had to say about communication, it is difficult to effectively define what knowledge flight instructors are bestowing upon students beyond some smaller idea clusters and some of the quotations shared. Several other ideas of content regarding interpersonal communication were shared by survey respondents, though it is not entirely clear whether those ideas originated from flight instructors or FAA publications. Another

finding regarding the content of material covered regarding effective communication is that a larger number of survey respondents indicated that material regarding communication delivery (e.g. communication precision, attitude projection) was covered than the number of survey respondents indicating that responsiveness behaviors (e.g. listening to student, interpreting student feedback) were covered.

Question 4: CRM Opinions

The final open-ended question posed on the survey was, "Have you participated in any crew resource management (CRM) courses? Please describe. Do you think that CRM courses are helpful and worthwhile, or is CRM something you learn more by doing?" All 102 respondents did respond to this survey item. Common responses were grouped thematically for analysis.

The most popular answer theme, with 48 respondents, was that they took a CRM course at UND, the CRM course was beneficial in providing a foundation of learning, and that CRM is something that must be further learned by doing after gaining the foundation. An additional respondent indicated that they had taken an online CRM course, found it beneficial in providing a foundation of learning, and that CRM was something that must be further learned by doing after gaining the foundation.

Another 35 respondents indicated that they had taken a CRM course at UND and found it beneficial. Two respondents indicated that they had taken the CRM course, five indicated that they had taken the CRM course but did not find it helpful, three indicated that they had not taken the CRM course but had learned by doing, and seven indicated that they had not taken the CRM course. Finally, the CRJ flight course was mentioned on a few occasions, which is comprised of a ground school and flight portion wherein two

students are paired to be a multiple-person flight crew. Two respondents indicated that they also learned about CRM in their CRJ course, and 6 indicated that the CRJ course was more beneficial than the CRM course in learning CRM skills due to the hands-on nature.

Respondents offered some comments outside of the utility of CRM training. Two mentioned that CRM courses did not address flight instructor/student dyadic interactions. Three indicated that the instructor of a CRM course is instrumental in its success or failure. Three also mentioned that observing flight crews was beneficial.

The following quotes typify what the largest number of respondents said, that CRM training was beneficial but that learning by doing was important: "Yes I have participated in a CRM course it was beneficial but it wasn't backed up with a lot of useful exercises. I think CRM need to be taught then backed up with practical situations so we can also learn by doing."

"Yes, I took the CRM class at UND. It was helpful, but I think it mostly provided a foundation. CRM is something you learn with practice."

"Airline bridge course in CRJ200 FTD. The course was extremely helpful in building CRM. It helped me by practicing with the same people to learn their individual tones and body language so that I can apply it to others and learn to work with them faster."

"Yes, I have participated in UND's CRM courses. In the classroom setting we learned some things, however I believe I learned the most by participating in the AVIT 480 (CRJ) course. Actually practicing CRM while in a stressful environment changed a lot of things and changed my view about some of the different aspects of CRM."

"Yes at (airline name) you are put in numerous scenarios to challenge the decisions you made. I think it's worthwhile because it gives you the opportunity to practice uncomfortable situations in a safe, and controlled environment opposed to a real situation."

CRM training was viewed as valuable, however it was emphasized in the survey responses that experience and opportunities to practice working in a crew environment were necessary for developing effective CRM skills. There was much discussion about CRM in the context of multiple-crewmember settings from survey respondents, but very little mention of flight instruction in responses to this question. This minimal overlap of mentions of flight instruction with CRM illustrates that respondents considered CRM separately from flight instruction communication. In respondents' minds, CRM communication skill sets for operating in a multiple-crewmember setting were separate, but related to flight instruction communication skill sets. Both segments of communication, CRM crew communication and flight instruction communication, fall under a larger umbrella of aviation communication skills.

CHAPTER V

CONCLUSIONS AND DISCUSSION

Summary

No statistically significant relationships were found for any of the hypotheses posed in this study. Measures of assertiveness and responsiveness on the Socio-Communicative Orientation Scale, flight instruction experience, and experience in multiple-crewmember settings did not significantly impact survey respondents' ability to accurately rate assertive cockpit communication video clips. Post hoc analyses of videos indicated that videos in the middle of the scale were most inaccurately rated. In open-ended responses, survey respondents indicated heavy reliance on college curriculum coursework to develop communication skills. Survey respondents indicated that experiences that helped form their ability to communicate were their college coursework, flight instructing, and experiences in daily life and extracurricular activities. Survey respondents indicated that the content of much of what they learned about how to communicate as a flight instructor was outlined in the FAA's *Aviation Instructor's Handbook* (2008) and from their own flight instructor. A greater number of survey respondents indicated that during training to become a flight instructor material regarding communication delivery was covered than the number of survey respondents who indicated that material regarding responsive communication behaviors was covered. Survey respondents compartmentalized CRM communication separately from flight instructor communication.

Conclusions and Discussion

This study is a starting point, a beginning on many fronts. The first beginning is the examination of flight instructors, a starting point to viewing flight instructor interactions from a research standpoint. When preparing the literature review for this thesis, published studies regarding flight instructors or communication in flight instruction were sought after. The principal researcher was not able to locate any published empirical studies of flight instructors, flight instruction, or communication in flight instruction. This study adds to the scant body of research conducted regarding flight instruction or in flight instruction settings.

Like many things in aviation, the periods of rapid movement forward have been due in part to knee-jerk reactions to events, sadly usually in response to tragic accidents. The area of research in CRM is one such example, as it sprouted in the 1970's and grew largely in response to accidents. Much of the research to date in CRM has focused on training and evaluating CRM, and while there is generalized large area of ideas that constitute CRM, there is still no complete agreement as to what encompasses it and no well-defined agreed-upon base theoretical framework upon which to construct the training and evaluation programs. There is a discussed need for greater understanding of the underlying theory and root causes of human factors issues, all the way up to the ranks of CRM scholarship dealing with multiple-person flight crews. Dismukes (1994) found that "Several of the senior university scientists I interviewed expressed concern that AHF research has spent much effort on the nuts and bolts of particular operations problems and relatively little effort on getting at the underlying causes of those problems" (p. 326). One example of the type of work that needs to be done that currently is being done is the

research being conducted to frame and evaluate CRM training utilizing Kirkpatrick's (1976) framework for evaluating training (O'Connor et al., 2008; O'Connor, Flin, Fletcher, & Helmsley, 2002; Salas et al., 2001; Salas et al., 2006). More application of theory is needed in all aspects of aviation. More study of flight instruction is needed, and as there is very little overall empirical work conducted in flight instruction, the door is wide open to the application of theory in flight instruction.

This study was part of an emerging area of empirically viewing cockpit interpersonal interactions through the lens of communication theory. The studies and published research regarding cockpit communication that the principal investigator was able to locate generally utilized discourse analysis or conversation analysis methods, and some connected the analyzed communication to various flight performance outcome measures (Kanki & Palmer, 1993; Nevile, 2001, 2002, 2004, 2005a, 2005b, 2006, 2007a, 2007b; Nevile & Walker, 2005). It was difficult to locate research reports of efforts to apply underlying communication theories to cockpit communication. To further illustrate why it is believed that this study helps to serve as a starting point regarding the application of communication theory in aviation, consider the scholarship of CRM researchers examining multiple-person flight crews. There is a wide and deep pile of research that has been done in the areas of CRM and teamwork in multiple-person flight crews; however the underlying theoretical framework used to move the body of research forward ranges from nonexistent to developing. Areas of scholarship such as psychology, education, and communication have more well-developed and well-defined theoretical frameworks that could be more closely examined in aviation and could help move aviation research forward by focusing research on well-established theory to better define

root causes and better define the overall theoretical frameworks in aviation. The theoretical framework of interpersonal communication competence with its components of assertiveness and responsiveness is just one of several communication theory frameworks; several more studies in aviation could be developed using this framework, and many more frameworks could be used to study other areas.

In many ways this study was a test of Besco's PACE framework (1995, 1999). Besco (1995, 1999) provided PACE as a tool, but the principal researcher was unable to locate any empirical studies conducted to either promote or refute its efficacy. Since this tool was aimed squarely at the new or timid first officer, and flight instructors are often the supply lines for new first officers at regional carriers, this study may have been a perfectly suited as a first empirical test for the tool. An opposing point can be made regarding the use of Beco's PACE (1995, 1999) framework: the point that the tool was designed for use in a multiple person crew and that it was tested inappropriately on flight instructors rather than on pilots currently engaged in multiple-crewmember settings. Since Besco's PACE (1995, 1999) framework does provide a hierarchy of assertive aviation-related communication with readily accessible key wording understood by this sample and the goal of this study was for survey respondents to identify and differentiate levels of assertive communication in the cockpit, Besco's PACE (1995, 1999) framework provided a useful tool for this study. Videos of the extreme ends of this scale were the most accurately rated by survey respondents, while videos of statements in the middle of the scale were less accurately rated, providing some preliminary evidence that beyond this study some portions of Besco's PACE (1995, 1999) could be correctly interpreted in a cockpit setting.

There are several factors that may have impacted the findings in this study. One potential impact is the potential for the CRJ course required in UND's curriculum to have a confounding effect on the data used to test Hypothesis 4. Some of the survey respondents may or may not have indicated that experience as experience on an aircraft that requires more than one flight crewmember. As many mentions of specific coursework were mentioned in survey responses, it is possible that the results of this survey generalize most seamlessly to the population of flight instructors who completed their training at UND using UND's collegiate curriculum. It may be possible that the sample size was too small to reveal any statistically significant relationships. Respondents tended to indicate high levels of both assertiveness and responsiveness on the Socio-Communicative Orientation Scale, which could be due to a number of factors. It is possible that flight instructors differ from the general population in communication assertiveness and responsiveness, though it would be necessary to conduct further research to determine if this is indeed the case. It is possible that because this survey was limited to flight instructors that survey respondents were biased toward responding to the Socio-Communicative Orientation Scale survey items in an idealistic fashion. It is possible that since all of the survey respondents were employees of a university that they could have been biased toward including university coursework in responses to the open-ended survey questions. Besco's (1995, 1999) PACE hierarchy was untested, and it is possible that further calibration and refinement of presented videos based on PACE is needed to enhance usability in a survey study. It is possible that the scale is not fine enough to detect differences in the ability to interpret assertiveness, particularly in the middle ranges of the scale. While the computer speed limitation introduced a new

variable that cannot be accurately assessed, the potential for severely confounding the study was mitigated by the fact that all survey respondents viewed and listened to the same video and audio stimuli.

It is true that no statistically significant relationships were found on any statistical test conducted for the four hypotheses posed in this study. One large challenge to overcome during statistical analysis was the fact that the survey respondents generally indicated higher levels of assertiveness and responsiveness. An even larger statistical analysis challenge was due to the uneven and confounded responses to the survey item regarding experience in multiple-crewmember settings. To attempt to overcome these challenges, multiple statistical tests were conducted, and all statistical tests echoed the same non-significant results.

Even though no statistically significant relationships were found, the statistical trend revealed that experience as a flight instructor in flight hours was most closely related to the ability of survey respondents to accurately rate the assertiveness of the video clips. The qualitative data gathered in the open-ended questions also revealed that the survey respondents felt they learned much about effectively communicating when they gained experience actually flight instructing students. Actual experience flight instructing develops a flight instructor's ability to communicate. The next challenge is to capture and define what specific communication skills flight instructors gain from their experience so those skills can be imparted on new instructors. The data gathered in this study points toward the possibility that a flight instructor's responsiveness skills such as the ability to interpret subtle verbal and nonverbal cues are enhanced with experience, though further study is needed to more conclusively determine whether this relationship

exists. What other skills are flight instructors learning when they are gaining experience teaching students? In addition to responsiveness skills specifically it is possible that overall interpersonal communication competence, including the assertiveness and versatility dimensions, is enhanced through experience, though again, further study is needed to more conclusively determine whether this relationship exists.

Many survey respondents referenced the fundamentals of instruction outlined by the FAA as base material, but a great number also stated that they learned about instructional communication from pointers and feedback given to them by their flight instructors during practice instruction sessions. The fundamentals of instruction outlined by the FAA are well defined in their publications; the feedback and ideas provided by flight instructors to their flight instructor applicant students are not. What communication skills are they learning from their instructors? Obviously there are additional instructional communication skill sets the FAA does not address as the base requirements for flight instructor applicants, as the FAA's stated requirements as far as interpersonal communication skills and knowledge are concerned is very limited. A large number of survey respondents indicated that they relied on their flight instructors for ideas and feedback regarding effective communication.

The qualitative data gathered started to shed some light on some of the areas covered by flight instructors such as using precise language, adjusting communication for different students, and gaining participation from students. It is possible that the material that flight instructors cover with their students is all more advanced aspects of interpersonal communication competence or instructional communication techniques that are more specific and detailed than what is addressed in the FAA's materials. Further

study is needed to determine and define what exactly flight instructors cover with students regarding interpersonal communication.

Beefing up the communication skill set of flight instructors will help to perpetuate good communication skills as they are passed from one generation of flight instructor to another. As most flight instructors remain in their positions as flight instructors for a relatively short period of time at the beginning of their careers, some could argue that adding additional instructional communication skills to a flight instructor's demands would be fruitless. Generally speaking, interpersonal communication skills are beneficial for aviation professionals, whether flight instructing or working as part of a crew. Additional communication skill sets need to be placed on a solid foundation of interpersonal communication skills to better function in different contexts, such as instructional communication skills for the flight instructor. Interpersonal communication skills are not only important to flight instructors in their positions as flight instructors, but as discussed also for their overall careers as aviators (Ruiz, 2004). Better equipping instructors from the outset will make them better prepared to succeed from the start and for the duration of the relatively short time they spend as a flight instructor during their career progression.

While much emphasis has been placed on training assertiveness skills in CRM training programs, responsiveness skills are important for maintaining human relationships. Interestingly enough, communication scholars believe additional work should be placed on responsiveness skills. Richmond and Martin (1998) stated, "Although some work has indicated that people can be taught assertiveness skills, there is less information about instruction in responsiveness skills" (p. 145). Besco proposed that

probing with questions as a way to hint to crewmembers that something is wrong while allowing that other crewmember to save face and preserve crew team relations (1995,1999). The problem with the use of questions is they can easily be misinterpreted, especially if a person lacks appropriate responsiveness skills. In previous CRM studies, the use of questions was connected to higher error rates or lower performance in crews (Kanki et al., 1991; Kanki et al., 1989). In this study, it was somewhat disturbing in relation to other responses how few open-ended survey responses indicated that listening, gauging student feedback and other responsiveness skills were important in learning how to flight instruct. Furthermore, the videos in this study that were most inaccurately rated were those that fell in the middle of the assertiveness scale where the cues were more subtle. It is possible that the large component of what is learned through experience is responsiveness skills. Perhaps an added or shifted emphasis on training more responsiveness skills could be useful both in CRM and fight instruction contexts, particularly additional training for crewmembers and flight instructors on detecting and interpreting verbal and nonverbal cues of fellow crewmembers or students.

Reflecting upon the work completed here, there were some unexpected outcomes. One thing that stuck out blatantly in this survey is how much CRM communication was compartmentalized in a separate bucket from instructional communication by survey respondents. The original intent of this study was to hone in more on communications in everyday flight instruction, but in the end, further described that the communication set used in flight instruction and the communication set for working with a professional flight crew can be described as two related but different communication skill sets. The communication skill set for flight instructors and the communication skill set for a

professional flight crewmember come from the same family of aviation interpersonal communication skills, but they are cousins. On the topic of CRM, generally speaking, many new hires at regional airlines are people who have recently come from the ranks of flight instructors at flight schools.

As tempting as it is to use all of the communication ideas and concepts formed under the CRM umbrella in flight instruction, not all ideas flawlessly translate into the flight instruction context without modification. In particular, the communication cues and the responses to cues differ in each setting. In a flight instruction setting, a flight instructor's responsibility is to guide a student toward learning something when the student communicates verbally or nonverbally that they need some sort of response. In a multiple-person flight crew, a crewmember is responsible for participating in safely conducting the flight, and may be a person of more or less authority. In a flight instruction setting students typically desire assistance and feedback, and while some students blatantly seek feedback, some students are unable to effectively communicate that they have or have not learned especially if the material they are learning is new and do not yet have the ability to process that they do not know what they do not know. In multiple crewmember environments, improperly communicated assistance or feedback can be construed as a threat to a crewmember's intelligence or authority. The goals of flight instruction and multiple crewmember flight crews are slightly different and require slightly different approaches to meet the goals. Responsiveness skills help to differentiate the subtleties of communication, and assertiveness skills help to form appropriate responses to difficult situations.

With regard to the survey responses about CRM training, overwhelmingly respondents of this survey indicated that CRM classroom training was beneficial, but that actual experience was more so. Some were brave to state that the classroom training helped them to think about extreme examples, but that they really only became aware of some of the subtleties when they actually had to practice in a crew environment. With this in mind, perhaps CRM training for a new hire with only flight instruction experience at a regional carrier needs to be different than CRM training for captains with decades of experience at a major carrier. CRM training for the regional carrier new hires could hone in on more of the subtleties and everyday communications that can make their transition to work easier and more productive, as well as methods of effectively but tactfully communicating with crewmembers. Training for captains could focus more on leadership skills, effectively including crewmembers in decision-making, and recognizing and responding to cues from crewmembers.

This study may have implications not only on the ways that flight instructors are trained, but also on the ways that pilots prepare for their careers. This study may serve as a bit of a snapshot about the overall picture of a current flight instructor's ability to communicate in a crew environment with the tools that he or she possesses. In a perfect world, new flight instructors and new professional pilots would be better equipped to recognize and respond to the nuances of human communication. As more and more is learned about human interaction in the cockpit, more may be demanded in the future. Regardless of how CRM training content may be altered, one thing is clear from the literature review and the survey respondents: experience and practice communicating is vital. Salas and Cannon-Bowers (2001) stated, "In sum, the literature has begun to

provide evidence that team training works. It works when the training is theoretically driven, focused on required competencies, and designed to provide students with realistic opportunities to practice and receive feedback" (p. 486). In another study's discussion, Smith-Jentsch et al. (1996) stated, "Although attitudinally focused (i.e., lecture only, lecture with demonstration) and practice-based training (i.e., behavioral role-modeling) produced more positive attitudes toward using assertiveness in a team setting, only practice-based training has an impact on behavior" (p. 932). Kanki and Palmer (1993) summed up the need for practice by stating, "Like other skills, communication requires active practice beyond simple concept learning" (p. 131), and a survey respondent offered a critique of the use of classes to build communication skills on the second open-ended survey question: "CRM and aviation safety helped tremendously with the extreme examples, but not as much with the everyday issues." While it is vitally important to teach the blatant examples of CRM coordination and lack of coordination in a classroom, it is also important to teach the subtleties of communication starting from day one and give developing aviators and flight instructor applicants opportunities to practice the skills that they learn in a controlled yet realistic environment.

Survey respondents indicated that they relied heavily on their college coursework to help them gain their communication skills. Because of this reliance, it is vitally important that an aviation student's curriculum includes communication coursework that lays a solid foundation of communication skills, starting the moment a student sets foot on campus. An interpersonal communication course developed with specific components could help provide some communication foundation early in an aviator's college curriculum. The course should include opportunities to practice speaking and responding

in dyads and small groups. Because so many pilots flight instruct as part of their career progression, the course should have a component that focuses on instructional communication techniques, particularly on responsiveness behaviors such as gauging student feedback. Later in a college curriculum, introductory CRM courses should include simulated scenarios, ideally in an aircraft simulator or mock-up where students can practice in as realistic an environment as possible without being a safety risk. The focus of the scenarios should be on practicing interaction skills, not flying skills. While it is clear that more information still needs to be gathered and defined regarding what communication skills are important for a flight instructor applicant beyond what the FAA publishes, it is clear that more emphasis needs to be placed on responsiveness skills during the practice ground instruction and practice flight instruction sessions during a flight instructor applicant's training.

In addition to providing more educational communication experience, many survey respondents indicated that some of the best ways to learn interpersonal communication skills were through real life experiences such as dealing with a difficult roommate. Allowing aviation students and flight instructors time to be involved in extracurricular activities may divert time and attention away from classroom activity and studying, but it may also help them gain additional interpersonal communication skills through experience. Electronic communication such as email, text messaging and social media websites has irreversibly changed the ways that people interact. Providing ample opportunity to practice interacting with people in social settings is important to do before being locked into a small cockpit with another person.

Recommendations for Further Research

As stated earlier, this study serves as a starting point on many fronts, and hopefully a springboard for more research. Many facets of human interaction are yet to be better understood in aviation contexts, and especially in the realm of flight instruction. There are several new research questions and ideas to consider.

One potential area is an expansion of testing Besco's (1995, 1999) PACE framework among professional flight crews at airlines. It could be helpful in better determining the usefulness of the tool among professional flight crews with more experience in the multiple-person flight crew setting, particularly the use of questions. Testing whether it is useful and clearly understood among flight crews could further verify the framework as a useful tool for training in CRM courses, especially among new hire pilots at airlines. Further testing is also needed to discern whether it is appropriate to use this framework in flight instruction settings, or if it is strictly applicable to multiple-crewmember settings. Additionally, more work could be done to test the validity and reliability of using Besco's (1995, 1999) PACE framework in future survey studies, and perhaps even serve as a platform to develop a new scale that is more sensitive to the subtleties of communication.

A large amount of research could be directed at figuring out more of the root communication concepts and behaviors that are beneficial to enhancing flight instruction, helping to build a solid foundation for an aviation career while benefitting students and hopefully trickling down to future generations of students. Survey respondents indicated delineation between CRM communication in multiple-person flight crews and communication between flight instructor/student dyads. With this separation is a

realization that communication patterns are different in each of these settings. More needs to be understood and defined regarding what key communication behaviors flight instructors and professional pilots need to interpret and respond to, especially communication patterns that are subtle. In order to better understand, communication theory must be employed in future research. Communication in flight instruction settings and communication in multiple-person flight crews must be treated as separate, but related entities. Better understanding root communication theoretical applications to flight instruction could help with determining specific communication patterns that can enhance the primary flight instruction experience and help build a more solid foundation for future career moves.

While statistically significant relationships were not found for the hypotheses in this study, there are many questions yet to be answered regarding socio-communicative orientation and socio-communicative style in aviation and flight instruction. As the survey respondents in this study generally indicated higher levels of communication assertiveness and responsiveness, it would be fruitful to study whether flight instructors differ from the general population in these dimensions. It would be especially interesting to see how flight instructors and students rate each others' socio-communicative styles, overall satisfaction with their working relationship, and students' learning outcomes. It would also be interesting to see how different combinations of levels of both assertiveness and responsiveness impact cockpit communications.

A better understanding of exactly what content is included in training an initial CFI applicant and exactly what communication skills a flight instructor learns through experience could be useful. The surveys indicated that many learned about teaching from

their flight instructor. Respondents' flight instructors had experiences that they shared, perpetuating the next generation of flight instructor. A greater understanding of what material is being passed from generation to generation would be beneficial as well as having a clearer picture of what is being learned by a typical CFI applicant in formal classroom settings. Studying the differences in communication skills between a newly certificated flight instructor and a highly experienced flight instructor would also be beneficial in understanding exactly what communication skills are learned through experience. By better defining what specific communication skills have been useful, it will be possible to better equip the next generation of instructors.

With such a large number of survey respondents indicating that coursework was important in their communication training, more work could be done to better determine if the communication content of a typical collegiate aviation curriculum is sufficient. Previous studies have found that collegiate aviation educators, alumni, and others deem communication skills and CRM to be important in a successful aviation career and address these skill sets in collegiate aviation programs (Pippin, 1993; Ruiz, 2004; Schwab, 2005; Young, 1995). A large number of respondents in this study indicated that they had taken several communication courses, CRM courses, and other aviation courses that addressed communication, but delineation was made that CRM and flight instruction communication are different. With a better understanding of exactly which communication skills are most important in all aspects of aviation including flight instruction, and an audit of what communication skill sets are currently addressed in an aviation curriculum, a better curriculum could possibly be developed that better equips future professionals to deal with subtleties of interpersonal communication. Ideally, a

study with a pre-test of baseline communication skills of flight instructor applicants and a post-test with a measure of communication skills of flight instructor applicants could be used to test the implementation of a new aviation communication curriculum. Pre-test and post-test methods could also be employed to test individual components of a curriculum such as an individual course or course component.

Finally, many indicated on the surveys that everyday experiences and involvement in extracurricular activities were beneficial in shaping their ability to communicate with others. Aviation students no doubt spend a large amount of time flying, attending class, and studying. It is possible that a typical student's college interpersonal relationship experiences have changed with the prevalence of electronic communication such as internet social media and text messaging. A survey of aviation students to determine whether they are involved in at least one extracurricular or work activity, to determine what other demands are placed on their time, and to determine typical communication patterns could illustrate what a typical student is exposed to in terms of opportunity to learn to communicate through practice interacting. To further investigate, a study comparing level of extracurricular involvement and accuracy in interpreting communication could help explain how important involvement is in developing communication skills. It is true that a student's involvement in broomball league may not have a direct correlation with how a student flies an instrument approach in an airplane, but it may serve as a nonthreatening method of helping a typical student learn how to be a leader, a follower, or merely play well with others.

APPENDICES

Appendix A
Survey

Please answer the following questions to the best of your ability.

Gender ____Male ___Female

Approximate your total flight time _____

Approximate your total flight hours of experience as a flight instructor _____

Place a check mark next to all certificates that you have:

_____ Certified Flight Instructor – Airplane

_____ Certified Flight Instructor – Instrument Airplane

_____ Certified Flight Instructor – Multiengine Airplane

_____ Certified Flight Instructor – Rotocraft - Helicopter

_____ Certified Flight Instructor – Instrument Helicopter

_____ Ground Instructor Basic

_____ Ground Instructor Instrument

_____ Ground Instructor Advanced

_____ Type rating
If you checked type rating, which aircraft are you type rated in?_____

_____

_____ Other flight instructor certificates
If you checked other flight instructor certificate, which certificate(s)?_____

_____

Did you obtain your flight instructor certificates at UND? Please check one:

_____Yes, I obtained ALL of my flight instructor certificates at UND.

_____Yes, I obtained SOME of my flight instructor certificates at UND.
If you answered Yes to this, which certificates did you obtain at UND?_____

_____

_____No, I obtained NONE of my flight instructor certificates at UND

Do you have any experience as a crewmember on an aircraft that requires more than one flight crewmember? _____YES ____NO
If yes, approximately how many hours of experience?_____
If yes, in which aircraft?_____

believe each of these characteristics applies to you while interacting with others by marking whether you:

(5) Strongly agree that it applies
(4) Agree that it applies
(3) Undecided
(2) Disagree that it applies
(1) Strongly disagree that it applies

There are no right or wrong answers. Work quickly; record your first impression.

_____ 1. helpful
_____ 2. defends own beliefs
_____ 3. independent
_____ 4. responsive to others
_____ 5. forceful
_____ 6. has strong personality
_____ 7. sympathetic
_____ 8. compassionate
_____ 9. assertive
_____ 10. sensitive to the needs of others
_____ 11. dominant
_____ 12. sincere
_____ 13. gentle
_____ 14. willing to take a stand
_____ 15. warm
_____ 16. tender
_____ 17. friendly
_____ 18. acts as a leader
_____ 19. aggressive
_____ 20. competitive

Please refer to the PowerPoint presentation that appears on the computer for instructions to watch videos. Rate any assertiveness or submissiveness displayed in each video by marking the box for your rating in each question that follows.

Video #1

☐----------☐----------☐----------☐----------☐----------☐----------☐----------☐

Extremely Submissive | Submissive | Neutral | Assertive | Extremely Assertive

Video #2

☐----------☐----------☐----------☐----------☐----------☐----------☐----------☐

Extremely Submissive | Submissive | Neutral | Assertive | Extremely Assertive

Video #3

☐----------☐----------☐----------☐----------☐----------☐----------☐----------☐

Extremely Submissive | Submissive | Neutral | Assertive | Extremely Assertive

Video #4

☐----------☐----------☐----------☐----------☐----------☐----------☐----------☐

Extremely Submissive | Submissive | Neutral | Assertive | Extremely Assertive

Video #5

☐----------☐----------☐----------☐----------☐----------☐----------☐----------☐

Extremely Submissive | Submissive | Neutral | Assertive | Extremely Assertive

Video #6

☐----------☐----------☐----------☐----------☐----------☐----------☐----------☐

Extremely Submissive | Submissive | Neutral | Assertive | Extremely Assertive

Video #7

☐----------☐----------☐----------☐----------☐----------☐----------☐----------☐

Extremely Submissive | Submissive | Neutral | Assertive | Extremely Assertive

Video #9

Video #10

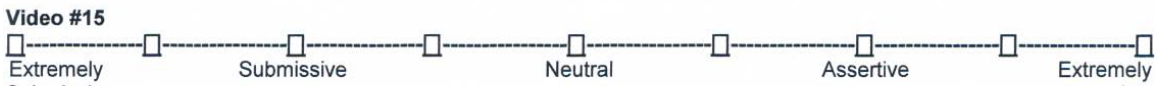
Video #11

Video #12

Video #13

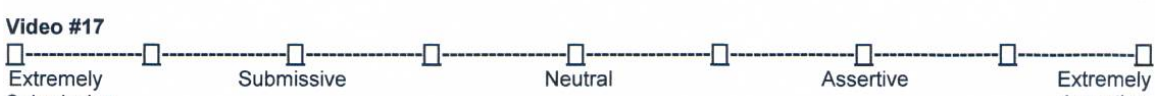
Video #14

Video #15

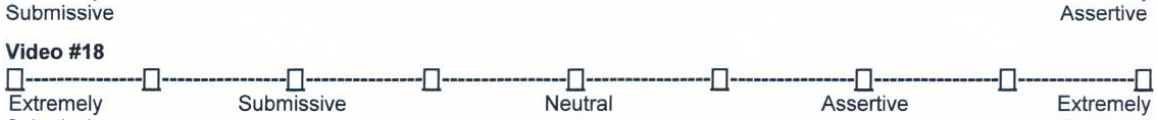


Video #16

Video #17



Video #18



Video #19

Video #20

Please answer the next questions to the best of your ability. If you need more paper for the follo questions, use the blank paper provided.
Please describe courses or training in communication you have received.

What experiences do you believe helped improve your ability to communicate effectively?

In your training for the first flight instructor certificate you obtained, what training did you recei communicating effectively with your students?

Have you participated in any crew resource management (CRM) courses? Please describe. Do y think that CRM courses are helpful and worthwhile, or is CRM is something you learn more by d

Appendix B
Video Scripts

NEUTRAL STATEMENTS

1) After takeoff checklist complete.

2) Climb maintain five thousand, Lear three one alpha.

3) The sky is really clear today; I can see halfway across the state from here!

PROBING STATEMENTS

4) Are you sure that the approach to runway two zero is the best choice for this weather?

5) Why don't we turn right to avoid that traffic?

6) Are you sure that fuel load is what you want?

ALERT STATEMENTS

7) I just saw some lightning come out of that cloud; If we keep going on this approach there could be some windshear up there.

8) Something just doesn't look right in the GPS. If we don't sort out where it's going, I'm not sure where we will end up.

9) There's only about forty-five minutes of fuel left; we can't stay in this holding pattern for much longer.

CHALLENGE STATEMENTS

10) You're putting us all in danger by continuing in this icing. You must immediately change altitude to get out of these conditions.

11) You're putting us in a great position for a crash if we continue in IMC on batteries only. Turn around and get back to VFR conditions.

12) This is a bad idea to continue this approach. You can turn westbound to get away from this storm.

EMERGENCY ACTION STATEMENTS

13) If you don't immediately change course and get out of icing, I must take over control of the airplane.

14) If you don't go around and try this approach again, I will take control of the airplane. I can't allow you to put us at risk for crash and death.

15) If you don't proceed to the airport now, I must take control of the airplane rather than wait for our fuel to run out and crash.

YIELDING STATEMENTS

16) Well, I guess that's ok.

17) Yeah, that's fine.

18) Sure. I hope this works out.

AMBIGUOUS STATEMENTS

19) I'm not comfortable with that.

20) I'd feel more comfortable using the longer runway.

Appendix C
Hypotheses Statistics Calculations

Hypothesis 1, t-test utilizing responsiveness score 30

Group Statistics

	RESPONSE	N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	>= 31.00	98	22.9082	7.17396	.72468
	< 31.00	3	21.0000	10.53565	6.08276

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	.459	.500	.449	99	.655	1.90816	4.25365	-6.53201	10.34834
	Equal variances not assumed			.311	2.057	.784	1.90816	6.12578	-23.75932	27.57564

Hypothesis 1, t-test utilizing mean responsiveness score

Group Statistics

	RESPONSE	N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	>= 39.62	55	22.6727	6.50087	.87658
	< 39.62	46	23.0652	8.08126	1.19152

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	.834	.363	-.271	99	.787	-.39249	1.45096	-3.27151	2.48653
	Equal variances not assumed			-.265	85.919	.791	-.39249	1.47922	-3.33313	2.54815

Hypothesis 1, t-test utilizing median responsiveness score

Group Statistics

	RESPONSE	N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	>= 40.00	55	22.6727	6.50087	.87658
	< 40.00	46	23.0652	8.08126	1.19152

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	.834	.363	-.271	99	.787	-.39249	1.45096	-3.27151	2.48653
	Equal variances not assumed			-.265	85.919	.791	-.39249	1.47922	-3.33313	2.54815

Hypothesis 1, correlation

Descriptive Statistics

	Mean	Std. Deviation	N
ABSDEV	22.8529	7.19240	102
RESPONSE	39.6238	4.51852	101

Correlations

		ABSDEV	RESPONSE
ABSDEV	Pearson Correlation	1	.006
	Sig. (2-tailed)		.956
	N	102	101
RESPONSE	Pearson Correlation	.006	1
	Sig. (2-tailed)	.956	
	N	101	101

Hypothesis 1, Hypothesis 2, Hypothesis 3, regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	RESPONSE, DUALGIV, ASSERT[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: ABSDEV

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
dimension0 1	.142[a]	.020	-.011	7.36284

a. Predictors: (Constant), RESPONSE, DUALGIV, ASSERT

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	105.472	3	35.157	.649	.586[a]
	Residual	5095.875	94	54.211		
	Total	5201.347	97			

a. Predictors: (Constant), RESPONSE, DUALGIV, ASSERT

b. Dependent Variable: ABSDEV

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	25.581	8.171		3.131	.002
	DUALGIV	-.001	.001	-.137	-1.339	.184
	ASSERT	-.065	.182	-.037	-.358	.721
	RESPONSE	.004	.168	.002	.022	.982

a. Dependent Variable: ABSDEV

Hypothesis 2, t-test utilizing assertiveness score 30

Group Statistics

	ASSERT	N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	>= 31.00	73	22.7123	7.35882	.86128
	< 31.00	28	23.2143	6.99395	1.32173

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	.412	.522	-.311	99	.756	-.50196	1.61408	-3.70464	2.70072
	Equal variances not assumed			-.318	51.328	.752	-.50196	1.57759	-3.66861	2.66469

Hypothesis 2, t-test utilizing mean assertiveness score

Group Statistics

	ASSERT	N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	>= 32.53	51	22.9608	7.29098	1.02094
	< 32.53	50	22.7400	7.23599	1.02332

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	.005	.943	.153	99	.879	.22078	1.44562	-2.64765	3.08922
	Equal variances not assumed			.153	98.985	.879	.22078	1.44552	-2.64744	3.08901

Hypothesis 2, t-test utilizing median assertiveness score

Group Statistics

	ASSERT	N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	>= 33.00	51	22.9608	7.29098	1.02094
	< 33.00	50	22.7400	7.23599	1.02332

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	.005	.943	.153	99	.879	.22078	1.44562	-2.64765	3.08922
	Equal variances not assumed			.153	98.985	.879	.22078	1.44552	-2.64744	3.08901

Hypothesis 2, correlation

Descriptive Statistics

	Mean	Std. Deviation	N
ABSDEV	22.8529	7.19240	102
ASSERT	32.5347	4.15106	101

Correlations

		ABSDEV	ASSERT
ABSDEV	Pearson Correlation	1	-.042
	Sig. (2-tailed)		.674
	N	102	101
ASSERT	Pearson Correlation	-.042	1
	Sig. (2-tailed)	.674	
	N	101	101

Hypothesis 3, t-test utilizing mean experience in hours

Group Statistics

	DUALGIV	N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	>= 619.87	30	22.1333	6.35031	1.15940
	< 619.87	69	23.2609	7.67473	.92393

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	.749	.389	-.706	97	.482	-1.12754	1.59732	-4.29778	2.04270
	Equal variances not assumed			-.761	66.151	.450	-1.12754	1.48252	-4.08735	1.83228

Hypothesis 3, t-test utilizing median experience in hours

Group Statistics

	DUALGIV	N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	>= 320.00	50	22.8000	7.91279	1.11904
	< 320.00	49	23.0408	6.66446	.95207

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	1.128	.291	-.164	97	.870	-.24082	1.47179	-3.16192	2.68029
	Equal variances not assumed			-.164	94.868	.870	-.24082	1.46924	-3.15768	2.67605

Hypothesis 3, correlation

Descriptive Statistics

	Mean	Std. Deviation	N
ABSDEV	22.8529	7.19240	102
DUALGIV	619.8687	896.95401	99

Correlations

		ABSDEV	DUALGIV
ABSDEV	Pearson Correlation	1	-.137
	Sig. (2-tailed)		.175
	N	102	99
DUALGIV	Pearson Correlation	-.137	1
	Sig. (2-tailed)	.175	
	N	99	99

Hypothesis 4, t-test

Group Statistics

	MULTIMEM		N	Mean	Std. Deviation	Std. Error Mean
ABSDEV	dimension 1	.00	84	22.9286	7.70352	.84052
		1.00	18	22.5000	4.17626	.98435

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ABSDEV	Equal variances assumed	5.253	.024	.228	100	.820	.42857	1.87692	-3.29518	4.15233
	Equal variances not assumed			.331	45.836	.742	.42857	1.29439	-2.17714	3.03428

Appendix D
Post Hoc Statistics Calculations

Individual video descriptive statistics, grouped by video type

Statistics: AMBIGUOUS

		AMBIGUOUS2	AMBIGUOUS5
N	Valid	102	102
	Missing	0	0
Mean		1.3627	1.4804
Median		2.0000	2.0000
Mode		2.00	2.00
Std. Deviation		.76804	.75427
Variance		.590	.569
Minimum		.00	.00
Maximum		3.00	3.00

Statistics: YIELDING

		YIELDING3	YIELDING14	YIELDING19
N	Valid	102	102	102
	Missing	0	0	0
Mean		1.0196	1.7745	1.7647
Median		1.0000	2.0000	2.0000
Mode		1.00	1.00	1.00
Std. Deviation		.70332	.95344	1.01646
Variance		.495	.909	1.033
Minimum		.00	.00	.00
Maximum		4.00	3.00	3.00

Statistics: NEUTRAL

		NEUTRAL1	NETURAL8	NETURAL18
N	Valid	102	102	102
	Missing	0	0	0
Mean		.5980	.2941	.7451
Median		.0000	.0000	.0000
Mode		.00	.00	.00
Std. Deviation		.93618	.66880	1.11414
Variance		.876	.447	1.241
Minimum		.00	.00	.00
Maximum		4.00	2.00	4.00

Statistics: PROBING

		PROBING7	PROBING10	PROBING15
N	Valid	102	102	102
	Missing	0	0	0
Mean		1.1863	1.9804	2.0098
Median		1.0000	2.0000	2.0000
Mode		1.00	3.00	3.00
Std. Deviation		1.03149	1.18556	1.15609
Variance		1.064	1.406	1.337
Minimum		.00	.00	.00
Maximum		4.00	5.00	5.00

Statistics: ALERT

		ALERT6	ALERT11	ALERT16
N	Valid	102	102	102
	Missing	0	0	0
Mean		1.6373	1.6275	2.4706
Median		2.0000	2.0000	2.0000
Mode		2.00	2.00	2.00
Std. Deviation		1.21695	1.22613	1.37665
Variance		1.481	1.503	1.895
Minimum		.00	.00	.00
Maximum		4.00	4.00	6.00

Statistics: CHALLENGE

		CHALLENGE4	CHALLENGE9	CHALLENGE13
N	Valid	102	102	102
	Missing	0	0	0
Mean		1.1275	.8922	1.4706
Median		1.0000	1.0000	1.0000
Mode		1.00	1.00	1.00
Std. Deviation		1.07787	.74338	1.33280
Variance		1.162	.553	1.776
Minimum		.00	.00	.00
Maximum		7.00	7.00	7.00

Statistics: EMERGENCY

		EMERGENCY12	EMERGENCY17	EMERGENCY20
N	Valid	102	102	102
	Missing	0	0	0
Mean		.7745	.7353	.7451
Median		.0000	.0000	.0000
Mode		.00	.00	.00
Std. Deviation		1.20975	1.03337	1.31018
Variance		1.464	1.068	1.717
Minimum		.00	.00	.00
Maximum		6.00	6.00	6.00

Descriptive statistics, videos grouped by statement type

Statistics

		AMBIGUOUS	YIELDING	NEUTRAL	PROBING	ALERT	CHALLENGE	EMERGENCY
N	Valid	102	102	102	102	102	102	102
	Missing	0	0	0	0	0	0	0
Mean		2.8431	4.5588	1.6373	5.1765	5.7353	3.4902	2.2549
Median		3.0000	5.0000	2.0000	5.0000	6.0000	3.0000	1.0000
Mode		2.00[a]	5.00	.00	7.00	5.00[a]	3.00	.00
Std. Deviation		1.17520	1.88045	1.71649	2.34378	2.52091	1.84415	2.99731
Variance		1.381	3.536	2.946	5.493	6.355	3.401	8.984
Minimum		.00	.00	.00	.00	.00	1.00	.00
Maximum		5.00	9.00	8.00	12.00	12.00	9.00	18.00

a. Multiple modes exist. The smallest value is shown

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