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Walden University

College of Management and Technology

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Sonia Bush

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Walden University
2021

Abstract

A Qualitative Phenomenological Study Exploring Aviation Communication Experiences of North American Pilots

by

Sonia Bush

MBA, International College of the Cayman Islands, 2002

MSc, International College of the Cayman Islands, 2002

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Management

Walden University

January 2021

Abstract

Human factors contribute to approximately 75% of aviation accidents. The lack of effective flight deck communication has caused numerous aviation accidents which has resulted in the loss of many human lives. The specific management problem was that standardized flight deck communication of airline pilots may not be sufficient to prevent aviation accidents. The focus of the study was the lived flight deck communication experiences of North American pilots. Using the Observer Model of Communicology formed the conceptual framework for this study, 15 participants were selected, using purposive sampling. Data collection was accomplished via one-on-one interviews. Coding and thematic analysis were used in this descriptive phenomenological study to analyze and interpret the data. Key findings were that pilots and air traffic controllers sometimes depart from the use of aviation standard phraseology using colloquial slang terms despite English being the universal language. This causes confusion and miscommunication that sometimes negatively affected group communication when it occurred. Power differential in the cockpit was also found to be a contributing factor. Recommendations for future research include using a wider participant pool outside the US may yield additional results. Adding a quantitative approach in the future may yield additional vital information. The findings of this study contribute to social change by identifying critical cockpit communication issues that pilots, air traffic controllers, leaders, and stakeholders can use to develop and implement tools to enhance communication in the cockpit and with other aviators that could reduce and prevent aviation accidents averting billions of dollars in losses and preservation of human life.

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Acknowledgments

Thanks to the faculty and staff of Walden University especially Bryan L. Forsyth Ph.D, my Chair, for his patience and dedication and who has provided his excellent guidance especially in drawing upon his background in aviation. Many thanks to Maja Zelihic Ph.D. who has also provided her sound guidance and Barbara Turner Ph.D for her dedication, patience and guidance during my journey.

Sincerest thank you to my husband Kel Thompson who has been more than encouraging during tough times, late nights writing and researching. Thanks to my daughter, Gina Bush who constantly gave me words of love and affirmation along the way to keep me motivated and to my son Gino Bush for his kind words and encouragement. Sincerest thanks to my sister Charmaine Jackson who always let me know, at every opportunity, how proud she is of my undertaking and other successes in life. Thanks to my sister Judith Dennis for her daily words of encouragement and consistent prayers. Thanks to my brother Trevor Carmola who declared me "Dr. Bush" even before the accolade was administered. Thanks to my mother, Mavis Bell and my step father Raymond Bell for their prayers for God to help me during my journey. Thanks to Mrs. Hyacinth Hurlock for her encouragement. I only wish my father was still alive to witness this accomplishment.

Last but not least, I am grateful to God for his many blessings upon my life and for granting me favor in the successful completion of this dissertation. I am also forever grateful to everyone else that I did not mention by name but contributed in some manner to the successful completion of this dissertation.

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Chapter 1: Introduction to the Study

Human factors contribute to approximately 75% of aviation accidents (Kharoufah, Murray, Baxter, & Wild, 2018). According to Enomoto (2017), lack of effective flight deck communication has resulted in numerous aviation accidents. The failure of effective flight deck communication remains a significant contributor to aviation accidents and has cost airline organizations billions of dollars over the years (Daly, 2018; Archer, 2015). Some airline managers are failing to implement effective training to prevent flight deck communication errors (Kanki, Helmreich, & Anca, 2010). Although researchers have identified some causes of aviation accidents, there is a literature gap on how effective communication can mitigate aviation accidents. Archer (2015) called for qualitative research in communication in the aviation industry, in particular, for interviews to be conducted with current aviation professionals to expand the data in this field. This study is significant to social change because the findings may be used to address the effective implementation of tools to prevent aviation accidents and ultimately save lives and billions of dollars.

In this chapter, I present the problem statement and the purpose statement for this study along with information on the significance of the study and the background of the research. It further includes the conceptual framework for this research study, the research question, the nature of the study, the assumptions, and the definition of the contextual terms. I also present limitations, the scope, and the delimitation of this research study.

Background of the Study

The literature below presents information on flight deck communication errors, contributory factors, consequences, and antecedents. The literature also identified training resources which the aviation industry currently uses in an effort to prevent aviation accidents. Daly (2018) confirmed that over the years, aviation accidents have claimed many human lives. The lack of strategies to implement effective flight deck communication has caused the loss of billions of dollars in the aviation industry (Chow, Yortsos, & Meshkati, 2014). In investigating how gender characteristics impact crew communication and aviation accidents, Archer (2015) concluded that some work has been done on gender communication between male and female pilots and the role the breakdown played in aviation accidents. The researcher suggested that further research on communication is needed, in particular data collection through interviews of aviation professionals to identify communication styles and linked personality traits in order to mitigate airline hazards.

Helmreich (1994) focused on the anatomy of an accident reported by the NTSB on Avianca Flight 052 and concluded that cultural factors such as a failure to advocate an alternative course of action to the senior pilot or even to question the Air Traffic Controller (ATC) could result in aviation accidents. Minkov and Hofstede (2011) discussed Hofstede's work on national culture, including Hofstede's dimensions of power distance, individualism-collectivism, and masculinity-femininity and uncertainty avoidance. According to Minkov and Hofstede these dimensions were all constructed in a thoughtful way to address basic problems in societies. Bridges, Neal-Smith, and Mills

(2016) identified gender, race, and nationality in aviation in particular gender-based attitudes regarding the behavior of pilots. Bridges, Neal-Smith, and Mills provided definitions of gender and gender attitudes and general background on masculinity and femininity in aviation.

Foushee and Manos (1981) drew attention to the rising concerns among aviators about accidents attributable to improper use of resources by human elements in aviation systems. Foushee and Manos posited that flight deck communication plays a significant role. They found that when flight deck communication is not forceful enough, when there is excessive obedience and when there is reluctance by the copilot to correct the captain, then those factors can contribute to airline disasters. Gladwell (2008) is known for his ethnic theory of plane crashes. Gladwell investigated the correlation between the behavior of Korean pilots and aviation accidents and concluded that power difference culture existed in Korean pilots and has a direct correlation with aviation accidents

Human error is a key contributing factor to most of the significant accidents in complex and high-risk systems (Reason, 1990). According to Reason (1990), one such high risk system is aviation communication system. Shappell, Detwiler, and Holcomb (2007) noted that the Human Factors Analysis and Classification System (HFACS) is sometimes used to address aviation accidents. The foundation for the HFACS is Reason's Swiss Cheese Model of latent and activities failure. The model breaks down human error in four different levels of failures. The levels of failures include unsafe acts, preconditions, unsafe supervision, and organizational influence. The model further breaks down unsafe acts into decision errors or honest mistakes, skilled-based errors or

unconscious thought, and perceptual error. This study was needed to answer the call of Archer (2015) to explore the lived flight deck communication experiences of North American pilots and to provide useful information to the airline industry for them to develop and implement tools to increase flight safety and loss prevention.

Problem Statement

Approximately 75% of aviation accidents are attributed to human factors (Kharoufah, Murray, Baxter, & Wild, 2018). The failure of effective flight deck communication has resulted in numerous airline accidents (Enomoto, 2017; Gladwell, 2008; Chute & Weiner 1996). Between 1990 and 2018, airline accidents have claimed over 30,000 thousand human lives (Bureau of Aircraft Accidents Archives, 2018). Flight deck communication remains a significant concern for the National Transportation Safety Board (NTSB), Federal Aviation Administration (FAA), and industry leaders. Archer (2015) found that communication errors account for 60% of all accidents that arise from human factors errors. Archer called for qualitative research in communication in the aviation industry, in particular for interviews to be conducted with current aviation professionals to expand the data in this field. Archer further suggested that observational research would be useful in order to provide a rich base for development of appropriate empirical studies in aviation communication.

Crew Resource Management (CRM) has been celebrated as a practical approach to pilot training, as a tool to assist in the prevention of aviation accidents (Kanki, Helmreich, & Anca, 2010). CRM training programs have been developed and disseminated in the United States of America and worldwide (Merritt & Helmreich,

1996). Although the aviation industry has applied much effort in the implementation of CRM, its overall effectiveness still remains doubtful (Shuffler, Salas & Xavier, 2010; Krieger, 2005). The CRM training program lacks formal instructions in respect to communication (Kanki, Helmreich, & Anca, 2010).

The general management problem is that some airline managers are failing to implement effective training to prevent flight deck communication errors (Kanki, Helmreich, & Anca, 2010). In some airlines, crewmembers are also left to develop their own methods of accomplishing communication and coordination goals prescribed by the CRM without formal training in these areas (Kanki, Helmreich, & Anca, 2010). The specific management problem is that standardized flight deck communication of airline pilots may not be sufficient to prevent aviation accidents. Flight deck communication errors have imposed tremendous financial burdens on the aviation industry (Daly, 2018; Archer, 2015; Chow, Yortsos & Meshkati, 2014). Understanding and using techniques to implement effective flight deck communication may prevent aviation accidents and save peoples' lives.

Purpose of the Study

The purpose of this qualitative, phenomenological study was to explore the lived flight deck communication experiences of North American pilots to provide useful information to the airline industry for them to develop and implement tools to increase flight safety and loss prevention. The findings of this study could provide information to pilots and managers and leaders in the aviation industry which could enable them to develop and use techniques to implement effective flight deck communication, which

may prevent aviation accidents and financial losses within the industry and importantly, save lives.

Research Question

What are the lived experiences of pilots relating to flight deck communication that could help flight safety and loss prevention?

Conceptual Framework

The phenomenon that grounds this study is flight deck communication. According to Enomoto (2017), the failure of effective flight deck communication has resulted in copious airline accidents. These accidents have cost the airline industry billions of dollars (Daly, 2018) and the deaths of many people. Flight deck communication occurs in the area of the airplane where the pilots sit and control the airplane. Communication is effective when it accomplishes the intended purpose (Muszyńska, 2018). On the flight deck, pilots mostly practice verbal communication either face to face or via radio between each other, the flight crew, ATC, and other ground crew (Alderson, 2009). Flight deck communication occurs when a message is sent by the sender who is usually a pilot though a medium such as a radio or by mouth and the intended receiver, usually by another pilot, crew members, ATC, or ground crew, receives and acknowledges the message. Drawing upon Shannon and Weaver's model, Kubota (2019) posited that communication is based on the message, the sender, the medium or channel used, the receiver and destination of the message (Shannon & Weaver, 1949; Ruesch & Bateson, 1951).

The universal language of aviation communication, which occurs particularly between pilots and ATC, is English. Further, a significant portion of aviation English language could be considered as a set of classified codes which is used in a restricted context, known as standard phraseology (Alderson, 2009). According to (Peksatici, 2018), culture in aviation is of significant importance, especially in respect to flight deck communication. It is influenced by language, education, religion, and customs of a group of people, and it also influences the way in which individuals perceive the world (Peksatici, 2018). In reference to the case of the Avianca Flight 052, Helmreich (1994) found that when flight deck communication is not effective and there is reluctance by the copilot to challenge the captain, those cultural factors can contribute to airline disasters. A more detailed analysis of flight deck communication, culture and aviation language is provided in Chapter 2.

Interpersonal communication is an interactive process through which people exchange information in a way that stimulates mutuality, understanding, and rapport (Anyim, 2018). Interpersonal communication accommodates knowledge sharing, sharing of experiences and ideas, and the coordinating and interpreting of general activities and decisions (Owoeye & Dhunsi, 2014). This type of communication forms a delicate thread in aviation communication. Lanigan (2013) presented Reutsch and Bateson's (1951) communication model, which presents four level of communication. One level is interpersonal communication, which occurs between one person and another. The communication of one pilot to another on the flight deck can be interpreted as interpersonal communication.

Another level of the Reutsch and Bateson (1951) communication model is intrapersonal communication, which addresses communication embedded in one's mind or consciousness. The third level of the Reutsch and Bateson communication model is group communication, which refers to communication of social interaction, and the fourth level is cultural communication. Cultural communication occurs between many people of various cultures (Reutsch & Bateson, 1951). The advancement of technology and globalization are affecting inter-cultural communication (Bauman & Shcherbina, 2018). In aviation and on the flight deck, there are times when a captain is from one culture, the junior pilot is from another, and the ATC is from another. There are also instances where the cabin crew is made up of individuals from diverse cultures. Pilots and their crew sometimes fly internationally, where they face different languages and methods of cultural communication. The communication between pilots from various and different cultures with each other and with the other members of the flight crew from various and different cultures on the flight deck can be interpreted in line with Reutsch and Bateson (1951) as cultural communication as well as group communication. A more detailed explanation of interpersonal communication, cultural communication, and group communication and their connection to flight deck communication is provided in Chapter 2.

The conceptual framework for this study included several interconnected ideas and principles. The failure of effective flight deck communication remains a significant contributing factor to aviation accidents (Daly, 2018; Archer, 2015; Gladwell, 2008). Flight deck communication can be viewed through three of the four levels of human

communication presented by Reutsch and Bateson (1951) in their Observer Model of Communicology. The four levels of human communication are intrapersonal communication, interpersonal communication, group communication, and cultural communication (Ruesch & Bateson, 1951). Each level of human communication carries an element of a message, a sender, a medium or channel used, a receiver, and a destination of the message (Ruesch and Bateson, 1951). This study to explore the lived flight deck communication experiences of North American pilots was conceptualized through interpersonal communication, group communication and cultural communication. Ruesch and Bateson (1951) demonstrated an accepted concept in understanding communication which provided a platform to aid pilots in understanding each level of effective communication. In understanding the various levels of communication, pilots may be able to develop and implement techniques which could result in more effective flight deck communication. Chapter 2 sets out the conceptual framework for this research study.

Nature of the Study

A qualitative research focuses on a phenomenon that is happening or has happened in a natural setting (Leedy & Ormrod, 2016) and facilitates studies of issues in depth (Patton, 2015). A phenomenological study is used to understand the perceptions and perspectives of people in relation to a given situation (Leedy & Ormrod, 2016). There are two main approaches to a phenomenological study. These approaches are interpretive (Heidegger, 1988) and transcendental, which is also called a descriptive or classical approach (Giorgi, 2009). Husserl's (1970) philosophical idea of the way in

which science should be carried out gave rise to the transcendental phenomenology approach. Husserl believed that phenomenology set aside all suppositions and was based on the meaning of an individual's lived experience (Husserl, 1970). Heidegger (1988) departed from the Husserlian descriptive analysis approach on the premise that the Husserlian approach lacks interconnection to the question of being, presenting a more interpretive approach.

This study is a qualitative study, as it focuses on human perceptions. The purpose of this study was to explore the lived flight deck communication experiences of North American pilots. A phenomenological descriptive analysis approach was most suited for this study as it provided an opportunity to explore the aviation communication experiences of North American pilots. This study employed the descriptive analysis approach.

The population for this study was 15 North American commercial aviation pilots. Guest, Bunce, and Johnson (2006) suggested that 15 is the smallest acceptable sample and the sample size should follow the concept of saturation (Mason, 2010). In determining the number of participants, I contemplated selecting a minimum of either 15 participants or until there was data saturation. The sample size selected for this research study was 15 participants.

Interviews are at the core of many qualitative studies as they provide deep, rich, individualized, and conceptualized data (Ravitch & Carl (2016). Archival data such as National Transport Safety Board reports, Federal Aviation Administration reports, Bureau of Aircraft Accidents Archive data, National Aeronautics and Space

Administration technical papers were collected along with data from semi-structured face to face interviews incorporating open-ended questions. The face-to-face interview was selected to gather data, including non-verbal data. Face to face interviews captured deep, rich, individualized data of lived experiences of the participants, spoken data, and unspoken data, such as body language and facial expressions.

Once the data were collected, I personally transcribed it. I familiarized myself with it by reading through the responses of all participants. I identified the statements and meanings that were relevant to the phenomenon which I was investigating. I then grouped the meanings into themes and then prepared a description of the phenomenon with all the emerged themes.

Open coding and selective coding were used in this study to identify themes and concepts related to flight deck communication. I used Microsoft Excel software to assist me in organizing the collected data for this study. The purpose of this study was to increase understanding of the phenomenon of flight deck communication. This purpose required the gathering of deep, rich, individualized, and conceptualized data of the lived experiences of commercial aviation pilots.

This study is a qualitative study, and I employed triangulation. Triangulation can be employed in a qualitative study (Abdalla, Oliveira, Azevedo, & Gonzalez, 2018). Researchers use triangulation to generate data and to increase their understanding of a phenomenon and for the purpose of completeness (Abdalla et al., 2018). The reliability and validity of the findings of this study were triangulated through (1) participants'

interviews, (2) archival data, and (3) theoretical perspective as defined by the literature review.

A qualitative research focuses on a phenomenon that is happening or has happened in a natural setting (Leedy & Ormrod, 2016) and facilitates studies of issues in detail (Patton, 2015). I focused on the phenomenon of flight deck communication that was happening or has happened in a natural setting for this research study. I needed deep and detailed data which I obtained through face-to-face interviews. A phenomenological study aims to understand the lived experiences of people (Leedy & Ormrod, 2016). I explored the lived experiences of pilots to better understand the phenomenon of flight deck communication. The qualitative methodology is appropriate for this phenomenological research. On the contrary, the quantitative methodology is not the appropriate methodology for this study as the nature of the quantitative methodology is more correlational, numerical, and experimental or quasi-experimental and tends to test hypotheses.

Definitions

The following definitions are provided to avoid misconceptions or misunderstandings. These definitions provided a shared understanding for their contextual use in this research.

Crewmember: This term means a person assigned to perform duty in an aircraft during flight time (14 CFR s.1.1).

Crew resource management: This term means the management of all resources that are available for effectiveness and safety and includes resources such as people, procedures, equipment (Kern, 2001).

Culture: This term means a pattern of basic assumptions and shared beliefs of a society (Chen & Starosta, 1998) such as certain practices, values, and norms (Helmreich, 2000).

Flight deck: This term means the area of a commercial aircraft from which the pilots navigate and control the aircraft (Cambridge Dictionary).

Flight deck communication: This term means communication between pilots in the area of a commercial aircraft from which the pilots navigate and control the aircraft.

Hard skills: This term means the talents and knowledge that is used for cultivating procedures and processes (Hunt, 1997).

Human error: This term means "the failure of planned actions to achieve their desired goals, where this occurs without some foreseeable or chance intervention" (Reason & Hobbs, 2003, p. 39).

Human factors: This term means the actions of individuals involved in a specific aviation job, including human abilities and limitations (Piwek, 2018). It is a discipline that concentrates the interactions of people and products in their environments (Sanders & McCormick, 1993).

North American pilot: This term means an aviation pilot who has a current pilot license, is employed with a North American airline organization, and operates commercial aircraft.

Safety: This term means an absence of danger (De, Florio, Filippo & Florio, Filippo De., 2006). It also means the "state in which the risks associated with various types of aviation activities, related or directly support aircraft operations are reduced to an acceptable level and controlled" (ICAO, 2013, p. 1-2.).

Soft skills: This term means skills that are crucial elements in building relationships (Hutchins & Rodriguez, 2018) and include listening ability, relationship-building, motivation, and empathy (Hunt, 1997).

Assumptions

Assumptions refer to personal, political, social, or philosophical biases that may limit a researcher's ability to study a problem with complete objectivity (Leedy and Ormrod, 2016). The first assumption for this study was that the participants have provided honest and accurate information. According to Leedy and Ormrod (2016), face to face interviews allow a researcher to establish rapport with participants and therefore gain their corporation. Obtaining open and honest responses from participants contributed to the trustworthiness of this study.

The second assumption was that the participants participated voluntarily. There were no incentives for participants, and all participants consented to participating in this research study. Participants were required to meet for face-to-face interviews and followed up with a transcript verification exercise. Each participant was given information about the interview and transcript verification prior to interviews. It was assumed that they participated voluntarily.

The third assumption was that the criteria required for participants ensured that each one was qualified through having direct experience with the phenomenon of this research. It was also assumed that their experience was sufficient to provide rich and accurate data for this study. Furthermore, it was assumed that participants were not negatively influenced by their organizations' policies and their personal schedules. It was assumed that participants were not restricted in any way from providing information.

Finally, it was assumed that the method selected for data collection was sufficient to gather rich and comprehensive information from participants. Ravitch and Carl (2016) posited that purposeful sampling means that the participants are purposefully chosen for specific reason such as their experience, their knowledge of the phenomenon, their residence, or some other criteria. Purposeful sampling also allows a researcher to gather detailed and contextually rich data concerning specific locations and populations (Ravitch & Carl, 2016). The participants for this study were selected for their unique ability to answer the research question. The following criteria were used to purposefully select participants for this study: must be (a) a commercial aviation pilot, (b) employed with a North American airline organization, and (c) possessing a current and valid aviation commercial pilot's license.

Finally, the rules in respect to number of participants in qualitative research vary widely. For example, Maxwell (2013) suggested five to 25 and Guest, Bunce, and Johnson, (2006) posited that 15 is the smallest acceptable sample. Sample size should follow the concept of saturation (Mason, 2010). Data saturation occurs when newly

collected data can shed no further light on the investigated issue (Glaser & Strauss, 1967). The sample for this study was 15 participants.

Scope and Delimitations

The scope of a research denotes the constraints surrounding the study (Simon & Goes, 2013). The scope of this research was the lived experiences of North American pilots regarding flight deck communication. The delimitations of a study are those intentionally emerging from the design of the study or by conscious inclusions or exclusions established by a researcher (Simon & Goes, 2013). The research question for this study concerned the lived experiences of aviation pilot in North American in regard to flight deck communication.

Purposeful sampling was used to recruit participants from a population with the inclusion criteria of: (a) must be a commercial aviation pilot, (b) employed with a North American airline organization, and (c) possess a current and valid aviation commercial pilot's license. Inclusion criteria has been used by others in related studies (Fontenot, 2019; Archer, 2015; Berger, 2008). The smallest acceptable sample size is 15 (Guest, Bunce, & Johnson, 2006) or until data saturation is reached (Mason, 2010). This study operated under the scope of data collection from 15 participants or until data saturation was reached. Data was collected from 15 participants for this study. The flight deck communication experiences of North American pilots may provide a springboard to reducing aviation accidents and to save human lives and to prevent economic burdens to the aviation industry.

Limitations

A limitation is an 'imposed' restriction which may affect the research design, the results, and subsequently the conclusions of a study (Simon & Goes, 2013). A research limitation is an element of the study that is uncontrollable by a researcher (Simon & Goes, 2013). It is a systematic bias that could inappropriately affect results of the research (Price & Murnan, 2004). One of the limitations of this study was that the collection of data solely from North American pilots limited the overall scope of responses in this area of study.

Possible biased responses from participants encroaches on the trustworthiness of a study and can be a limitation (Yin, 2017). The method of collecting data used was triangulation to eliminate challenges of trustworthiness. I triangulated the data collected from interviews with participants with my field notes and archival data to prevent possible bias. Another limitation of this study was that only aviation pilots were selected to participate. The sample excludes other aviation communicators such as ground crew, ATC, and cabin crew such as flight attendants.

Significance of the Study

Archer (2015) called for further qualitative research in aviation communication to expand the data in this field. In particular, Archer suggested that interviews should be conducted with current aviation professionals to gather rich data. Krieger (2005) also suggested that future research explore the communication behavior of both experienced and inexperienced pilots. Effective flight deck communication is not a trivial matter

(Chute & Weiner, 1996). This study was significant as it responded to both Krieger and Archer in contributing to the existing literature on flight deck communication.

Significance to Practice

The outcome of this study may provide meaningful information to pilots, managers, leaders, and other stakeholders in the aviation industry so they can better understand flight deck communication which could enable them to develop and implement more effective flight deck communication techniques. Better understanding and implementation of effective flight deck communication could contribute to the prevention of aviation accidents and financial losses within the aviation industry and ultimately the saving of human lives.

Significance to Theory

Implementing effective flight deck communication techniques may prevent aviation accidents and financial losses within the industry. Ruesch and Bateson's (1951) Observer Model of Communicology demonstrated that communication operates in four ascending levels, being intrapersonal communication, interpersonal communication, group communication, and cultural communication. (Ruesch & Bateson, 1951). This research study showed the effectiveness of incorporating Ruesch and Bateson's Observer Model of Communicology in aviation communication to improve flight deck communication.

Significance to Social Change

The failure of effective flight deck communication remains a major contributor to aviation accidents and has cost airline organizations billions of dollars over the years

(Daly, 2018; Archer, 2015; Chow, Yortsos & Meshkati, 2014). The outcome of this study may provide meaningful information to pilots, industry leaders, managers, and stakeholders so they can better understand flight deck communication and implement more effective flight deck communication techniques. Better understanding of effective flight deck communication may contribute to the prevention of aviation accidents and ultimately save people's lives and billions of dollars.

Summary and Transition

Chapter 1 of this study presented an introduction to the phenomenon that was explored in this research. I presented a background of the study, which formed the foundation of a conceptual framework. I also presented the gap that emerged from the existing literature and the formulated research question for this study. Despite extensive available literature concerning aviation communication and flight safety, no qualitative research had been done to understand the lived experiences of aviation pilots regarding flight deck communication. Previous research investigated human factors including communication in correlation to aviation accidents. This unique study approached this field of study via a qualitative methodology to understanding perceptions rather than quantifications in further understanding flight deck communication from the perspectives of aviation pilots.

The literature review for this research study is presented in Chapter 2. The literature showed methods of communication in the aviation industry including the standard phraseology and English as the universal language. The literature presented communication errors that led to aviation accidents. In Chapter 2, I present the globally

accepted training tool which is known as the crew resource management and its effectiveness. Further, the literature addresses the role that culture, power differential, and human errors play in communication in the aviation industry. Various models were presented such as the Swiss Cheese Model, the HFACS, and the Observer Model of Communicology, which previous researchers used to understand communication and aviation accidents. The literature presented information on flight deck communication errors, contributory factors, consequences, and antecedents.

Chapter 2: Literature Review

The purpose of this literature review was to provide contextual information on flight deck communication. The literature review was conducted in a structured manner using a funnel approach. The review starts with a systematic identification and examination of documents comprising information related to aviation communication and the loss of many innocent lives as a result of aviation accidents. I examine relevant documents to determine what was already known about aviation communication, what was controversial about it, and what remained to be studied. I continued the review and narrowed it down to flight deck communication and continued the review until a gap in the literature emerged.

In this literature review, I describe the ways in which researchers approached the phenomenon of flight deck communication as well as the strengths and weakness in their approaches. Human factors that cause flight deck communication errors, along with statistical results of flight deck communication errors, are included in the discussions of this literature. Aviation training policies and manuals are also reviewed to understand the tools that already exist to prevent flight deck communication errors and aviation accidents.

In framing the gap in the existing literature, I assess the Observer Model of Communicology by Ruesch and Bateson (1951), particularly in relation to flight deck communication errors and aviation accidents. I explore how the Observer Model of Communicology relates to communication in general, and in particular, its application to flight deck communication. I presented the model developed by Shappell and Wiegmann

(2000), which is called HFACS. The Swiss Cheese Model (Reason, 1990) is also presented in relation to the causes of aviation accidents. In this review, I describe the qualitative methodology, which I used for this research study, as it was consistent with the scope of the study.

The outcome and findings of this study could provide stakeholders in the aviation industry with meaningful information that may assist them with a deeper understanding of flight deck communication errors. A better understanding of flight deck communication could lead to the implementation of better flight deck communication tools as a measure to prevent aviation accidents, which could ultimately result in saving human lives. This chapter ends with a summary and conclusion of the literature review and a transition to Chapter 3.

Literature Search Strategy

In conducting the literature review for this study, I systematically searched for articles, including peer-reviewed articles, published in English primarily between 2013 and 2018. The literature review was conducted in a structured manner. I searched through various databases using several search engines. The Walden University Library was the main database source.

These databases included: ProQuest Central, Business Source Complete, Sage, Science Direct, Taylor and Francis, Thoreau Multi Database Search, Journal of Media Critiques, Journal of Aviation Psychology and Applied Human Factors, The International Journal of Aviation Psychology, Journal of Business Communication, Journal of Aviation/Aerospace Education and Research, Journal of Human Factors and Ergonomics.

In addition, I used Google Scholar search engine. I focused on using current and available peer-reviewed articles, aviation policies, and Ph.D. dissertations on aviation communication and accidents in this study.

The key search terms and combination of search terms used in this review included: *cockpit communication, aviation communication, airline accidents, airplane crash, pilot error, cabin crew, flight deck, human errors, airplane safety, crew resource management, safety systems, culture, gender, power differential, air traffic control, aviation training*, *flight deck communication,* and *communication theories.* I reviewed over 200 articles on aviation communication. As the literature unfolded, I extended my reviews to human errors in the aviation industry.

Human factors contribute to approximately 75 percent of aviation accidents (Kharoufah, Murray, Baxter, & Wild, 2018). Archer (2015) found that communication errors account for 60 percent of all accidents that arise from human factors errors. In this chapter, I also described the conceptual framework, the literature that is relevant to the research problem, and Ruesch & Bateson's (1951) communication model. I then built on that foundation through relevant studies on aviation communication.

Conceptual Framework

There are several interconnected ideas and concepts which guide this study. I applied these ideas and concepts to achieve a possible solution to the research question. I also used the same ideas and concepts to develop a questionnaire for the participants selected for this study.

The phenomenon that grounds this study is flight deck communication. According to Enomoto (2017), the failure of effective flight deck communication has resulted in many airline accidents which, according to Daly (2018), have cost the airline industry billions of dollars. On the flight deck, pilots mostly practice verbal communication either face to face or via radio between each other, the flight crew, ATC, and other ground crew (Alderson, 2009). Flight deck communication usually occurs when a message is sent by a pilot though a medium such as a radio or by mouth and the intended receiver, usually another pilot, crew member, ATC or ground crew who receives and acknowledges the message.

The universal language of aviation communication, which occurs particularly between pilots and ATC, is English. A significant portion of aviation English language could be considered as a set of classified codes used in a restricted context, known as standard phraseology (Alderson, 2009). Culture in aviation is of significant importance, especially in respect to flight deck communication (Peksatici, 2018). It is influenced by language, education, religion, and customs, and it also influences the way in which people perceive the world (Peksatici, 2018). In reference to the case of the Avianca Flight 052, Helmreich (1994) found that flight deck communication is not effective when there is reluctance by the copilot to challenge the captain. In such cases, cultural factors can contribute to airline disasters.

Interpersonal communication is an interactive process through which people exchange information in a way that stimulates mutuality, understanding, and rapport (Anyim, 2018). Interpersonal communication accommodates knowledge sharing, sharing

of experiences and ideas, the coordinating and interpreting of general activities, and decision making. (Owoeye & Dhunsi, 2014). This type of communication forms a delicate thread in aviation communication. Reusch and Bateson (1951) posit that one level of communication is interpersonal communication and this occurs between one person and another. The communication of one pilot to another on the flight deck can be interpreted as interpersonal communication.

Cultural communication occurs at an intergroup level (Reutsch & Bateson, 1951). Globalization and the advancement of technology are affecting inter-cultural communication (Bauman & Shcherbina, 2018). In aviation and on the flight deck, there are times when a captain is from one culture, the junior pilot is from another, and ATC is from another. There are also instances where the cabin crew is made up of individuals from diverse cultures. Pilots sometimes operate flights internationally, where they encounter different languages and different methods of cultural communication. The communication between pilots from different cultures with each other and with the other members of the crew from various cultures on the flight deck can be interpreted in line with Reusch and Bateson (1951) as cultural communication as well as group communication.

Communication is a process where information is shared between two or more persons or groups (Kincaid, 1980). It is an "extremely dynamic phenomenon with a rapid rate of change of levels of functions, which range from evaluation to transmission and conduction." (Ruesch & Bateson, 1951, p. 274) and is effective when it reaches its goals and accomplishes the intended purpose (Muszyńska, 2018).

Shannon and Weaver Model of Communication

Communication is based on the message, the sender, the medium or channel, the receiver, and the destination (Shannon & Weaver, 1949). According to Kubota (2019), this model lays out the process of the transmission of information from the sender to the receiver, and it includes the factor of noise and channels. Flight deck communication involves a message, a sender who is usually a pilot, a medium which is sometimes a radio, a destination which is usually another pilot or a crew member. Below is an illustration of the Shannon Weaver Model of Communication at Figure 1.

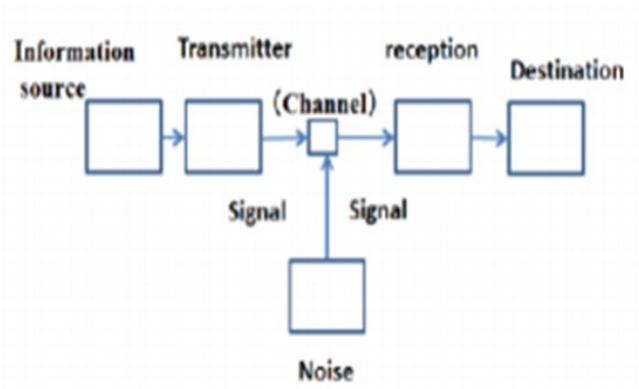

Figure 1. Shannon and Weaver's communication model. Adapted from "What is communication—Beyond the Shannon & Weaver's model," by M. Kubota, 2019, *International Journal for Educational Media and Technology 13(1),* p. 55.

Observer Model of Communicology

The Ruesch and Bateson's Observer Model of Communicology (1951) specifies that the communication of human beings' functions on four ascending levels through a network. These ascending network levels are intrapersonal, interpersonal, group, and cultural levels of organizations (Ruesch & Bateson, 1951). Although flight deck

communication uses these four levels of organizations, it is evident that they are underused as there is still evidence of aviation accidents as a result of flight deck communication errors (Bureau of Aircraft Accidents Archives, 2018).

The "scientific theory traditionally distinguishes between that which is assumed to exist in reality and that which is actually perceived by a human observer" (Ruesch & Bateson, 1951, p.273). The nearest approximation of "reality" can be obtained in the field of communication (Ruesch & Bateson, 1951). This model demonstrates that a human observer can focus on various aspects of communication with many magnifications while the limitations and characteristics of his perceptual apparatus remain the same (Ruesch & Bateson, 1951). This is analogous to a person looking through a microscope.

Similarly, the human observer, when looking at communication, can have only one focus at any one time (Ruesch & Bateson, 1951). Depending on whether he focuses on the small or large entities, he will see the various function in greater or smaller detail (Ruesch & Bateson, 1951). It follows that the process of receiving, evaluating, and transmitting can be observed at the intrapersonal, interpersonal, group, and cultural levels of organizations.

At the intrapersonal level of the Observer Model of Communicology, the focus of the observer is limited to self. This is generally facilitated through the first person (Oliver, Markland, Hardy, & Petherick, 2008) and can include self-talk, visualization, and imagination (McLean, 2005). This level of communication includes situations where persons are aware of their effect on their surroundings.

Interpersonal communication is another level of communication and refers to how two persons use verbal and nonverbal cues to achieve their goals (Ruesch & Bateson, 1951; Berger, 2008). At the group level, communication involves many people, and at the cultural level, communication involves many groups. Communication is another level which includes verbal, nonverbal, and symbols of communication by members in a community.

The Observer Model of Communicology assigns each level within the network according to the origin of message, the sender, the medium or channel used, the recipient, and the end point of the message. These assignments can be significant in aviation communication. The Observer Model of Communicology also includes the evaluation of the message, sending of the message, the channel used, and the receiving of the message. The process begins with an observer evaluating the message. Communication is an "extremely dynamic phenomenon with a rapid rate of change of levels of functions, which range from evaluation to transmission and conduction." (Ruesch & Bateson, 1951, p. 273).

These assignments align with this study as each assignment is fundamental for effective communication on the flight deck. The origin of the message is vital to pilots, as the receiving pilot and the observer of the message will be able to make a decision, whether to act on that message or refrain from acting. Observers, receivers, and senders of messages on the flight deck are usually pilots. Their medium include face to face, nonverbal, and through avionic devices such as a radio. Communication on the flight

deck includes cabin crew, ground crew, and ATC. The focus of this study is on communication between pilots on the flight deck.

Ruesch and Bateson (1951) demonstrated an accepted concept in understanding communication. These levels of communication could provide a platform to aid pilots in understanding each level of communication, so that they can develop and implement effective communication tools and techniques. Despite the implementation of training tools for aviation communication, such as the CRM, some airlines are still failing to implement effective training to prevent flight deck communication errors (Kanki, Helmreich, & Anca, 2010). Flight deck communication errors remain a significant contributing factor to aviation accidents (Enomoto, 2017), resulting in the loss of human lives.

The Ruesch and Bateson's (1951) Observer Model of Communicology addressed the conceptual framework of this research study through its various levels of communications. These various levels of communications are intrapersonal, interpersonal, group, and cultural communication. The four levels of communication are currently practiced on the flight deck. Intrapersonal communication occurs in situations where a pilot may speak out loudly or to himself as the thinks through a process.

Interpersonal communication occurs between two pilots. Group communication occurs between two pilots and ATC. Cultural communication occurs through nonverbal between pilots. For example, a sweeping gesture of the hand by one pilot to another, while they are in their respective seats on the flight deck, can be an indication to retract the flaps of the airplane.

Managers in the aviation industry and pilots could broaden their attention to understanding the Observer Model of Communicology by Ruesch and Bateson, to recognize which level of the model and its assignments could be efficiently utilized on the flight deck. They could aim to develop and implement tools and techniques to incorporate some or all levels and assigns of the model in their flight deck communication policies. In recognizing drawbacks with flight deck communication which occurs at various levels the Observer Model of Communicology, industry leaders may be able to develop and implement targeted solutions at those various levels. This could result in a holistic aviation communication solution.

Mangers and pilots could then employ the developed tools and techniques in the CRM. The CRM is a worldwide accepted training tool which is used in the aviation industry. Managers and pilots could ensure that flight deck crew are educated on the Observer Model of Communicology and that they be trained to use developed tools arising from the model, to practice effective flight deck communication. This could be one component that could prevent aviation accidents and safe lives.

I used the Observer Model of Communicology as the conceptual framework in this study to develop questions for the participants, and to answer the research question, while synchronously addressing the problem, and the purpose of this study. This model specifies that human communication functions on four ascending network levels. These four ascending network levels are intrapersonal communication, interpersonal communication, group communication, and cultural communication (Ruesch & Bateson,

1951). Below is an illustration of the Observer Model of Communicology by Ruesch and Bateson at Figure 2.

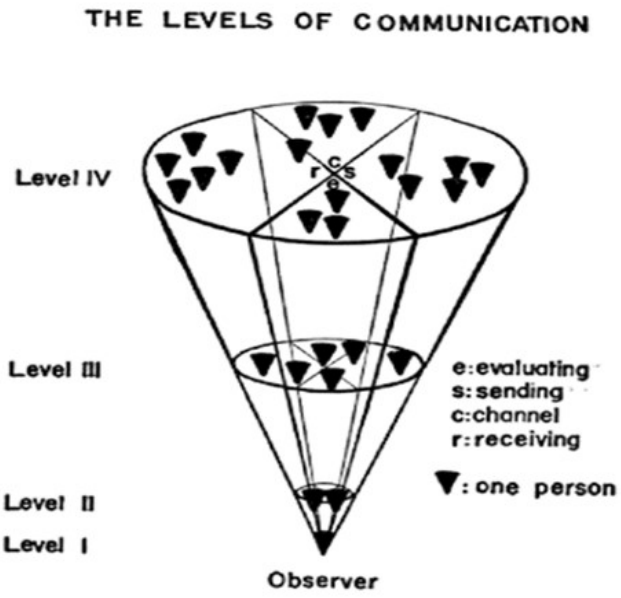

Figure 2. The Observer Model of Communicology showing the four ascending levels of communication which are, intrapersonal communication, interpersonal communication, group communication and cultural communication. Adapted from "Communication: The Social Matrix of Psychiatry," New York: W. W. Norton & Company by J. Ruesch and G. Bateson, 1951, pp. 274-275.

Literature Review

Introduction

The main aim of this exercise in conducting a literature review is to systematically find current existing research on information related to the research problem, to ascertain what is already known about flight deck communication, what is controversial about it, and what remained to be studied. I focus on the following:

1. communication in aviation,
2. current aviation communication procedures in practice,
3. human errors and effective aviation communication, and
4. a renewed approach to aviation communication.

Communication in Aviation

Communication can be described as an approach of how human beings use "semiotic systems" to represent their shared thinking, speaking, and bodily expressions (Lanigan, 2010b). Semiotic systems include verbal systems and non-verbal system. Lanigan also termed verbal systems as "eidetic codes" which include mathematics, linguistics, and logics. Lanigan also termed nonverbal systems as "empirical codes". Examples of empirical codes includes space, time, sight, action, sound, tactile, and smell (Lanigan, 2010b).

Fontenot (2019), added some definition to nonverbal communication as it being wordless communications exchanged either intentionally or unintentionally. Communication not only refers to verbal, non-verbal, expressed, and intentionally transmitted messages, but it also includes processes through which people influences

each other (Ruesch & Bateson, 1951). The acquisition and retention of information is also paramount in any system of communication (Ruesch & Bateson, 1951).

In the aviation industry, both verbal communication and written communication occur especially on the flight deck. Aviation written communication is usually conducted through operations and navigational manuals, maintenance manuals, and training manuals which are produced by the airline manufacturers and operators (Sarmento, 2005). On the flight deck, aircrew mostly practice verbal communication either among the aircrew, with ATC and other ground crew either verbal face to face or over a radio using special aviation frequencies (Alderson, 2009). Radio communication usually takes place between pilots and ATC using strictly standard phraseology. Communication is effective when it reaches its goals and accomplishes the intended purpose (Muszyńska, 2018). It is the lifeblood of any human relations (Rajkumar, 2010) and is used generally and includes all procedures by which one communicator affects the other.

Aviation Standard Phraseology

The universal language of aviation communication which occurs particularly between pilots and ATC is English (Alderson, 2009). However, aviation English is not for general purposes but for the specific and sole purpose of aviation. A significant portion of aviation English language could be considered as a set of classified codes which is used in a restricted context, known as standard phraseology (Alderson, 2009). Aviation English concentrates on the particular grammatical structures, pronunciation, vocabulary, and discourse styles that are normally used by aviators (Moder, 2012).

The International Civil Aviation Organization (ICAO) is an agency of the United Nations. This body regulates aviation on an international scale (Alderson, 2008). It also puts in place the levels and caliber for security and safety and it promotes unity and cooperation throughout the international civil aviation industry (Paramasivam, 2013).

In 1962, the ICAO ruled that ATC must provide aviation service in English and since that time English for Specific Purposes (ESP) emerged. In 2004, the ICAO issued a mandatory requirement that all aviation pilots flying on international routes and all ATC who were operating in airspaces that oversee international flight had to sit and pass an English test in aviation (Paramasivam, 2013). The ICAO Language Proficiency Requirements (LPRs) carries an assessment measure of skills in different components of language usage in six different tiers. The components of the language measured are vocabulary, structure, pronunciation, fluency, interactions, and comprehension (Paramasivam, 2013).

Alderson (2009) determined that several of the assessment processes of ICAO fell short of the worldwide professional standard designed for a language test. Alderson (2009) further concluded that the application of the policy for language assessment was insufficient. Alderson (2009) recommended that a meticulous and closer attention was needed in the implementation of the policy. Paramasivam (2013) stated that there is still a need for further research on various aspects of the teaching of English Specific Purpose (ESP). Feak (2013) observed that in respect to aviation English, since the mandatory requirement by the ICAO for the passing of an English test, further development and effective assessments of aviation English courses to validate the proficiency and the

aptitude of pilots and ATC's continues to be a precarious area of the ESP speaking inquest.

Communication Errors that Lead to Aviation Accidents

There are several well-documented cases in which one of the contributing factors to fatal aviation accidents is the inadequate communication between aviation persons from different linguistic environments (Alderson, 2009). Gladwell (2008) referred to numerous instances where aviation accidents resulted from poor communication between a pilot and a copilot or between the pilots and ATC. Aviation researchers have demonstrated that inadequate or poor communication is a contributing factor to the decision-making errors by pilots or flight crew (Enomoto, 2017; Krieger, 2005; Chute & Weiner, 1996; Shappell & Weigmann, 1997) which sometimes result in fatal accidents.

Flight deck communication includes the transfer of information between pilots (Archer, 2015). Issues concerning cabin crew are usually communicated to the flight crew at a late time in the flight at which time the parties were encumbered with multiple tasks (Armentrout-Brazee and Mattson, 2004). Flight deck communication errors have claimed thousands of lives (Bureau of Aircraft Accidents Archives, 2018) and have imposed tremendous financial burdens on the aviation industry. According to the Bureau of Aircraft Accidents Archives (2018), 30,000 people died between 1990 and 2018 as a result of aviation accidents. Flight deck communication errors remains to be a major concern for the National Transportation Safety Board (NTSB), Federal Aviation Administration (FAA) and industry leaders.

Researchers have documented a strong positive correlation between poor communications and airline accidents (Gladwell, 2008; Foushee & Manos, 1981). Archer (2015) found that communication errors account for 60% of all accidents that arise from human factors errors. According to Alderson (2009), unforeseeable and incalculable circumstances can cause severe miscommunications. The risk of severe miscommunication in unforeseeable and incalculable circumstances becomes higher in emergencies, especially where crucial remedy or information is need, and where a communicator may be emotionally pressured (Alderson, 2009). Flight deck communication failure is a detrimental factor to the aviation industry but more serious to the everyday airline passengers.

The International Air Transport Association (IATA) conducted a Phraseology Study in 2011 and discovered that the most significant issue for the 2,070 airplane pilots that were surveyed, was communication. The report confirmed that the use of standardized phraseology is one of the most fundamental factors in the process of communication as it allows efficient and effective communication that prevents barriers in language, while simultaneously reducing the risk of misunderstanding. Vague or non-standard phraseology is a common contributing or casual factor in aviation accidents (IATA, 2011).

Billings and Cheaney (1981), confirmed that 70% of the Aviation Safety Reporting System (ASRS) at that time, involved some form of information transfer that are primarily related to voice communication. According to the Grayson and Billings (1981), information transfer problems included absent communication, incomplete or

inaccurate message content, incorrectly perceived messages which were caused by similarities in phonics, ambiguous or distorted phraseology, and the absence of monitoring by receiver.

In January 1990, an Avianca Airlines Boeing 707-321B crashed in Long Island, New York. The flight was bound from Bogota, Colombia to John F. Kennedy International Airport located in New York, United States of America. The NTSB determined, among other causes of the accident, that the main cause was that the flight crew did not clearly and precisely communicate to the ATC that the fuel in aircraft was dangerously depleted, and that they were in an emergency situation. The NTSB further determined that the crew had failed to use the standard phraseology for pilots and controllers in minimum fuel and fuel emergency situations.

Eight crew members out of nine died and 65 passengers out of 149 also died. Helmrecich (1994) concluded that one of the miscommunication errors which contributed to this crash occurred when the dispatcher gave the weather report to crew that was 9 hours old. Researchers have shown that sometimes participants facing emergency situations may fail to use standard phraseology and sometimes revert to using plain or natural language (Sarmento, 2005).

One of the world's deadliest aviation accidents occurred in 1977 at the Tenerife airport in Spain (NTSB). On March 27, a Boeing 747 aircraft collided with another similar aircraft on the runway. The main cause for this accident resulted from a miscommunication and understanding of the phraseology "at takeoff" (NTSB). The crash claimed the lives of 583 passengers and the entire crew for both airplanes which

was more than any other fatality in the history of aviation at that time (NTSB, Safety Recommendation A-86-034).

The communication breakdown occurred between the Dutch pilot of one aircraft, the English-speaking pilot on the second aircraft and the Spanish speaking ATC. Some researchers attributed this breakdown of communication to cross culture and the lack of aviation linguistic proficiency (Merritt & Ratwatte, 2004; Stratechuk & Beneigh, 2004).

Lack of aviation linguistic proficiency may occur among multicultural cockpit crews, where silence, overlapping talk, and taking turns to talk are popular variables. Ripley and Finch (2004) attributed the death of 1,006 people to language issues which then led to problems of communication in three accidents alone. In India, in November 1996, a midair collision occurred between a Kazakhstan Airline aircraft and a Saudi Arabian Boeing 747 aircraft killing 351 people. The pilots were Saudi and Russian and the ATC was Indian.

In another incident involving Air China 981 which was landing at John F. Kennedy International Airport in New York, United States of America, the English language of the Chinese pilot was incomprehensible. The pilot also failed to comprehend the native-English-speaking ATC. In addition, the ATC failed to use the standard phraseology in communication with the pilot and a degree of communicative incompetence ensued. (Sarmento, 2005).

In July 2000, just after two minutes of takeoff, the Concorde Air France flight 4590 crashed killing all 109 persons on board in burning flames. The aircraft ran over metal debris on the runway which punctured its tire and damaged the gas tank. One of

the verbal commands that is universal in aviation communication before takeoff is from the ATC that the runway is clear. The runway in this instance was not clear or the ATC did not give the verbal communication. There is some room there for clarification.

Another deadly aviation disaster occurred in June 2009 when Air France flight 447 crashed as it was leaving Rio de Janeiro bound for Paris. The accident took the lives of all 216 passengers on board and 12 crew members. Authorities located the black boxes and reported that there were inconsistencies with the airspeed coupled with the crew communication and reactions.

On 6th July 2013, Asiana Flight 214, a Boeing 777 carrying 307 passengers, crashed into a seawall as it attempted a landing at San Francisco airport. A trainee pilot was making his first landing at this airport. The NTSB (AAR-14/01), investigated the accident and found that no mechanical problems prevailed at the time of the accident. Chow et al. (2014) posited that, as the NTSB investigation unfolded, the lack of appropriate training, communication, and the overdependence on technology were emerged as lethal errors that caused the accident. Among the contributing errors that led to this accident were "the flight crew's nonstandard communication and coordination regarding the use of the autothrottle and autopilot flight director systems" (NTSB/AAR-14/01).

On 29th October 2018, another devastating aviation accident occurred when Lion Air Flight 610, which was a Boeing 737 Max took off from Jakarta, Indonesia. The aircraft crashed 12 minutes after take-off into the Java Sea. All 189 passengers along with all the crew members on board were killed.

The Indonesian officials, Komite Nasional Keselamatan Transportsi Republic of Indonesia (2018), reported that the day before the accident, the pilot in command had communicated to the engineer of a problem with the aircraft. The pilot had logged in the Aircraft Flight Maintenance Log (AFML) that the Indicated Air Speed (IAS) and the Altitude Disagree and Feel Differential Pressure light had a problem. The pilot had also lodged a report about the conditions of the flight through the electronic reporting system of the airline of concern.

The officials also stated that the engineer had rectified the problem and performed a ground operation test and was contented and that the problem was resolved. The aircraft crashed the following day. As I undertook this research, and during the writing of this literature review, yet another Boeing 737 Max crashed and killed all 157 souls on board. On 10th March 2019, Ethiopian Airlines Flight ET 302 crashed just six minutes after take-off. Since this accident, the President of the United States of America grounded the entire fleet of all Boeing 737 Max airplanes in the United States of America, which is approximately 371 aircraft. There is also a worldwide grounding of all Boeing 737 Max aircraft.

The FAA has a team investigating the crash along with the NTSB. The Acting Administrator, Dan Elwell, at the FAA, stated that "It became clear to all parties that the track of the Ethiopian Airlines was very close and behaved very similarly to the Lion Air flight." (BBC, 2019). This accident is still being investigated. Aviation accidents are occurring worldwide and some of them are devastating to families and to the aviation industry.

The Readback-Hearback Problem

Researchers have shown that miscommunication in aviation can be detrimental. According to Wilson (2016), aviation accidents sometimes occur when an aviation pilot incorrectly reads back a clearance (the *readback* problem), and the ATC is unable to understand or recognize the readback (the *hearback* problem). Linguistics play a vital role in this industry.

Wilson (2016) confirmed that the pilots in the accident that occurred on 18 December 1983 at Kuala Lumpur Airport, Malaysia, which involved Malaysian Airline System Flight 684, readback the altitude that they were assigned incorrectly and ATC failed to notice and rectify the error. Errors sometimes happen in circumstances where the ATC are too busy to properly acknowledge the readback. Errors also sometimes occur in circumstances where the pilots interpret the silence of the ATC as acceptance of their readback (Wilson, 2016). Read-back can be defined as a "procedure whereby the receiving station repeats a received message or an appropriate part thereof back to the transmitting station so as to obtain confirmation of correct reception" (ICAO Annex 10 Vol II, Ch.1. p.3).

This readback-hearback loop is a communicative tool which has been used by the aviation industry. Readback can be defined as a procedure whereby the receiver repeats a message, that is received or an appropriate part of that message, back to the transmitter in order to get confirmation of the correct reception. (ICAO Annex 10 Vol II). Using this tool appropriately, could prevent miscommunication among aviators. The usage of each communication tool in this very specialized industry is vital, and failure to properly use

such tools can lead to fatal results. Figure 3 below shows the readback-hearback communication loop.

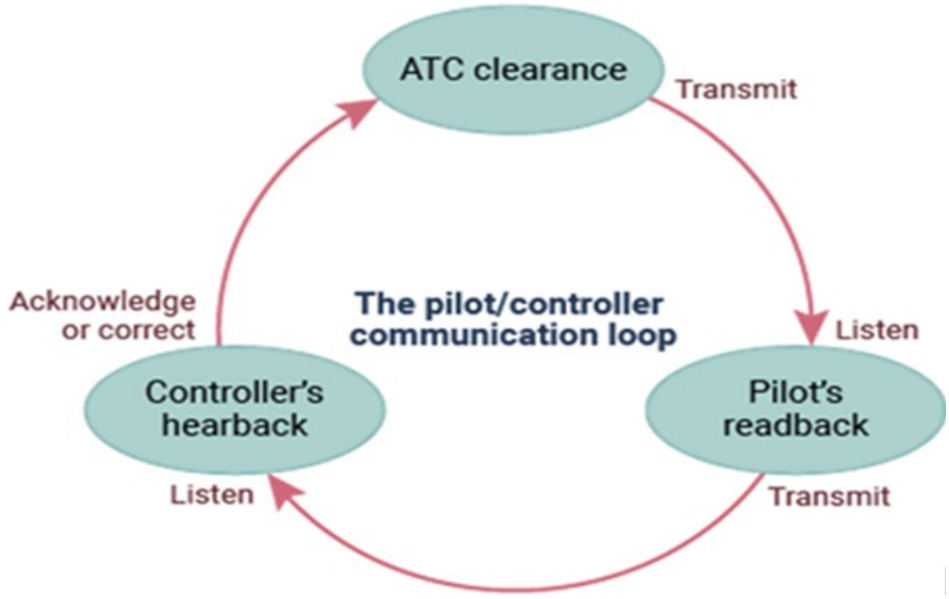

Figure 3. The Readback - Hearback model showing the ATC's communication loop. From "Failure to communicate. Aerosafety World," by G. Wilson, 2016), *https://flightsafety.org/asw-article/failure-to-communicate/*

Researchers have demonstrated the significance of the mastery of the English language in aviation and that communication should not be undervalued in the aviation industry (Alderson, 2009). Researchers have also demonstrated that flight deck communication errors are a major contributor to aviation accidents (Enomoto, 2017; Gladwell, 2008). The problem of lack of effective communication in the aviation industry, and especially on safety issues is not an inconsequential matter (Chute & Wiener, 1996). The NTSB's recommended that aviation communication should be

addressed in CRM training with cabin crew and pilots (Cardosi & Huntley, 1998; Chute & Wiener, 1994; NTSB, 1992). The seriousness of aviation communication attracts a wide range of commentary.

The Crew Resource Management: Overview

Several aviation accidents have been documented in which cabin crew have failed to communicate important information to the pilots on the flight deck (Chute & Weiner, 1996). This situation was so serious that the NTSB recommended that the issue of flight deck communication should be addressed through CRM training among flight deck crew (Cardosi & Huntley, 1998; Chute & Weiner, 1994; NTSB, 1992).

In 1979, John Lauber who was a psychologist for National Aeronautics and Space Administration (NASA) and studied cockpit communication processes for several years, coined the term "cockpit resource management". The term was later generalized to "crew resource management" (CRM). In 1992, the NASA researcher later found that human error was the fundamental cause of most of aviation accidents. The principal problems were the lack of accurate interpersonal communication, decision making on the flight deck and leadership (Kelley, 2006). In an effort to manage safety issues and teamwork, the concept of CRM was introduced by the aviation industry (Salas, Bowers, & Edens. 2001; Wiener, Kanki, & Helmreich, 1993).

CRM is the management of all resources that are available for effectiveness and safety and include resources such as people, procedures, equipment (Kern, 2001). The aviation industry has been using CRM for over two decades, and it has experienced numerous evolutions (Helmreich & Foushee, 1993; Helmreich, Merritt, & Wilhelm,

1999). The latest evolution is the recognition and awareness of human error. In most regulated aviation, including the FAA located in the United States of America, and the Joint Aviation Authorities (JAA) located in Europe, CRM training is currently a mandatory obligation for aviation pilots (Merritt & Helmreich, 1996). The CRM has been celebrated as a practical approach to pilot training and as a tool to assist in the prevention of aviation accidents (Kanki, Helmreich, Anca, 2010). The CRM covers training for pilots, ATC, and cabin crew on aviation communication.

The fundamental principle of CRM is to decrease the amount cabin crew and pilot errors (Helmreich, Merritt, & Wilhelm, 1999). CRM has been implemented as a training tool to assist in the prevention of aviation accidents, but its overall effectiveness remains uncertain (Shuffler, Salas & Xavier, 2010). Researchers found several barriers to the success of the CRM (Shuffler, Salas & Xavier, 2010; Helmreich, Merritt, & Wilhelm, 1999; Kanki, Helmreich, Anca, 2010). According the Shappell and Weigmann (2000), the fundamental breakdown of good CRM relates to episodes of the Unsafe Supervision which represents a barrier to safety and is depicted in the Swiss Cheese Model (Reason, 1990). In some airlines, crewmembers are left to develop their personal methods for accomplishing communication and coordination objectives, without formal training in these areas (Kanki, Helmreich, Anca, 2010). One specific barrier to the success of the CRM is that it lacks formal instructions in respect to communication (Kanki, Helmreich, Anca, 2010).

Despite the implementation of the CRM in many countries, some airline managers are failing to implement effective training to prevent flight deck communication errors

(Kanki, Helmreich, Anca, 2010). The researchers acknowledged that although CRM is esteemed in aviation as the lifeblood of training, its effectiveness is still uncertain as it faces challenges of economic drawbacks, culture barriers, and complexities of bureaucracies. Some examples of barriers to the effectiveness of the CRM include, the culture of flight crew, power differential among pilots, the language used between flight crew, ground crew and ATC, gender barriers, the implementation of training for crew members, pilots' fatigue, sleep deprivation of pilots, pilots' cognitive performance, pilots' mistakes, stress, pilots' absent mindedness, extended work hours of pilots, and the disruption of pilots' circadian rhythm (Archer, 2015; Krieger, 2005; Helmreich, 1994).

Culture and the Effectiveness of the CRM

The perceptions of human beings can be influenced by their cultural backgrounds and the environment in which they reside (Mehta, Rice, Winter, & Eudy, 2017). Culture can be described as a pattern of basic assumptions and shared beliefs of a society (Chen & Starosta, 1998), such as certain practices, values, and norms (Helmreich, 2000). The daily practices and customs of people from diverse cultures can influence their outlook, their mindset, and their decisions.

Researchers have established several dimensions of cultures such as the avoidance of uncertainty, hierarchical dimension, power-distance relationships, and individualism (Hofstede, 2001), all of which have a positive correlation with aviation accidents (Enomoto, 2017). Researchers have also demonstrated that a national culture significantly influences the effectiveness of the training programs of CRM (Maurino, 1994; Merritt & Helmreich, 1995b). The implementation of CRM worldwide has been

ineffective due to the nationwide failure in acknowledging that national culture is a powerful and overarching influence (Helmreich, Wilhelm, Klinect, & Merritt, 2001). The impact of CRM on aviation safety remains uncertain.

Communication and the Effectiveness of the CRM

In the aviation industry, communication is significant in successfully achieving goals, coordination, and managing tasks (Kanki, 2010). In January 1990, an Avianca Ailines Boeing 707-321B crashed in Long Island, New York, United States of America. The NTSB determined, among other causes of the accident that the main cause was that the flight crew did not clearly and precisely communicate to the ATC that the fuel in aircraft was dangerously depleted and that they were in an emergency situation. The NTSB further determined that crew had failed to use the standard phraseology for pilots and controllers in minimum fuel and fuel emergency positions. The result of unsuccessful communication was the death of eight of the nine crew members and 65 of the 149 passengers on board.

Communication can be interpreted differently in diverse cultures, particularly in combination with power differential of participants, potentially giving rise to miscommunication. Chute and Wiener (1996) found that some individuals from various cultures on the flight deck can create difficulties in communicating safety information to each other or they may hesitate to communicate. In 1988, an American Airline flight approached Nashville when the cabin crew noticed smoke in the cabin. The NTSB concluded that the cabin crew applied the CRM procedures and the flight deck crew

failed to use the CRM techniques. The NTSB found that there was "a deficiency in communication" (p.4) among the flight deck crew and the cabin crew (NTSB, 1988).

According to Chute and Wiener (1996, p. 217), "nothing has caused more confusion among cabin crew members than the so-called sterile cockpit rule". The Federal Aviation Regulations (FAR) 121.542 provides that crew members or pilots should not carry out any activities that could distract them during certain phases of a flight. The regulations further provide some example of these activities which include eating, engaging in conversation which are not essential, and reading. According to Chute and Wiener (1996), cabin crew members may already be overwhelmed with the flight deck authority. Adding these further regulations and expecting them to decipher situations that are vital to conducting safety in operating an aircraft can be intimidating. This creates communication dilemma (Chute & Wiener, 1996).

Communication properties are the unique characteristics of individuals solely (Falkenberg, 1996). Communication properties are the climatic point of hard and soft skills (Falkenberg, 1996). Hard skills are the aptitudes and knowledge that is used for creating and developing processes and procedures. Soft skills refers to the ability to listen, having empathy, relationship-building, and incentivizing, (Hunt, 1997). The CRM model focuses on training of activities of flight crew. Soft skills are fundamental in relationship-building (Hutchins & Rodriguez 2018) and may be one element that could be added to the CRM. Tullo (2010) argues that those in the aviation industry who regulate, train, manage, and evaluate crewmembers should be aware of the imperfect CRM. Researchers remain doubtful that the CRM is effective in its entirety.

In the context of aviation communication and CRM, Kanki (2010), described communication, as one of many tools which can be used to achieve the procedural and technical objectives of the CRM. Kanki (2010) further posited that communication is a tool which can be utilized by the CRM has many functions. Using communication, information of the CRM can be transferred to intended recipients, and it can assist in the accomplishment of team building and interpersonal relationships (Kanki (2010). Communication can also serve as a medium to transfer information in situations where behaviors are predictable and for managing workload and the awareness of crew (Kanki (2010).

Aviation, being an industry of people and communicators is also faced with challenges of power differential culture. For example, one pilot on the flight deck may be from Korea and the other may be from Columbia, and the ATC may be American. Communication between all parties can be challenging. Pilots are not only required to master the technicality of flying an airplane, but they must also manage their crew and their ground-to-air communication to ensure efficient performance and safety.

Power Differential and the Effectiveness of the CRM

Gladwell (2008) is known for his ethnic theory of plane crashes. The researcher investigated the Korean Air Flight 801 crash which killed 223 people. The researcher found that the copilot was afraid to question the poor judgment of the captain, which led to a fatal mistake. According to Gladwell (2008), power difference culture existed in Korean pilots and has a direct correlation with aviation accidents. Gladwell (2008) also

noted that in numerous circumstances involving aviation accidents, the flight crew was from a high-power distance culture.

Galdwell (2008) concluded that the Korean culture is hierarchical in the sense that a junior co-pilot is obligated to a senior captain in a way that is unimaginable to the culture in the United States of America. The researcher added that this type of culture is dangerous when it comes to modern airplanes, because sophisticated machines are designed to be piloted by a crew that work together as a team, not as individuals. Despite the renowned household name of the CRM and its worldwide implementation, gaps in its effectiveness still exists and such gaps can lead to aviation catastrophes.

Helmreich (1994) focused on the framework of an accident through the report of the NTSB on Avianca Flight 052. This researcher concluded that cultural factors such as power differential can negatively affect communication, which could result in aviation accidents. In the case of Avianca Flight 052, the first officer failed to challenge the captain for an alternative option and they both failed to even advocate to the ATC their dire situation. Foushee & Manos (1981) draws attention to the rising concerns among aviators about accidents attributable to improper use of resources by humans in aviation systems. The researchers posited that flight deck communication plays a significant role in aviation safety.

Foushee & Manos (1981) found that when flight deck communication is not forceful enough, when there is excessive obedience, and when there is reluctance by the copilot to challenge the captain, then those cultural factors can contribute to airline disasters. Overbearing captains can also hinder the transfer of information from

subordinate crew members to flight deck, even in potentially hazardous situation (Foushee & Manos, 1981). Culture in aviation is of significant importance, especially in respect to flight deck communication. Effective aviation communication could reduce or minimize aviation accidents.

Although the focus of CRM is on training of crew activities, there is a slight shift to accompany training with communication and coordination (Helmreich & Foushee, 2010). Crewmembers are now mandated to operate as effective team. They are further mandated to develop their own means of accomplishing this goal without formal supervision, direct management from CRM, or formal policies and instructions (Helmreich & Foushee, 2010). This hands-off approach widens the gap for failure of implementation of good CRM.

The importance of airline management providing a good and well-thought through set of Standard Operating Procedures (SOPs) cannot be overemphasized. There are instances where operators' budgets are low which results in burdens on none or low proficient aviators with complex tasks, at which they fail. Airlines that are financially challenged have a higher propensity to neglect aviation safety requirements than airlines that are economically sustainable (Kim & Rhee, 2016). Crewmembers operating on their own initiatives can lead to dismal consequences (Tullo, 2010).

In theory, CRM provides guidance for aviation training to prevent accidents but effective implementation of safety tools by each airline industry remains questionable. The fundamental question as whether CRM training achieved its goal of increasing aviation safety is not simplistic, but it can be said that CRM is not, and will never be the

mechanism that will totally eliminate error and assure aviation safety (Helmreich, Merritt, & Wilhelm, 1999).

Human Errors and Effective Aviation Communication

Human factors contribute to approximately 75% of aviation accidents (Kharoufah, Murray, Baxter, & Wild, 2018). Human factors is defined as human abilities, pattern behavior, characteristics, limitations, and their motivation in their lived environments (Sanders & McCormick, 1993, p. 5). Reasons (1990) referred to aviation communication system as a high-risk system and concluded that one of the key contributing factors to aviation accidents is human error.

The science of human error is concentrated on how people intermingle with tools, products, procedures, and workplace processes (Sanders & McCormick, 1993). While it is impossible to illuminate human errors without eliminating human beings, the focus should be on reducing and controlling human errors (Rodríguez-Pérez, 2019). The academic conversation for accident prevention models is ongoing with developing models sometimes criticizing older models and even disqualifying some (Ghirxi, 2010; Jacobsson, Sales & Mushtaq, 2009). The academic debate concerning development of accidents models can be appreciated in respect to the Swiss Cheese Model of accident causation (Reason, 1990, 1997), the Human Factors Analysis and Classification System (HFACS), and the Ruesch and Bateson's (1951) Observer Model of Communicology.

The Swiss Cheese Model

James Reason (1990) categorized two main approaches to human errors. One category is "person" and the other is "system" (Reason, 1990). In regard to the

systematic approach to human error, Reason developed a model that breaks down human error in four different levels of failures. This model is called the "Swiss Cheese Model". The Swiss Cheese Model suggests that multiple contributors (referred to as the holes in cheese slices) must be aligned in order for an accident to occur.

The barriers in a system (depicted as the cheese slices themselves) are meant to prevent errors that result in accidents. Barriers include education, training, effective policies, technology, communication and checklists. The holes represent failures in the barriers. The holes represent latent failures such "Unsafe Acts, Preconditions for Safety Acts, Unsafe Supervision and Organizational Influences" (Reason. 1990). In this model, Reason (1990) described the four levels of human failures (the holes in the cheese slices) as each influencing the other. These are also known as latent failures. According to Reason (1990), when the trajectory of the holes in the barriers are aligned an accident will occur.

The Unsafe Acts is more commonly referred to as pilot/aircrew error. Reason (1990) classified Unsafe Acts in two further categories: errors and violations. Errors represents physical or mental activities performed by an individual that failed to accomplish the intended goal (Shappell & Wiegman, 2000). The Preconditions for Unsafe Acts involves psychological exhaustion, poor synchronization practices and substandard communication (Shappell & Wiegmann, 2000).

CRM and flight deck communication are the fundamental elements on which this research hinges. According the Shappell and Weigmann (2000), the fundamental breakdown of good CRM reverts to the Unsafe Supervision element which is the third

tier of the Swiss Cheese Model. It may be helpful where aviation leaders and managers acknowledge that there will be failures, and that there are some safety gaps, and thereby implementing tools to prevent all holes from aligning, and thereby preventing accidents.

The Unsafe Supervision level of the Swiss Cheese Model goes to the heart of aviation leaders and managers. Shappell and Weigmann (2000), portrayed Unsafe Supervision by way of an example in an instance where two below average and inexperienced pilots were combined together and were directed to fly at night in a stormy weather. The outcome would likely have been unsatisfactory and in contemplation, and Shappell and Weigmann (2000) posited that a flight crew of that nature was composed to fail. Human error occurs at the supervisory level although it trickles down to the aircrew.

Communication forms an integral element of supervision. Unsafe Supervision includes the coupling of inexperienced pilots in adverse weather at night. Reason's (1990) fourth category of human error occurs from Organizational Influences. Organizational influences can be the conduct of an organization to reduce spending on training pilots when they are going through economic challenges. Researchers have shown that most industrial incidents include multiple independent failures (Stauffer, Sands, & Strobhar, 2017).

The holes in the Swiss cheese represent the opportunity for mistakes, which are left unidentified in this model (Shappell & Wiegmann, 2000). In order for a failure to occur, the holes in the slices of cheese must align. The layers represent defenses, safeguards and barriers and they can be aligned as a result of active and latent failures.

The best solution is to eradicate the holes but that is an impossible job since human errors cannot be eradicated unless humans are eradicated. Another alternative is to plug the holes by proactive prevention of any failures at all. This approach also is a meandering and uncertain approach. The next alternative solution is to control the errors by preventing the alignment of the holes.

This Swiss Cheese Model has some drawbacks, and attracts some criticisms, and with use over time, even Reason (1990) acknowledged the model's limitations. Despite its limitations, it remains widely utilized. It is also considered as the grounds and foundation for the development of new models. A breakdown of the levels of failures indicating latent failures is at Figure 4 below.

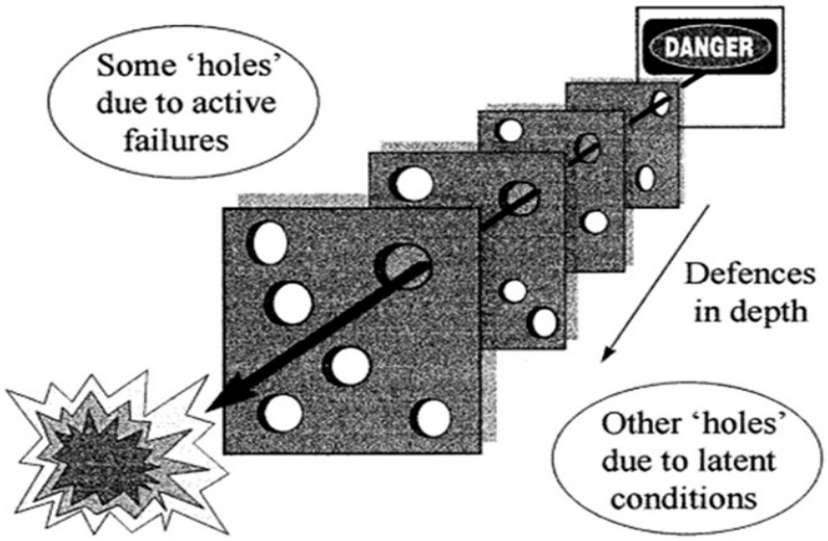

Figure 4. The Swiss Cheese Model showing the breakdown in the levels of failures that can lead to accidents. Adapted from "Perceptions of 'just culture' - the case of aircraft maintenance," by G. Malone and C. Darcy, 2019*, Journal of Strategic Innovation and Sustainability, 14(1),* pp.48-65.

The Human Factor Analysis and Classification System

The motivation to reduce aviation accidents has yielded a high volume of research. The researchers expanded the Swiss Cheese Model (Reason 1951), addressing the classification of active failures (Unsafe Acts) which included failures as intentional or unintentional errors. Shappell and Weigmann (1997) posited that, it is an act, not a failure, and an underlying decision process, that is either intentional or intentional. Shappell and Wiegmann (1997) developed the Human Factor Analysis and Classification System (HFACS) by building on the four levels of human errors provided in the Swiss Cheese Model.

The notion of Swiss Cheese Model and the HFACS models promotes the investigation of aviation accidents from the approach of two categories of failures. The two types of failures are the active failures which is at a level of Unsafe Acts and latent failures at the three levels of Organizational Influences, Unsafe Supervision and Preconditions for Unsafe Actions (Yoon, Dong-Han, & Yoon, 2017). According to Shappell, Detwiler & Holcomb (2007), the foundation for the HFACS is the Swiss Cheese Model. The HFACS can be used to analyze aspects of human errors at both the supervisory level and the organizational level.

While Reason's (1990) focused on the active errors, the HFACS model extended the theory to organizational rather than on individual weakness (Theophelus et al., 2017). According to Sanders & McCormick (1993), human factor is the methodical application of pertinent information about human competences, confines, characteristics, behavior, and their inspiration to create effects and processes which is used in their environments (Sanders & McCormick, 1993).

The science of human factors focuses on how people interrelate with tools, procedures, products, and processes (Sanders & McCormick, 1993). The HFACS is a taxonomy that provides an analytical framework for investigating the role that human errors play in accidents. It has been used by many researchers to analyze human errors and aviation accidents.

Shappell and Wiegmann (2000) drew on the Swiss Cheese Model (Reason, 1951) of human errors and causation and the concepts of active and latent failures and developed the HFACS. The HFACS expands the categories of Unsafe Acts,

Preconditions for Unsafe Acts, Unsafe Supervision, and Organizational Influences which are categories of the Swiss Cheese Model. For example, the HFACS extended two limbs of Unsafe Acts which are errors and violation.

Violations extend to two limbs and occurs as a result of a "conscious failure to adhere to procedures or regulations" (Helmreich, 2000, p. 782). The two extended limbs are Violations are Routine Acts and Exceptional Acts. Errors refers to the failed action in achieving its intended goal (Shappell & Wiegmann, 2000). There are three extended factors of errors that are presented in the HFACS model. These extended limbs are decision errors, skilled-based errors and perceptual errors (Shappell and Wiegmann, 2000).

The HFACS extends the Precondition for Unsafe Acts (Swiss Cheese Model), presenting information as to why the Unsafe Act took place by adding Environmental Factors, Conditions of Operations and Personal Factors. These three main factors are further expanded. Environmental Factors include Physical Environment and Technological Environment. Conditions of Environment include Adverse Mental State, Adverse Physiological State and Physical and Mental Limitations.

The HFACS further extends the Unsafe Supervision level of the Swiss Cheese Model to include Inadequate Supervision, Planned Inappropriate Operations, Failed to Correct Problem and Supervisory Violations. Finally, the HFACS extends the Organizational Influences level of the Swiss Cheese Model to include Resource Management, Organizational Climate and Organizational Process. The development of

these categories to understand causes of aviation accidents is commendable. This study is similar in nature as it sought to minimize aviation accidents and to save human lives.

Shappell & Wiegmann (1997) also developed the safe crew conditions, which are typical conditions of operation and below average practices. Resource management, organizational climate, and organizational process which are limbs under Organizational Influences usually permeate the entire organization. Errors form an inevitable part of aviation. It is difficult to eliminate human errors since all human beings make mistakes. The fundamental cause of most accidents is human errors (Shappell & Wiegmann, 2000) and the natural unreliability of humans is the highest hazard to safety (Dekker 2002a).

Some researchers view the notion of human error as a symptom of a failure and not as a cause (Hollnagel 1998; Dekker 2002a). Between the years of 1990 and 2002, around 70% of human errors were related with some form of supervisory, or organizational, or aircrew failure (Shappell, Detwiler, Hackworth, Boquet, & Wiegmann, 2007). Understanding human errors has important practical implications for coping with the ever-present risk in aviation. The challenge today and in the future, is the optimum design of safety tools within risky industries and the implementation of these tools to minimize or prevent accidents.

The research problem of this study is that current flight deck communications of airline pilots may not be sufficiently optimal to prevent aviation accidents. The aim of this study is to explore the lived flight deck communication experiences of North American pilots to provide a better understanding of flight deck communication and better understand flight safety and loss prevention. The Swiss Cheese Model (Reason,

1951) and the HFACS (Shappell & Wiegmann, 1997) are integral safety measurement models which provides the springboard for this research in respect to the phenomenon of flight deck communication regarding aviation safety.

Figure 5 below presents the layout of the extended categories of Unsafe Acts. Figure 6 below presents the layout of the extended categories of the Preconditions for Unsafe Acts. Figure 7 below presents the layout of the extended categories of the Unsafe Supervision and Figure 8 below presents the layout of the extended categories of the Organizations Influences.

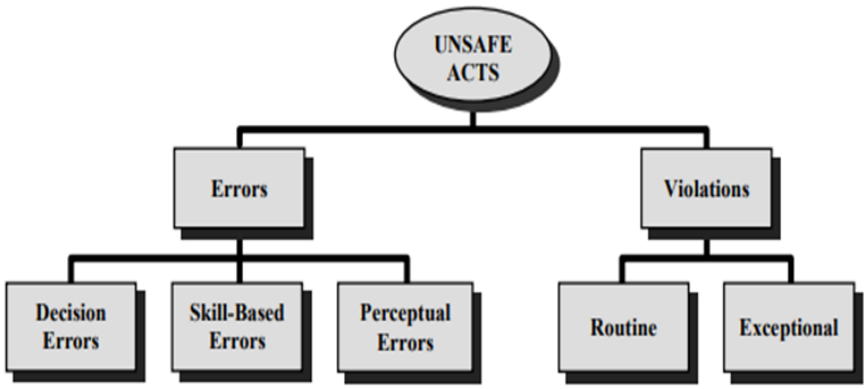

Figure 5. The Human Factor Analysis and Classification System showing the categories of unsafe acts extended which could contribute to accidents. Adapted from "The human factor analysis and classification system-HFACS," by S.A. Shappell and D.A. Weigmann, 2000, *https://commons.erau.edu/publication/737* pp. 102-103.

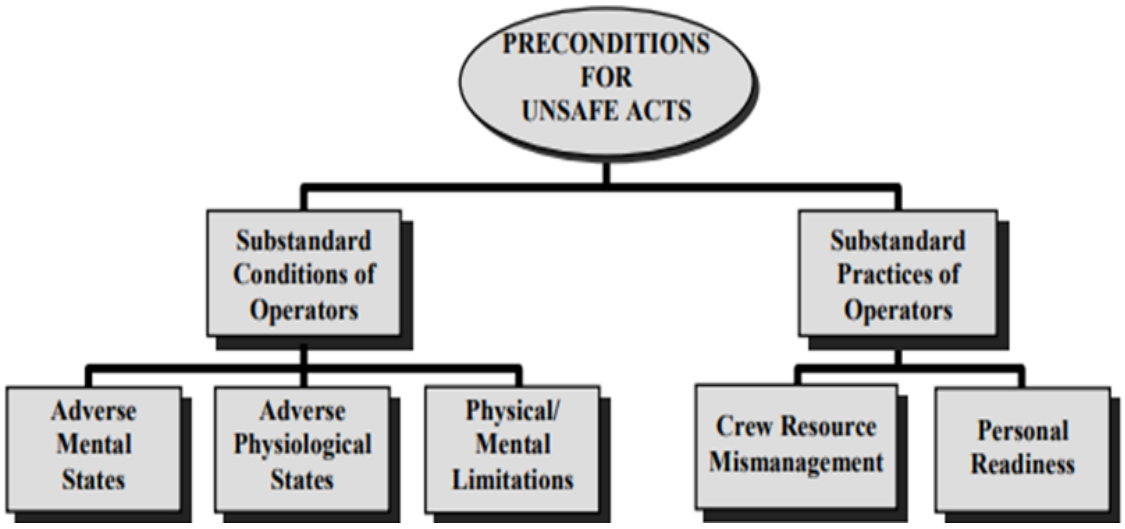

Figure 6. The Human Factor Analysis and Classification System showing the categories of preconditions for unsafe acts extended which could contribute to accidents. Adapted from "The human factor analysis and classification system-HFACS," by S.A. Shappell and D.A. Weigmann, 2000, *https://commons.erau.edu/publication/737* pp. 102-103.

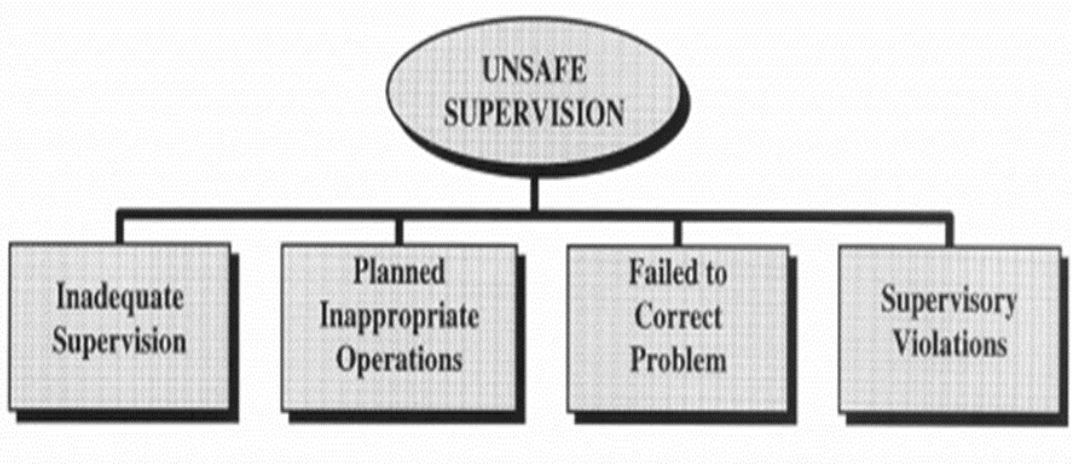

Figure 7. The Human Factor Analysis and Classification System showing the categories of unsafe supervision extended which could contribute to accidents. Adapted from "The human factor analysis and classification system-HFACS," by S.A. Shappell and D.A. Weigmann, 2000, *https://commons.erau.edu/publication/737* pp. 102-103.

Figure 8. The Human Factor Analysis and Classification System showing the categories of organizational influences extended which could contribute to accidents. Adapted from "The human factor analysis and classification system-HFACS," by S.A. Shappell and D.A. Weigmann, 2000, *https://commons.erau.edu/publication/737* pp. 102-103.

The Swiss Cheese Model (Reason, 1990) and the HFACS (1997) provide meaningful insights in respect to human errors and aviation accidents. Human factors contribute to approximately 75% of aviation accidents (Kharoufah, Murray, Baxter, & Wild (2018) and communication is a human factor that impacts aviation safety (Enomoto, 2017; Gladwell, 2008). Safety risk management is important in aviation (Lee, 2006). The aviation communication concept occurs on the flight deck as well as outside the parameters of the flight deck in areas such as organizations and in multi-purpose teams.

In response to an emerging trend in communication study, researchers have created and developed various communication models. Karl Buhler (1934) developed the Organon Model of Human Communication. This model was developed from one of

Plato's positions. Edmund Husserls (1922) subsequently extended the science of linguistics into the science of logic foundation (Lanigan, 2010).

Claude Shannon's (1948) model is articulated as information theory and focuses on the problem solving of "noise in the channel" (Shannon & Weaver, 1949). Subsequently, Ruesch and Bateson (1951) responded to Shannon's information theory model and developed the Observer Model of Communicology. This model formed the conceptual framework for this study.

Reusch and Bateson's Observer Model of Communicology

The Ruesch and Bateson's (1951) Observer Model of Communicology demonstrated that communication operates in four ascending levels. These levels are intrapersonal communication, interpersonal communication, group communication and cultural communication (Ruesch & Bateson, 1951). The findings of this study show the effectiveness of incorporating the Observer Model of Communicology to improve flight deck communication.

This model specifies that communication by the human species functions on ascending network levels. These four network levels are intrapersonal communication, interpersonal communication, group communication and cultural communication (Ruesch & Bateson, 1951). The model assigns each network according to the origin of message, the sender, the medium or channel used, the recipient and the destination of the communication. The conceptual framework for this study was the Observer Model of Communicology because it aligned with this study in addressing the significance of intrapersonal, interpersonal, group, and cultural communication in relation to flight deck

communication. Intrapersonal, interpersonal and cultural communication are the foundational elements that guided this study in analyzing the collected data.

Interpersonal communication is an interactive process through which people exchange information in a way that stimulates mutuality, understanding, and rapport (Anyim, 2018). Interpersonal communication, as an indispensable force, is geared to individual and organizational achievements, and it accommodates knowledge sharing, sharing of experiences and ideas, and the coordinating and interpreting of general activities and decision making. (Owoeye & Dhunsi, 2014). This type of communication forms a delicate thread in aviation communication. Effective interpersonal communication on the flight deck could prevent aviation accidents and save lives.

The advancement of technology and rapid globalization are changing the cultures of organizations and are affecting inter-cultural communication (Bauman & Shcherbina, 2018). The ongoing challenges with inter-cultural communication has emerged as significant and has influenced several processes of management such as decision making (Kesari et al., 2014; Okoro, 2013).

In aviation, there are times when a captain is from one culture, the junior pilot is from another and the ATC is from another. There are also instances where the cabin crew is made up of diverse cultures. Airplanes sometimes fly from their country of origin to international destinations where pilots and cabin crew face different languages and different methods of cultural communication.

Ruesch and Bateson (1951) initiated the dawning of a modern and widely engaged communication theory which remains today. The researchers stated that the

effects of the experiences of humans are assumed to be codified messages or signs and therefore we must communicate in order to study communication. "Communication is the discriminatory response of an organism to a stimulus" (Stevens, 1950). Ruesch and Bateson demonstrated an accepted concept in understanding communication which could provide a platform to aid pilots in understanding each level of effective communication. In understanding the various levels of communication, pilots may be able to develop and implement techniques which could result in more effective flight deck communication.

A Renewed Approach to Aviation Communication

Aviation safety has been a major concern for the general public, the authorities and all stakeholders involved in the design, production and the operation of aircraft (Alderson, 2009; Gladwell, 2008). Human errors are acknowledged to be either the primary or the secondary cause of aviation accidents (Reason, 1990) that have claimed many innocent lives. Human error is a significant contributing factor to aviation accidents, but it is not the only factor. In several cases, organizational culture of incompatible managers and leaders coupled with feeble organizational work processes have resulted in failure of people. People can only perform up to a level supported by their organization.

The challenge for the aviation industry is that they need to reduce human errors (Amalberti & Wioland, 1997). The CRM has made some progress in aviation communication training over the past decade so as to reduce the risk of aviation accidents, however its effectiveness is doubtful (Helmreich, Wilhelm, Klinect, & Merritt, 2001; Kanki, Helmreich, Anca, 2010; Shuffler, Salas & Xavier, 2010). Although the

airline industry is relatively safe, finding new and improved ways to continuously promote, audit, and regulate aviation safety is an unending responsibility for airline executives and airplane manufacturers. There are now some increased opportunities for CRM improvement in aviation communication training.

The implementation of the good CRM practices is also a challenge. Airline companies who suffer from low budgets sometimes fail to prepare good policies, procedural guidelines, and training for their crew members. The arms of international regulatory bodies are limited and as such the corporate responsibility should lie with the airline companies themselves to ensure that their flight crew are trained properly and consistently to prevent aviation accidents. Aerospace developments and new technological advancements impose future safety demands. The manufacturers of airplanes, such as Boeing and Airbus, should continue to publish current and clearly written procedural manuals for each of their products so that pilots may learn and practice them and thus prevent aviation accidents.

Summary and Conclusions

In this literature review, I examined aviation accidents and communication. I found that a significant contributor to aviation accidents is human error and that it forms the primary as well as the secondary cause of aviation accidents. I found that human errors contribute to approximately 75% of aviation accidents. The literature shows that the aviation industry has suffered many aviation accidents which have claimed the lives of many innocent people. These accidents have also proven to be a financial burden to the aviation industry. One factor of aviation accidents is human error and one factor of

human error is communication. The literature review showed that flight deck communication errors result in aviation accidents which have claimed many innocent human lives and have caused financial burden on various aviation organizations. It is vital to invest in research that can reduce flight deck communication errors which could minimize aviation accidents, save money and importantly, save lives. I used Ruesch and Bateson (1951) Observer Model of Communicology to assist with answering the research question, as I explored the lived experiences of North American pilots relating to flight deck communication. I selected the design for this research after a thorough review of existing literature on flight deck communication. In the next chapter, I address the methodology, the sample, the instrument for data collection, and the analysis employed in this study.

Chapter 3: Research Method

The purpose of this qualitative descriptive phenomenological study was to explore the lived flight deck communication experiences of North American pilots to provide a better understanding of flight deck communication and better understand flight safety and loss prevention. The failure of effective flight deck communication has resulted in numerous airline accidents (Enomoto, 2017; Gladwell, 2008; Chute & Weiner 1996). Between 1990 and 2018, airline accidents claimed over 30,000 human lives (Bureau of Aircraft Accidents Archives, 2018). Flight deck communication remains a significant concern for the FAA, NTSB, and industry leaders. Given that Archer (2015) called for qualitative research in communication in the aviation industry, in particular for interviews to be conducted with current aviation professionals to expand the data in this field, I conducted a qualitative descriptive phenomenological study to answer the scholar. This research study is important as the findings contributed to the existing data in this field. Understanding and using techniques to implement effective flight deck communication may also prevent aviation accidents and save peoples' lives.

In this Chapter 3, I present detailed information of the selected methodology and the design and rationale that were used to answer the research question of this qualitative phenomenological study. The research question for this study is presented along with details on the logic and strategy in selecting participants, collection of data, and data analysis strategies. This chapter also presents the instrument and the role of the researcher of this study along with the issues of trustworthiness including credibility,

dependability, confirmability, and ethical procedures of this research. Finally, I present a summary on the main points of this chapter.

Research Design and Rationale

The purpose of this study was to explore the lived flight deck communication experiences of North American pilots to provide useful information to the airline industry for them to develop and implement tools to increase flight safety and loss prevention. In achieving this purpose, the research question for this study was formulated as: What are the lived experiences of pilots relating to flight deck communication that could help flight safety and loss prevention? A qualitative research is one that focused on a phenomenon that is happening or has happened in a natural setting (Leedy & Ormrod, 2016) and facilitates studies of issues in depth and in detail (Patton, 2015). I opted to follow a qualitative research design for this study as I focused on the phenomenon of flight deck communication, and my aim was to explore the lived experiences of pilots in their natural setting of the flight deck.

Ravitch and Carl (2016) described a qualitative research design as a systematic and engaged process of planning for in-depth, rigor, and the conceptualization of data. The qualitative research design afforded me with a process where I obtained in-depth data, rigor and conceptualization of collected data. Interviews form the core of numerous studies that use the qualitative methodology as they afford in-depth, reflective, insightful, individualized, and conceptualized data (Ravitch & Carl, 2016). In qualitative interviews, researchers seek more depth but on a narrower range of issues than people do

in normal conversations but not a yes-or- no or agree-disagree response (Rubin & Rubin, 2012).

The core forms of in-depth qualitative interviews are semi structured and unstructured interviews (Rubin & Rubin, 2012). Face-to-face interviews have the significant advantage of enabling a researcher to establish rapport with participants and gain their cooperation and such interviews yield the highest response rates (Leedy & Ormrod, 2016). I conducted face-to-face interviews using open ended semi structured questions which allowed me to obtain deep, rich, individualize data in order to explore the experiences of pilots.

Purposeful sampling occurs when participants are intentionally selected for reasons such as having a certain type of experience, having knowledge of a certain phenomenon, or residing in a particular location (Ravitch & Carl, 2016). All selected participants for this study were commercial aviation pilots, were employed with North American airline organizations, and possessed current and valid aviation commercial pilot's licenses.

Although there are no concrete rules in qualitative research in respect to the number of participants, Maxwell (2013) suggested five to 25 and Guest, Bunce, and Johnson (2006) suggested that 15 is the smallest acceptable sample. Sample size should follow the concept of saturation (Mason, 2010). Saturation occurs at a stage when the collecting of additional data no longer provides new information on the issue that is being researched (Glaser & Strauss, 1967). The sample for this study consisted of 15 participants.

A qualitative research design allows the collected data to be analyzed by coding (Saladana, 2016). Qualitative analysis is usually inductive in the early stage especially when figuring out possible categories, patterns, and themes (Patton, 2015) which is often called open coding (Strauss & Corbin, 1998). Coding is a process of assigning meaning to data (Ravitch & Carl, 2016; Saladana, 2016). Once I collected the data, I used open coding and selective coding to identify themes and concepts related to flight deck communication. I used Microsoft Excel software to assist me in organizing the collected data.

Considering that the features of a qualitative research design allowed for the exploration of experiences and perspectives of individuals, the collection of deep, rich contextualized data through open ended semi structured interviews, purposeful sampling and coding of collected qualitative data, the qualitative research design was most suitable for this research. This design allowed me to collect data through open ended semi structured questions in interviews with pilots to explore their experience on the phenomenon of flight deck communication. This is the ideal way to gather, organize, and analyze deep, rich, individualized, and conceptual data. On the contrary, the quantitative methodology was not the appropriate methodology for this research as the nature of the quantitative methodology is more correlational, numerical, and experimental or quasi-experimental and tends to test hypotheses.

Role of the Researcher

Qualitative researchers tend to pursue better understanding of complex situations (Leedy & Ormrod, 2016). Aviation communication is a complex situation and this

qualitative research sought a better understanding of aviation communication as a complex phenomenon. The concept of a researcher being an instrument is abundant in qualitative research literature (Barrett, 2007) and an observatory platform for the discovery and the interpretation of meanings (Josselson, Lieblich, & McAdams, 2003). I was the instrument and the observatory medium for this study. I simply observed and interpreted the information and knowledge that was provided to me by the participants.

In this research, I focused on the phenomenon of aviation communication. The sphere of this study was outside my work scope, and I am not involved in aviation through my work or otherwise. I am not an aviator, and I have never worked in the field of aviation. I have no personal or professional relationships with any of the participants. I am qualified and trained as an attorney at law. I used my training and experience as an attorney at law to gather, understand, and present information. I received no incentives for any part of this study. I found no challenges with ethical issues. I made every effort to be fair and balanced in the conduct of this study.

The examination of biases is the ethical responsibility for researchers since it has both indirect and direct implications for other people's lives (Nakkula & Ravitch, 1988). Triangulation of data and participants' validation strategies are two strategies that Ravitch & Carl (2016) recommended. To avoid bias, I applied the data triangulation tool to ensure accuracy. I triangulated my collected data from interviews with collected secondary data and my field notes. I also used transcript verification to ensure trustworthiness. For example, I used the written medium of emails for all correspondence with participants. I sent emails to request participation and permission to

record interviews, to verify accuracy of the transcribed interview data and to thank responders. This was to ensure accurate record keeping and transparency.

I obtained written consent from participants before interviewing them. Additionally, to enhance accuracy and to prevent errors and biasness on my part, I transcribed the data I collected from a voice recorder. I then obtained the participants' confirmation by email that the transcribed data was accurate before I analyzed it. Leedy and Ormrod (2016) recommended that qualitative researchers intentionally look out for outliers, exceptions, and contradictions, both within the sample and the data collected. I set up a Microsoft Excel spreadsheet to identify outliers, exceptions, and contradictions.

Methodology

Participant Selection Logic

The aim of this study was to explore the lived flight deck communication experiences of North American pilots and provide a better understanding of flight deck communication to better understand flight safety and loss prevention. In addressing accidents that arose from human factors errors, Archer (2015) called for qualitative research to be conducted in aviation communication, and in particular for interviews to be conducted with current aviation professionals to expand the data in the field of aviation. In the selection of participants, researchers must pay careful attention to issues of representation such as social identities, experiences, realties, and roles (Mantzoukas, 2004). Participants for this study were carefully selected to prevent issues of any representation.

Purposeful sampling occurs when participants are intentionally selected for reasons such as experience, knowledge, or location (Ravitch & Carl, 2016). The following criteria were set for the eligibility of each participant in this research: (a) must be a commercial aviation pilot, (b) must be employed with a North American airline organization, and (c) must possess a current and valid aviation commercial pilot's license. Selection of participants was made through purposeful sampling. Their places of employment were purposefully selected within the North American geographical region. Purposeful sampling allows a researcher to collect detailed accounts and rich context-based data of specific populations and locations and participants are selected for their unique ability to answer the set research question (Ravitch & Carl, 2016). This study aimed to understand aviation flight deck communication and therefore purposeful sampling was the ideal method for sampling.

A letter of introduction (see Appendix A) was sent by email to each potential participant that sought his or her participation. Each potential participant was asked for his or her consent to participate via the informed consent form (see Appendix B). I obtained consent from the participants via email. In-depth qualitative interviewing is one key naturalistic research method where researchers talk to those who have knowledge and experience with the research problem (Rubin & Rubin, 2012).

Interviews are designed to focus on the research question and to pursue it in great depth. Interview questions are planned in advance by the researcher to gather the experiences and perspectives of people in regard to the research phenomenon. I carefully planned and prepared the interview questions to seek depth on a narrower issue of flight-

deck communication. I asked four questions. I organized the questions so that they were linked to each other for me to obtain data for a holistic view of the participants' flight desk experiences. The interview protocol is included in Appendix C.

Although there are no concrete rules in qualitative research in respect to the number of participants, Maxwell (2013) suggested five to 25 and Guest, Bunce, and Johnson (2006) suggested that 15 is the smallest acceptable sample. Sample size should follow the concept of saturation (Mason, 2010). Saturation occurs at a stage when the collecting of additional data no longer provides new information on the issue that is being researched (Glaser & Strauss, 1967). The sample for this study consisted of 15 participants. Data saturation is reached when there is enough information to replicate the study and when further coding no longer makes sense (Fusch & Ness, 2015). Saturation will occur when 80% or more of the participants' comments fall within the same coding and theme.

Coding is a process of assigning meaning to data (Ravitch & Carl, 2016). A code can be a word or a phrase that describes what is going on in the data (Corbin & Strauss, 2015). Open coding and selective coding were used in this study to identify themes and concepts related to flight deck communication. I used Microsoft Excel software to assist in organizing the collected data for this research, and I presented the themes from the data collected.

Instrumentation

The researcher is the instrument and the medium for discovery and interpretation of meanings in qualitative research (Barrett, 2007; Josselson, Lieblich, & McAdams,

2003). The data collection tools for this research included interviews, audiotape, and archival data. As the instrument of this study, I conducted interviews with the selected participants. Interviews represent the fundamental ingredient of many qualitative studies as they allow researchers to collect in-depth, individualized, contextual, and rich data (Ravitch & Carl, 2016).

A qualitative researcher should prepare a limited number of questions grounded in the conceptual framework of the research before semi-structured interviews and plan to ask follow-up questions. In a semi-structured interview, a researcher looks for specific facts, description of events, or examples that will help to answer a research question (Rubin & Rubin, 2012). I planned and prepared four questions which I asked each participant during their interview with me. These questions explored the lived experiences and perspectives of aviation pilots in respect to flight deck communication. These questions were also grounded in the conceptual framework (Reusch & Bateson, 1951) that I employed to this research study.

A researcher can ask questions relating to the belief and perspectives of people about facts (Silverman, 1993). Interviews in a qualitative research tend to be broadly prescribed and structured and it is more informal and friendly (Leedy & Ormrod, 2016). Participants feel more relaxed and comfortable, and so may provide more and genuine data in such a setting. Pilots are aviation professionals. They need to feel comfortable and not rushed so that data is genuine and abundant. I used audiotape to record the interviews as a second instrument for accuracy.

The interview protocol presented semi-structured questions grounded in the conceptual framework of this study and Reusch & Bateson's (1951) Observer Model of Communicology. The Observer Model of Communicology demonstrates that communication operates in four ascending levels. These levels are "intrapersonal communication, interpersonal communication, group communication and cultural communication." (Reusch & Bateson, 1951. p. 274). The semi-structured interview questions were grounded in the four levels of communication of the Observer Model of Communicology addressing (a) the intrapersonal communication experiences of North American pilots, (b) the interpersonal communication experiences of North American pilots, (c) the group communication experiences of North American pilots, and (d) the cultural communication experiences of North American pilots.

Procedures for Recruitment, Participation, and Data Collection

The research question for this study aimed to explore the lived experiences of pilots relating to flight deck communication that could help flight safety and loss prevention. I recruited 15 aviation pilots employed with different North American airline organizations and explored their experiences in relation to flight deck communication. Participants were selected through LinkedIn which is a networking website for professionals. Social media platform widens the access of possible participants that would be otherwise challenging to access (King, O'Rourke, & DeLongis, 2014). LinkedIn sampling failed to generate the required number of participants and so I used the snowballing sampling method as an alternative method for sampling.

I emailed the letter of introduction (see Appendix A) to candidates on LinkedIn online platform who met the inclusion criteria of this study. Once I received an indication from candidates who wished to participate, I sent them the informed consent document. The informed consent document set out the research process in details to ensure that each participant was aware and understood the risks and the research before agreeing to participate.

Upon receiving the signed informed consent document from each participant, I contacted each participant through their preferred method of contact and scheduled interviews. The nature of each interview was semi-structured and lasted between 30-45 minutes with each participant via Skype. Although Skype interview method has been criticized for internet connection issues, higher probability of interruption, and limitation in response time (Cheng, 2017), Skype interviews allow a researcher to collect data from participants regardless of their location. It is also a very cost and time effective method of screening candidates and it is effective in creating less pressure on candidates (Seitz, 2016).

Data analysis began once three participants completed the interview process. I continued the interviewing process for 15 participants, by which time data saturation was reached. In order to prevent biasness and error, once the interviews were completed, I transcribed verbatim all interviews that were audio recorded. I also transcribed my handwritten field notes to an electronic format. I allowed approximately eleven weeks for interviews and transcriptions to be completed. Once each transcription was

completed, I emailed each participant a copy and sought approval for its accuracy. Upon receipt of the approval of each participant, I then prepared for the data analysis.

Data Analysis Plan

The purpose of this study was to explore the lived flight deck communication experiences of North American pilots and provide a better understanding of flight deck communication. The research question was focused on the lived experiences of pilots in relation to flight deck communication. Questions in relation to experience and behavior focus on what a person has done, will do, and is currently doing (Ravitch & Carl, 2016). The interview protocol for this study was prepared to gather deep, rich, and detailed data on the lived experiences of North American pilots in relation to flight deck communication.

According to Rubin and Rubin (2012), a researcher can structure research interviews in categories of questions. One category of question is the main question, the second category is follow-up and probe question and a third category is a conversation guide to guide the interviewer conducting the interview (Rubin & Rubin, 2012). This study adopted the interview pattern posited by Rubin and Rubin (2012). I prepared a formal interview protocol (see Appendix C) using the interview pattern by Rubin and Rubin (2012) in asking a main question, follow up questions and probes.

Coding is a procedure that researchers use to give precise values or meaning to their collected data and is useful in the interpretation of data from the perspective of the researcher on the phenomenon that is being studied (Saladana, 2016). Qualitative analysis is usually inductive in the early stage, especially when figuring out possible

categories, patterns, and themes (Patton, 2015) which is often called open coding (Strauss & Corbin, 1998). I conducted an inductive data analysis using open coding to code the transcribed data collected from interviews, field notes and secondary data. According to Braun and Clarke (2006), a researcher should categorize the emerged codes into themes. This study aimed to explore the perception of selected participants and not the researcher's interpretation of their language in the researcher's own words and phrases.

Thematic analysis is a qualitative method of perusing a set of data to find repeated patterns which are meaningful as outlined by Braun and Clarke (2006). Once I completed coding and categorizing the transcribed data, I identified emerging themes and patterns. According to Braun and Clarke (2006), a researcher must repeatedly read the transcripts of the interviews to maximize full understanding of the collected data to form general ideas of emerging patterns. I used Microsoft Excel to assist me in organizing the collected data for coding, categorizing and theming.

Microsoft Excel program is a computer program which allows the input of data. I transcribed each response to each interview question in different cells in the Microsoft Excel program. Each cell contained each participant's response. I assigned a code, then a category to each response to each interview question in an adjoining column. The Microsoft Excel program allows sorting of cells. I then sorted the data by code, category and then highlighted the emerging themes in a separate colors and rows.

According to Braun and Clarke (2006), at this stage, the researcher should refine and review the emerged themes to ensure accurate representation. I reflected and

critically thought though the data collected, the archival data and the emerged themes. I then prepared results and conclusion.

Issues of Trustworthiness

The quality of a research can be measured by its credibility, transferability and dependability or reliability (Burkholder et al., 2016). The framework of a study is the fundamental technique for ensuring trustworthiness of qualitative research (Sheldon, 2004). One aim of the framework of this qualitative phenomenological study was to repudiate challenges of credibility. I made every effort to present the findings accurately with adequate contextual account of the collected data. Details of procedures were provided, and the findings demonstrated the realistic experiences of the participants. I considered the elements of transferability, dependability, and confirmability in the process of this research to negate challenges of credibility.

Credibility

The credibility of a research is based on the seriousness of the research mechanisms (Drost, 2011). A data collection plan and the design complexity of a research study contribute to the validity of research (Ravitch & Carl, 2016). The research design and framework are a qualified starting point to determine the credibility of a study (Burkholder et al., 2016). This was a qualitative research study which required deep, rich, and accurate data to better understand a phenomenon. Digitally recording the interviews allows a researcher to conduct a more thorough and objective analysis of the data (Simon & Goes, 2013) which enhances credibility. All interviews for this study were digitally recorded.

Triangulation combines a number of procedures which researchers employ to enhance the validity of a study (Ravitch & Carl, 2016). Triangulation can be employed in a qualitative study (Yeasmin & Rahman, 2012). This study was a qualitative study and employed triangulation. Researchers use triangulation to generate data and to increase their understanding of a phenomenon and for the purpose of completeness (Yeasmin & Rahman, 2012). This study was triangulated through (1) participants' interviews, (2) secondary data and (3) field notes. Data triangulation can be done by collecting data from different places, people, and different space. I triangulated the collected data though interviews, my field notes and transcript verification to ensure trustworthiness of this study. I spent time reflecting on the collected data before coding and stopped data collection once data saturation was reached. I also used peer-reviewed material in the literate review of this research.

I conducted face to face interviews to collect rich data and audio record each interview for cross references, checks and balances. I interviewed 15 participants and data saturation was reached by that point. The participants had and no personal affiliation with me. Transparency starting from the pre-data-collection to post data collection was a priority. I provided a good audit trail including emails with participants. Evidence of moving data through the process of coding, categorizing and theming was sufficiently provided. The findings and results of this study were presented. I used the splitting method of coding to translate the collected data. As such, the participants' exact words were used to create codes and later created categories and themes. This action was intentional to refute credibility challenges.

The framework of a research is the fundamental technique for ensuring trustworthiness of qualitative research (Shenton, 2004). I spent time reflecting on my data before I started coding and assigning themes. Extensive and thorough literature reviews with an aim of building on preceding and connected studies is a technique that researchers can use to minimize threats to the credibility and trustworthiness of a research (Burkholder et al., 2016). I conducted extensive literature reviews and connected other studies to this study for authenticity.

I used Microsoft Excel to assist me in organizing the collected data. I conducted transcript verification in accordance with Lincoln and Guba (1995) by emailing a copy of each transcribed interview for each participant to that particular participant for confirmation of accuracy. According to Harper and Cole (2012), the process I used was a quality control process which is called member checking and it ensures credibility and accuracy of the research. This process can also ensure the validity of the data collected on the audio recording during the interviews.

Transferability

Transferability refers to is the extent to which significant factors emerging from a naturalistic study could be extrapolated to other settings (Lincoln & Guba, 1988). The design of a research can influence its transferability. The design of a research should consider the applicability of how samples are obtained, measurements used, and the duration of the research. (Burkholder et al., 2016). Participation selection was varied. I recruited 15 participants for this study from six different North American airline organization. The requirement for all participants was that they were airline pilots.

There were no requirements in respect to gender, age, or culture which allowed for a wide amount of diverse data to be collected for thick description and variation of participants. I also provided a full and accurate description of the context of the research and the collected data starting from the pre-collection of data to post collection. I refrained from collecting data from friends and family. The transferability or the external validity was demonstrated through detailed interpretations and transcribed interviews verbatim. I coded, categorized and grouped the participants' responses into themes. This methodology could assist future researchers in understanding the context and the topic of this research. The data translation could be repeated for transferability purpose.

Dependability

The credibility, reliability and trustworthiness of research is based on the seriousness of the research mechanisms (Drost, 2011) and is concerned with accurate findings of a study (Burkholder et al., 2016). Researchers use triangulation to increase their understanding of a phenomenon and for the purpose of completeness (Yeasmin & Rahman, 2012). I used data triangulation by comparing archival data, existing literature, collected data, and my field notes to verify the information from the summary of themes generated by this study. I recorded each interview with an audio recorder and transcribed the collected data verbatim.

Confirmability

Confirmability will be established by using reflexivity. Confirmability may be accomplished in instances where a researcher keeps a reflective journal (Guba & Lincoln (1982). The journal should also reflect any personal assumptions or biases (Guba &

Lincoln 1982). I regularly recorded diary notations of my thoughts and insights as I conducted this study. I regularly reflected on the interpretation of collected data. Confirmability relates to the ability of researchers to yield objective findings from the data, rather than produce biased findings of their own reflections and preferences (Lincoln & Guba 1985). I made notes in a journal and recorded my potential bias that I may have been thinking while reading the participants' responses. This exercise was done to produce objective findings.

Ethical Procedures

Potential ethical issues in qualitative research could involve volunteers, protection of participants, confidentiality and anonymity, deception to participants, analyzing and reporting findings and general adherence to the Institutional Review Boards (IRB) and the Professional Codes of Ethics (Burkholder et al., 2016). Ethical conduct is normally associated with morals (Babbie, 2016). Researchers are ethically obligated to report the findings of their studies correctly and disclose any errors and limitations of their research (Babbie, 2016). I ensured ethical treatment to all participants.

I considered The Code of Federal Regulation, in particular 45 CFR 46 which protects human research subjects. Threats in the selection process of research include incidents where proper permission from parents for minor participants and consent and authorization for vulnerable participants such as pregnant women, fetuses, prisoners and mentally challenged is not properly obtained. The participants for this study were not affected under The Code of Federal Regulation 45 CFR 46. All participants were volunteers and I advised all participants that they were at liberty to end their participation

at any time during the study if they desired. I confirmed to all participants that no participant would be offered any form of incentive for their participation.

Once I have completed the requirement and I obtained my PhD, I will transfer all data to a portable flash drive and erase all data from my computer hard drive. I will lock the flash drive with a password and store it away for the five years. After five years, I commit to destroying the flash drive to ensure the security of the collected data.

This study ventured into a new area of knowledge and experience for me as I was never involved in aviation and I am not currently involved in aviation. My work as an attorney at law does not intertwine with aviation. I have no conflict of interest. I presented myself only as a student to all participants. There was no risk of power differential between any participant and me in this study.

Summary

In this chapter, I have presented a plan for the research design and the rationale. I have explained my role as a researcher and have presented a plan for the methodology of this research. I have identified the intended participants and the instrument for data collection. I have presented a drafted instrument for data collection. This chapter also included details of the procedures for recruitment of participants, details and criteria for participants and methodology of this study. A data analysis plan was also presented. A plan in respect to the issues of trustworthiness, including credibility, transferability, dependability, confirmability and ethical procedures was also presented. In the next chapter of this research, I will present my research findings.

Chapter 4: Results

The purpose of this qualitative, phenomenological study was to explore the lived flight deck communication experiences of North American pilots to provide useful information to the airline industry for them to develop and implement tools to increase flight safety and loss prevention. The main research question for this phenomenological research study was: What are the lived experiences of pilots relating to flight deck communication that could help flight safety and loss prevention?

In this chapter, I laid out my research setting by describing any organization or personal situations that may have influenced the participants at the time of the study, which could impact the interpretation of this research study's result. I also presented the demographics and the characteristics of all participants that were relevant to this research study. The number of participants in this study, the location, frequency, and data collection duration for each data collection instrument are presented. This chapter describes how the data were collected and any unusual circumstances that were encountered in the collection of data.

This chapter also sets out the process that I used to move from inductive coding to a broader generalization of the data including categories and themes. The specific codes, categories, and themes that emerged from the data using participant quotations are presented as needed to emphasize their importance. The qualities of discrepant cases and how they were factored into the analysis are also presented.

Research Setting

Data for this study were collected using semi-structured face-to-face interviews with 15 participants meeting the inclusion criteria of being a commercial aviation pilot, employed with a North American airline organization and possessing a current and valid aviation commercial pilot's license. I recruited some participants via LinkedIn, which is a professional networking platform, and some through snowballing. In the recruitment process, I sent each participant a letter of introduction. Once I recruited participants, I maintained contact with them via their respective email addresses. I sent an informed consent form to each participant, which included the confidentiality agreement. After that, each participant consented via email to participate in this study.

I then scheduled interview times with each participant via their respective email addresses. I conducted all interviews at each participant's choice of venue with privacy and minimal interruptions. I interviewed each participant face-to-face and one-on-one as agreed using Skype. The semi-structured interview protocol was designed to keep each participant engaged during the interview and freely sharing their experiences and views on the phenomenon being discussed without any interruptions. There were no personal or organizational conditions that influenced the participants or their experience at the time of the study which could have influenced the interpretation of the results of this research study.

Demographics

Each interview was recorded using MP3 Skype recorder, which is a free software program that can be used to record audio via Skype. I also used my handheld Samsung

Galaxy S6 digital audio recorder as a backup recording device. The duration of the interviews conducted ranged from 23 minutes and 6 seconds to 54 minutes and 20 seconds. Fifteen commercial aviation pilots, employed with six North American airline organizations and possessing current and valid aviation commercial pilot's licenses, took part in the study. All participants were commercial aviation pilots employed with a North American organization and have a current and valid commercial pilot's license. The demographic issues that I considered for the conceptual framework of this study are (1) the geographical location of employment of the participant, (2) the employment position of the participant, and (3) the validity and currency of the participant's commercial pilot's license.

For confidentiality purposes, I assigned pseudonyms to the participants. The assigned pseudonyms are depicted in XY format where X is presented by the letter P, representing commercial aviation pilots, employed with North American airline organizations, who possess current and valid aviation commercial pilot's licenses. The Y is the identifier number assigned to each participant. Table 1 shows the details of the demographics and characteristics of participants.

Table 1

Participants' Demographics and Characteristics

Participant	Geographical location of employment	Employment position of the participant	Current valid commercial pilot's license
P1	Florida	First officer	Yes
P2	Florida	First officer	Yes
P3	Caribbean	Captain	Yes
P4	Caribbean	Captain	Yes
P5	Florida	First officer	Yes
P6	Florida	First officer	Yes
P7	Florida	Captain	Yes
P8	Florida	First officer	Yes
P9	Caribbean	Captain	Yes
P10	Florida	Captain	Yes
P11	Florida	First officer	Yes
P12	Florida	Captain	Yes
P13	Florida	Captain	Yes
P14	Florida	Captain	Yes
P15	Florida	Captain	Yes

Data Collection

Recruitments started April 1st, 2020, after obtaining IRB approval from Walden University on March 31st, 2020, and completed on August 29th, 2020. IRB approval is #03-31-20-0636200. I recruited participants using LinkedIn, which is a professional networking website, and also used snowballing sampling method to generate additional participants. I emailed the "Letters of Introduction" (See Appendix A) to candidates who met this study's inclusion criteria via the LinkedIn online platform. Once the candidates indicated they wished to participate, I sent them the "Informed Consent Form" (See Appendix B). Each participant provided written consent via email. Subsequently, I scheduled interviews for 30-45 minutes with each participant based on that participant's

convenience. I conducted the interviews as scheduled in my private home office via Skype.

Data for this research study were collected from 15 participants through face-to-face interviews on Skype platform. The participants were all North American pilots, employed with six different airline organizations. Three participants were located in the Cayman Islands, and 12 were based in various locations in the United States of America. The collection of data started on June 18th, 2020. The data collection tools for this research included interviews, audiotapes, and archival data. Interviews represent the fundamental ingredient of many qualitative studies as they allow researchers to collect in-depth, individualized, contextual, and rich data (Ravitch & Carl, 2016).

I developed a data collection tool, which is labeled the interview protocol and can be seen at Appendix C, to conduct interviews with the selected participants. The interview questions were formulated in advance to gather the experiences and perspectives of the participants in regard to the research phenomenon. The interview questions were sequenced to elicit data for a holistic view of the participants' flight desk experiences in regard to communication. The interviews went as I expected, and because the interviews were conducted at each participant's convenience, we encountered no interruptions.

My Skype ID was shared with the participants, and I obtained their respective Skype ID to locate each participant on the Skype platform. I had minor challenges assisting some participants with uploading Skype and connecting to my Skype address, but these were quickly resolved. Each interview was recorded using MP3 Skype

recorder, which is a free software program that can be used to record audio via Skype. I also used my handheld Samsung Galaxy S6 digital audio recorder as backup recording device.

All participants openly and willingly shared their experiences in respect to communication on the flight deck. The interview questions addressed interpersonal communication, cultural communication, standard phraseology used in the aviation industry and communication and aviation safety as a whole. Once each interview was done, I personally transcribed the collected data from the interviews and emailed each transcription to each participant for approval.

I kept reflective journal notes from the date of receiving IRB approval. Throughout the interview proceedings, I recorded my emotions, thoughts, and reflections along with the participants' nonverbal signals such as facial expressions and gestures. Triangulation is significant for credibility of a research study. My handwritten field notes were transcribed to an electronic format using Microsoft Excel for triangulation.

The following activities were carried out over 6 months simultaneously when applicable and in parallel: (1) recruiting participants; (2) obtaining written consent from participants; (3) arranging and conducting interviews; (4) recording my reflective journal notes; (5) transcribing collected data; and (6) obtaining approval of each transcription by each participant.

Data Analysis

The interviews of the participants and my reflective journal notes were instruments I used to gather data. Upon obtaining approval from each participant for

their transcript, I started data analysis. Qualitative data analysis is usually inductive in the early stage, especially when figuring out possible categories, patterns, and themes (Patton, 2015). The research question is focused on the lived experiences of pilots in relation to flight deck communication and the data gathered from the interviews presented the lived experiences of North American pilots relating to flight deck communication that could help flight safety and loss prevention. Qualitative analysis is typically inductive in the primary stage, particularly when figuring out possible categories, patterns, and themes (Patton, 2015).

Inductive analysis is an approach that researchers use to code raw data without conforming it to a predefined code frame or their preconceptions. The key purpose of the inductive approach is to allow the research results to emerge from the repeated, central, or significant themes inherent within the raw data, without any limitations by methodologies that are structured. The inductive approach encompasses working solely from the experiences of participants. Researchers apply inductive analysis by using the raw collected data to generate themes and concepts (Thomas, 2006). I used the inductive approach which allowed my research findings to naturally emerge from the raw collected data.

According to Saladana (2016), coding is a procedure that researchers use to give precise values or meaning to their collected data. The descriptive coding method presented by Saladana was used in this research study to allocate meaning to the collected data. I also used Microsoft Excel to hand code the collected raw data from each participant's approved transcription from their interview.

A researcher should categorize the emerged codes into themes (Braun & Clarke, 2006). I embraced Braun and Clarke's (2006) suggestion and used the emerging coded units to find patterns which are meaningful for theming and categorization. According to Braun and Clarke, categorizing the emerging codes into themes can be useful in the interpretation of data from the perspective of the researcher on the phenomenon that is being studied. I used the thematic approach by searching through the emerging codes to identify emerging themes. I identified common words, phrases, and codes in each response of each participant. I then created categories from those words, phrases, and codes using a Microsoft Excel spreadsheet. Once the categories were highlighted, I then looked for emerging themes. As a result of my personal conduct in carrying out interviews, doing the transcription, keeping a reflective notes journal, and analyzing the data, I was able to get much deeper into the data, and that assisted me with a rich contextual comprehension of the collected data.

As a novice researcher, I believe that the manual descriptive coding method was a better and more effective method to use for this study rather than the Computer Assisted Qualitative Data Analysis software programs. I kept notes to reflect on each participant's response. I analyzed the raw data collected from each participant as well as my reflective notes journal for triangulation which contributes to the credibility and dependability of this study.

There are four conceptual categories which emerged in the data analysis which are all grounded in the conceptual framework of this study. These categories are cultural communication, group communication, interpersonal communication and intrapersonal

communication. There are 10 themes that also emerged which are shown in Table 2 below.

Table 2

Examples of Categories and Themes

Participants	Interview excerpts	Categories		Themes
Participant 1	"Well, for the most part in some countries culture barrier and the "Captain is King" rule influences communication on the flight deck. There have been a crash…I believe in the Everglades where this "Captain is the King" rule is said to have played a part..... I believe that the First Officer tried to warn the Captain but he did not listen and the last recorded words on the black box is "you've just killed all of us....Yeah I have called a go around on a captain before"	Interpersonal communication	(1)	Power differential negatively affects interpersonal communication.
Participant 2	"I use to use standard phraseology and reading everything back and be as correct as I could be and as time went on then you memorize the airport and the frequencies and the spots and the control holders and it kind of breaks down a bit and there is a lot more slang, a lot less standard phraseology ...if they tell you proceed to this spot contact this frequency it was just ...you would just respond as wilco roger got it you know it was definitely a breakdown and I think it dependent on the airport and stuff and that my personal experience"	Group communication	(1)	Departure from the use of aviation standard phraseology negatively affects group communication.

(continued)

(continued)

Participants	Interview excerpts	Categories	Themes
Participant 3	"In places like Cuba where most of those controllers are trilingual lot of them can speak Russian, Spanish and English but Spanish being their primary language and when you are communicating with them sometimes they tend to use a Spanish dialect in their English and of course English is the standard universal language for aviation then because of that then the standard phraseology is broken down because you know and I am not bilingual by any means so I don't understand quite what they are going through but I imagine they have to process...all of that in their minds and try to speak to that to English right and from my knowledge you know amor in Spanish can mean something completely different in English so that is where the standard phraseology really is broken down ….. when you have …. an individual who are bilingual and in some case trilingual"	Group communication	(1) Departure from the use of English language as the universal language in aviation negatively affects group communication.
Participant 4	"I had instance where I would point something out that was being done incorrectly and you kind a get scolded for it and then you just zip it up after that and say well do what the hell you want to do type thing you know as long as long as you don't hurt me then that's that so that does happen"	Interpersonal communication	(1) Power differential negatively affects interpersonal communication.
Participant 5	"I use to go to Moscow a lot...and the Russians you know a colleague told me that a lot of times they are kind of prideful and if they don't totally understand they won't say anything, they won't repeat it"	Cultural communication	(1) Culture influences communication
	"…you need clarification and they are very hesitant, so yes basically it leads to a lot of maybe misunderstandings and or issues that could become an accident or potentially dangerous if you don't understand something you have to get clarification"	Group communication	(2) Lack of clarity and precision in verbal group communication

(continued)

(continued)

Participants	Interview excerpts	Categories		Themes
Participant 6	"There are still challenges. So there's still personalities. There's still differences. And that part is inevitable"	Interpersonal communication	(1)	Challenges to interpersonal communication as a result of personality differences.
Participant 7	"I've had a few instances where they were trying to control or clearly had a second language and he might have had a heavier accent. Perhaps it those like a Spanish accent or some other country. But. It's only been once or twice where I've maybe had to ask them to repeat because we don't understand"	Group communication	(1)	Verbal accents negatively affects group communication.
Participant 8	"My co-pilot goes through the item and reads fuel cap and responds secure. But he hasn't turned his head. So I let him continue the rest of the checklist. And at the end I say, can we go through that checklist one more time? I feel like there's something there that we're missing now. At this point, you would think that it was stress, not just a procedural, but to the honesty of what we're trying to do. A checklist. Right. Communicating back and forth. And so he reads it and he misses it one more time"	Interpersonal communication	(1)	Interpersonal communication challenges as a result of checklist complacency.
Participant 9	"as a pilot, we're always taught to always know where you're at, your situational awareness and communication helps, although we're in a radar environment…right….you still always want to know where other aircraft are via communications…right so you can visually picture...but like when it come to some airlines, you know, their English is very, very poor....you can hear their frustrations sometimes communicating with those airlines coming in. Communication is key in an emergency situation, you know, clear and precise language and clarity is the key, you know, but unfortunately, even with, you know, Some Latin aviators, you know, sometimes their English is broken as well, you know, so but, you know, it is what it is"	Group communication	(1)

(continued)

Participants	Interview excerpts	Categories	Themes
Participant 10	"there was a guy that I used to fly with....he didn't want to hear from the first officers and they had already sent him to what we call charm school to try to get him to be nice and the first officer was flying and he was going to do something that the captain kept telling him what to do and the first officer said, look, you know, I'm a pilot. I know what I'm doing. So the captain took the airplane from him and said, look, I don't want to hear one word from you until we get to the gate. So he said, OK. And so they came in. They landed. Well, they taxi into the gate. They were in a real tight alleyway. And he's the captain's taxiing by the gate they were going to park at. First officer didn't say anything. They get to the end. He can't turn around. So let's shut down and get towed back to the gate So he's like, what are you talking about? For two hours, like, hey, you told me not to say one word. So the captain took out logbook, whacked him in the head"	Interpersonal communication	(1) Challenges to interpersonal communication as a result of personality differences.
Participant 11	"most of us are type A personality we always think we know what we're doing we've got it all figured out and for us to ask for help is kind of out of the norm for us. There's been a big pressure in the industry since I started my last airline that even if it's something minor, ask for help. The worst case scenario was nothing. I guess that's best case. It was nothing. You're on the ground. It's a little bit extra paperwork, you know and then if there was something big, at least we got to get the ball rolling on that. So that's how it is in the United States I don't know how other countries still operate like that"	Intrapersonal communication	(1) Challenges to interpersonal communication as a result of personality differences.

(continued)

(continued)

Participants	Interview excerpts	Categories	Themes
Participant 12	"there might be a certain message that you expect to see. So instead of looking, you just say there, you know, you say an example is take off configuration, OK, is a message we get a lot of times people say check without even looking at it more times than not"	Interpersonal communication	(1) Interpersonal communication challenges as a result of checklist complacency.
Participant 13	"I think every first officer can attest to that experience of being. We say we're chameleons because at the end of the day, the captains dictate the environment of the cockpit. You know, you kind of go with it."	Interpersonal communication	(1) Power differential negatively affects interpersonal communication
Participant 14	"cultural differences are huge…..although the international language for aviation is English airlines flying domestically in these countries do not have to speak English….create an issue of some type"	Cultural communication	(1) Culture influences communication. (2) Departure from the use of English language as the universal language in aviation negatively affects communication.
Participant 15	"Generally speaking, I'm having him run the majority of the checklists. The majority are run by the first officer of my airline. I'm the one that's checking him. and have I said the wrong thing before"	Interpersonal communication	(1) Communication challenges as a result of checklist complacency.

Brief Description of Themes

(1) Power differential negatively affects interpersonal communication. This theme refers to interpersonal communication that exists on the flight deck. There is an aviation cultural rule of seniority which presents that the "captain is the king" and that he should be treated as such. Power differential refers to a relationship where one person believes that he or she has more power over the other and that person tries to assert

that power. This term also refers to the power dynamic that exists on the flight deck that negatively affects communication.

(2) Culture influences communication. This term refers to the experiences of North American pilots with other aviators who are not North American and have dissimilar beliefs, morals, laws, customs and other acquired habits. This includes behaviors which influences aviation communication.

(3) Departure from the use of aviation standard phraseology negatively affects group communication. The use of aviation standard phraseology was put in place by ICAO to prevent ambiguous communication between pilots and ATC and to improve safety by raising the standard of radiotelephony transmissions. This terms refers to group communication where the use of non-standard phraseology causes aviation incidents and accidents.

(4) Departure from the use of English language as the universal language in aviation negatively affects group communication. This term refers to aviation incidents and accidents as a result of the inconsistent usage of the English as the universal aviation language. ICAO had some safety concerns in respect to effective communication among pilots and air traffic controllers. ICAO recommended that English be the universal language for international aeronautical radiotelephony communications to assist with the prevention of aviation incidents and accidents and the proposal was globally accepted.

(5) Challenges to interpersonal communication as a result of personality differences. This term refers to interpersonal communication challenges faced by North

American pilots on the flight desk as a result of each other's character in their feeling, thinking and behavior.

(6) Lack of clarity and precision in verbal group communication. This term refers to the unclear verbal group communication among North American pilots on the flight deck, international pilots and also with ATC in United States of America as well as international ATC.

(7) Verbal accents negatively affect group communication. This term refers to unclear pronunciation of spoken words by international pilots and ATC which affect aviation communication causing repeated need for clarification and, in some instances, aviation incidents and accidents.

(8) Interpersonal communication challenges as a result of checklist complacency. This term refers communication by one pilot to another that a task on the checklist has been completed but in fact that task was not carried out which amounts to inaccurate communication.

(9) Poor group communication negatively affects a pilot's situational awareness. This term refers to unclear, ambiguous, departure from using the aviation standard phraseology, using English and lack of communication to pilots by ATC and other pilots. Pilots rely on communication to have situational awareness of their positions in the air in relation to other aircraft to prevent accidents.

(10) Communication is key in an emergency situation. This term refers to communication as the ultimate tools to prevent aviation incidents and accidents.

Evidence of Trustworthiness

Research instruments used in a qualitative research are instruments that are typically non-metrics (Merriam & Tidsell, 2015). Trustworthiness in a qualitative research designates the credibility, transferability, dependability and confirmability of the findings of the research (Merriam & Tidsell, 2015). Trustworthiness speaks to the extent to which others perceive are convinced of the findings of the research study and whether the findings are worth taking seriously (Leedy & Ormrod, 2016). It is therefore vital to establish trustworthiness in a qualitative research.

Credibility

The credibility of a research is grounded in the seriousness of the mechanism of the research (Drost, 2011) and the research design and framework is a qualified starting point to determine the credibility of a study (Burkholder et al., 2016). This study was a qualitative study which required deep, rich, and accurate data to better understand the phenomenon that is being explored. Recording interviews digitally allows a researcher to conduct a more thorough and objective analysis of the data (Simon & Goes, 2013). In addition to digitally recording interviews, triangulation and member checking were used in this study to aid the study's credibility.

The data collection process for this research involved face to face interviews where the audio for each interview was digitally recorded. Once each interview was completed, I transcribed the collected digitally audio recordings. I then emailed each participant a copy of the transcribed data seeking their approval to disseminate any inaccuracies and for data source triangulation. All 15 participants approved their

respective transcript. This transcript verification process is known as member checking and is used as a research tool to aid credibility of a research study.

Researchers also use triangulation to generate data for the purpose of completeness (Yeasmin & Rahman, 2012). Triangulation combines a number of procedures which researchers use to enhance the validity of a study (Ravitch & Carl, 2016). I triangulated (1) participants' interviews, (2) secondary data and (3) field notes to aid with the credibility of this research study. All transcriptions were used for data analysis and hand coding and then assembled in a protected file and stored in accordance with the data security plan I laid out in Chapter 3.

Transferability

According to Lincoln and Guba (1988), transferability refers to the extent to which significant factors emerging from a naturalistic study could be extrapolated to other settings. The design of a research should consider the applicability of how samples are obtained, measurements used, and the duration of the research. (Burkholder et al., 2016). As planned and presented in Chapter 3, I recruited and collected data from 15 participants who met the participants eligibility criteria which is they must be a commercial aviation pilot, (b) employed with a North American airline organization, and (c) possess a current and valid aviation commercial pilot's license. I provided a full and accurate description of the context of the research, the collected data of the participants' thoughts, perceptions, and experiences starting from the pre-collection of data to post collection. I refrained from collecting data from friends and family. The transferability or

the external validity is demonstrated through the detailed interpretations and transcribed interviews verbatim.

Dependability

The credibility, reliability and trustworthiness of a research is based on the seriousness of the research mechanisms (Drost, 2011) and is concerned with accurate findings of a study (Burkholder et al., 2016). The research methodology and design of this qualitative phenomenological study ensures that the findings are accurate and consistent and may be repeated.

To aid with the dependability of this research study, I kept a very thorough and comprehensive detailed record of the strategies employed, and the methodologies and processes of data collection, audio recorded interviews, dates and duration of interviews, transcriptions, reflective journal, field notes, triangulation methodology, and coding, the emergence of themes and finally data analysis in accordance with strategies stated in Chapter 3.

Confirmability

Confirmability relates to the ability of researchers to yield objective findings from the collected data, rather than produce biased findings of their own reflections and preferences (Lincoln & Guba 1985). The research finding for this research study are informed by the thoughts, emotions, experiences and information provided by participants and not based on my bias. This is evident from the stringent audit trail throughout this study from the onset of my proposal, the research design, the data collection process, my journal and reflective notes and documentation in general of how

the findings emerged. This exercise was carried out to produce objective findings free from my bias and executed as was laid out in Chapter 3.

Study Results

A qualitative research is one that focused on a phenomenon that is happening or has happened in a natural setting (Leedy & Ormrod, 2016) and facilitates studies of issues in depth and details (Patton, 2015). This qualitative research study focused on the phenomenon of communication in a natural setting within the aviation industry and specifically flight deck communication. The aim of a phenomenological research study is to comprehend the insights and perspectives of people in relation to a specific circumstance (Leedy & Ormrod, 2016). This phenomenological study focused on understanding the lived flight deck communication experiences of North American pilots to provide useful information to the airline industry for them to develop and implement tools to increase flight safety and loss prevention.

The central research question used to explore the phenomenon of communication within the aviation industry and specifically the flight deck is: What are the lived experiences of pilots relating to flight deck communication that could help flight safety and loss prevention? This qualitative phenomenological study revealed the lived flight deck communication experiences of North American pilots. This revelation became apparent during data analysis where themes and patterns emerged from the raw data which I collected through face-to-face semi-structured interviews.

Qualitative analysis is usually inductive in the early stage especially when figuring out possible categories, patterns, and themes (Patton, 2015) which is often called

open coding (Strauss & Corbin, 1998). Thematic analysis is a qualitative method of perusing a set of data to find repeated patterns which are meaningful as outlined by Braun and Clarke (2006). There were 10 themes that emerged in this study. These themes were analyzed in relation the central research question.

Themes from Collected Data

The themes that emerged during data analysis in relation to the research question are presented below. These themes were substantiated by direct quotes collected from participants during interviews. These themes emerged from of common words, phrases, and codes from each response of each participant. There were 10 emerged themes.

(1) Power differential negatively affects interpersonal communication. This theme refers to interpersonal communication that exists on the flight deck. There is an aviation cultural rule of seniority which presents that the "captain is the king" and that he should be treated as such. Power differential refers to a relationship where one person believes that he or she has more power over the other and that person tries to assert that power. This term also refers to the power dynamic that exists on the flight deck that negatively affects communication. The response I received when I asked Participant 1 to tell me about his experience with communication on the flight deck was that

> Well, for the most part in some countries …..the "Captain is King" rule influences communication on the flight deck. There have been a crash…I believe in the Everglades where this "Captain is the King" rule is said to have played a part..... I believe that the First Officer tried to warn the Captain but he did not listen and the

last recorded words on the black box is “you've just killed all of us....Yeah I have called a go around on a captain before.”

Participant 4 also stated that

“I had instance where I would point something out that was being done incorrectly and you kinda get scolded for it and then you just zip it up after that and say well do what the hell you want to do type thing you know as long as long as you don’t hurt me then that’s that so that does happen.”

Participant 10 referring to the First Officer flying the plane, stated that

“…the Captain took the airplane from him and said, look, I don't want to hear one word from you until we get to the gate. So he said, OK. And so they came in. They landed. Well, they taxi into the gate. They were in a real tight alleyway. And he's the captain's taxiing by the gate they were going to park at. First officer didn't say anything. They get to the end. He can't turn around. So let's shut down and get towed back to the gate so he's like, what are you talking about? For two hours, like, hey, you told me not to say one word.”

(2) Culture influences communication. This term refers to the experiences of North American pilots with other aviators who are not North American and have dissimilar beliefs, morals, laws, customs and other acquired habits. This includes behaviors which influences aviation communication. Participant 14 summarized his experience in three words “cultural differences are huge” and Participant 5 explained that

> "I use to go to Moscow a lot and the Russians you know a colleague told me that a lot of times they are kinda prideful and if they don't totally understand they won't say anything, they won't repeat it."

(3) Departure from the use of aviation standard phraseology negatively affects group communication. There is standard set phraseology put in place by ICAO to prevent unambiguous communication between pilots and ATC and to improve safety by raising the standard of radiotelephony transmissions. This term refers to group communication where the use of non-standard phraseology causing aviation incidents and accidents. Participant 3 succinctly described his experience as "the standard phraseology really is broken down" and Participant 2 said that

> "I use to use standard phraseology and reading everything back and be as correct as I could be and as time went on then you memorize the airport and the frequencies and the spots and the control holders and it kinda breaks down a bit and there is a lot more slang, a lot less standard phraseology ...if they tell you proceed to this spotting contact this frequency it was just ...you would just respond as wilco roger got it you know it was definitely a breakdown and I think it dependent on the airport and stuff and that my personal experience."

(4) Departure from the use of English language as the universal language in aviation negatively affects group communication. This term refers to aviation incidents and accidents as a result of the inconsistent usage of the English as the universal aviation language. There were safety concerns that the International Civil Aviation Organization (ICAO) had in respect to pilots and air traffic controllers (ATC) with

effective communication to prevent aviation incidents and accidents. ICAO recommended that English be the universal language for international aeronautical radiotelephony communications. The recommendation is now widely accepted. Participant 3 explains that

> "In places like Cuba where most of those controllers are trilingual lot of them can speak Russian, Spanish and English but Spanish being their primary language and when you are communicating with them sometimes they tend to use a Spanish dialect in their English and of course English is the standard universal language for aviation then because of that then the standard phraseology is broken down because you know and I am not bilingual by any means so I don't understand quite what they are going through but I imagine they have to process all of that in their minds and try to speak to that to English right and from my knowledge you know amor in Spanish can mean something completely different in English so that is where the standard phraseology really is broken down when you have an individual who are bilingual and in some case trilingual."

Participant 6 shared his experience stating that

> "Just to clarify the international language across the board at what's called ICAO. So under the ICAO rules, English is the go-to language, whether you're operating in Russia or whether you're operating in Argentina or Canada. All controllers speak the English language, but that doesn't necessarily mean that their English is perfect. If you will, there are times where you've had difficulty understanding."

(5) Challenges to interpersonal communication as a result of personality differences. This term refers to interpersonal communication challenges faced by North American pilots on the flight desk as a result of each other's characters in their feeling, thinking and behavior. Participant 6 said that

> "There are still challenges with personalities. There's still differences. And that part is inevitable."

Participant 10 gave his experience that

> "…there was a guy that I used to fly with....he didn't want to hear from the first officers and they had already sent him to what we call charm school to try to get him to be nice and the first officer was flying and he was going to do something that the captain kept telling him what to do and the first officer said, look, you know, I'm a pilot. I know what I'm doing. So the captain took the airplane from him and said, look, I don't want to hear one word from you until we get to the gate. So he said, OK. And so they came in. They landed. Well, they taxi into the gate. They were in a real tight alleyway. And he's the captain's taxiing by the gate they were going to park at. First officer didn't say anything. They get to the end. He can't turn around. So let's shut down and get towed back to the gate so he's like, what are you talking about? For two hours, like, hey, you told me not to say one word. So the captain took out logbook, whacked him in the head."

Participant 11 said that

> "…most of us are type A personality we always think we know what we're doing we've got it all figured out and for us to ask for help is kind of out of the norm for

> us. There's been a big pressure in the industry since I started my last airline that even if it's something minor, ask for help. The worst-case scenario was nothing. I guess that's best case. It was nothing. You're on the ground. It's a little bit extra paperwork, you know and then if there was something big, at least we got to get the ball rolling on that. So that's how it is in the United States I don't know how other countries still operate like that."

(6) Lack of clarity and precision in verbal group communication. This term refers to the unclear verbal group communication among North American pilots on the flight deck, international pilots and also with ATC in United States of America as well as international ATC. Participant 9 summarized his experience by stating that "clear and precise language and clarity is the key". Participant 5 shared that

> "…you need clarification and they are very hesitant, so yes basically it leads to a lot of maybe misunderstandings and or issues that could become an accident or potentially dangerous if you don't understand something you have to get clarification."

(7) Verbal accents negatively affect group communication. This term refers to unclear pronunciation of spoken words by international pilots and ATC which affect aviation communication causing repeated need for clarification and, in some instances, aviation incidents and accidents. Participant 5 stated that

> "…similar sounding stuff and how people pronounce stuff like you know I use to go down to Mumbai India and like the Indians will say one thing and if any little …almost sound like something else."

Participant 6 shared that

> "Being that our airline is an international airline, we spend a lot of time in South America where you're operating and on radar environments in your ear, you're communicating with controllers who whose native language is, for example, Spanish and their accent is sometimes thick and it's difficult to always understand."

Participant 7 summarized his experience by saying that

> "I've had a few instances where they trying to control or clearly had a second language and he might have had a heavier accent. Perhaps it those like a Spanish accent or some other country. But. It's only been once or twice where I've maybe had to ask them to repeat because we don't understand."

(8) Interpersonal communication challenges as a result of checklist complacency. This term refers communication by a first officer to a captain that a task on the checklist has been completed but in fact that task was not carried out which amounts to inaccurate communication. Participant 8 said

> "…my co-pilot goes through the item and reads fuel cap and responds secure. But he hasn't turned his head. So I let him continue the rest of the checklist. And at the end I say, can we go through that checklist one more time? I feel like there's something there that we're missing now. At this point, you would think that it was stress, not just a procedural, but to the honesty of what we're trying to do. A checklist. Right. Communicating back and forth. And so he reads it and he misses it one more time."

Participant 2 said

> "…there might be a 13 message that you expect to see. So instead of looking, you just say there, you know, you say an example is take off configuration, OK, is a message we get a lot of times people say check without even looking at it more times than not."

Participant 15 shared that

> "...98% of the time you're always going to get the same answer and you're just accustomed to….just rolling off your mouth."

(9) Poor group communication negatively affects a pilot's situational awareness. This term refers to unclear, ambiguous, departure from using the aviation standard phraseology, using English and lack of communication to pilots by ATC and other pilots. Pilots rely on communication to have situational awareness of their positions in the air in relation to other aircraft to prevent accidents. Participant 9 shared his experience and stated that

> "As a pilot, we're always taught to always know where you're at, your situational awareness and communication helps, although we're in a radar environment…right….you still always want to know where other aircraft are via communications…right so you can visually picture...but like when it come to some airlines, you know, their English is very, very poor....you can hear their frustrations sometimes communicating with those airlines coming in. Communication is key and in an emergency situation, you know, clear and precise language and clarity is the key, you know, but unfortunately, even with, you

know, Some Latin aviators, you know, sometimes their English is broken as well, you know, so but, you know, it is what it is."

(10) Communication is key in an emergency situation. This term refers to communication as the ultimate tools to prevent aviation incidents and accidents. Participant 9 summarized his concerned stating that

"Communicating with those Asian airlines coming in, you know, and so I'm gonna say this once again And you know sometimes I'll be like, you understand when he said and we just laugh, you know, very, very you know, it's like I said, it's key. Communication is key. And, you know, and an emergency situation, you know, clear and precise language and clarity is the key, you know, but unfortunately, even with, you know, Latin aviators, you know, sometimes their English is broken as well, you know, so but, you know, it is what it is. But, you know, it's supposed to have a level four proficiency on your license."

Triangulation

Triangulation combines a number of procedures that are used by researchers to enhance the validity of a study (Ravitch & Carl, 2016). Researchers also use triangulation to generate data for the purpose of completeness (Yeasmin & Rahman, 2012). I used three data sources for this research study including (1) a semi-structured interview protocol (2) archival data from NTSB reports, FAA reports, BAA archive data, NASA technical papers, and (3) my reflective field notes.

Data collection was carried out using the interview protocol as a semi-structured question grounded in the conceptual framework of this research study. The interview

protocol for this study is prepared to gather deep, rich, and detailed data on the lived experiences of North American pilots in relation to flight deck communication. Transcript verification also known as member checking was used as a research tool to aid credibility of a research study. An audit trail of emails reveals member checking and approval of transcript by each and every participant.

I reviewed approximately 300 scientific peer-reviewed scholarly journals and articles which allowed me to continue with the triangulation process in answering the central research question. I cited approximately 150 articles out of the 300 journals, articles, and aviation authority related reports as is relevant to my research study. These archival data assisted me in reflecting and questioning the meaning in concepts and emerging themes that are grounded in the conceptual framework of this research study.

Reflexivity was used for confirmability of this research study. Confirmability may be accomplished in instances where a researcher keeps a reflective journal (Guba & Lincoln (1982). I kept a journal that reflects my personal assumptions and biases (Guba & Lincoln 1982). I recorded diary notations of my thoughts and insights as I conducted this research study. I regularly reflected on the interpretation of collected data. Confirmability relates to the ability of researchers to produce objective findings from raw data, rather than produce biased findings of their own reflections and preferences (Lincoln & Guba 1985). I made notes in a journal to record any potential bias that I may have been thinking while reading the participants' responses. My reflexivity and positionality as a researcher were done in this research study to produce objective findings.

Summary

In this chapter, I presented the recruitment and data collection procedures including confidentiality protection of each participant, method of correspondence with each participant, consent to participate and transcript approvals from each participant. Data for this study was collected using semi-structured face-to-face interviews with 15 participants meeting the inclusion criteria of being a commercial aviation pilot, employed with a North American airline organization, and possessing a current and valid aviation commercial pilot's license. I confirmed the demographic for this research study that 15 commercial aviation pilot, employed with North American airline organizations, and possessing current and valid aviation commercial pilot's licenses took part in this study.

I also presented data analysis of data collected from 15 participants to answer the central research question which is: What are the lived experiences of pilots relating to flight deck communication that could help flight safety and loss prevention? Grounded in the Observer Model of Communicology (Ruesch & Bateson, 1951), 10 codes advanced from the collected data. These codes are (1) power dynamic challenges, (2) cultural challenges, (3) aviation standard phraseology, (4) aviation universal language challenges, (5) personalities issues, (6) clarity in communication issues, (7) verbal accent issues, (8) checklist complacency issues, (9) situational awareness issues, and (10) safety issues.

Ten themes later emerged. These are (1) Power differential negatively affects interpersonal communication, (2) Culture influences communication, (3) Departure from the use of aviation standard phraseology negatively affects group communication, (4) Departure from the use of English language as the universal language in aviation

negatively affects group communication, (5) Challenges to interpersonal communication as a result of personality differences, (6) Lack of clarity and precision in verbal group communication, (7) Verbal accents negatively affects group communication, (8) Interpersonal communication challenges as a result of checklist complacency, (9) Poor group communication negatively affects a pilot's situational awareness, and (10) Communication is key in an emergency situation. Triangulation was also used to assist with the trustworthiness of this study.

In Chapter 5, I reiterated the purpose and nature of the study and why it was conducted. The key findings were concisely summarized and I described the ways in which the findings confirmed, disconfirmed, or extended knowledge in the discipline by comparing them with what has been found in the peer-reviewed literature described in Chapter 2. I described the limitations to trustworthiness that arose from execution of the study in accordance with my proposal in Chapter 1 and described recommendations for further research that are grounded in the strengths and limitations of this research study as well as the literature reviewed in Chapter 2. I described the potential impact for positive social change at the individual, family, organizational, and societal level and provided recommendations for practice.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this qualitative, phenomenological study was to explore the lived flight deck communication experiences of North American pilots to provide useful information to the airline industry for them to develop and implement tools to increase flight safety and loss prevention. Flight deck communication errors have claimed thousands of lives (Bureau of Aircraft Accidents Archives, 2018). The qualitative phenomenological approach employed in this study allowed me to voice the flight deck communication experiences of North American pilots to provide useful information to stakeholders to increase flight safety and loss prevention.

Summary of Findings

Ten themes emerged from the raw data collected through face-to-face interviews with first officers and captains. The findings of this research study show that power differential negatively affects interpersonal communication on the flight deck and that culture also influences aviation communication. Further findings demonstrate that pilots and ATC depart from the strict use of aviation standard phraseology from time to time and that such departure negatively affects group communication in aviation. I also found that pilots and ATC at times also depart from the use of English language as the universal language in aviation and that such departure also negatively affects group communication in aviation.

The results also show that challenges to interpersonal communication as a result of personality differences exist and that the lack of clarity and precision in verbal group communication exist in aviation communication. I further found that verbal accents

negatively affect group communication and that there are interpersonal communication challenges as a result of checklist complacency on the flight deck. Additionally, the results show that poor group communication exist and that it negatively affects a pilot's situational awareness and that communication is key in an emergency situation.

Interpretation of Findings

In this section, I will describe the ways in which my findings confirm, disconfirm, or extend knowledge by comparing them with what has been found in the peer-reviewed literature described in Chapter 2. The literature review was conducted to provide contextual information leading to an understanding of flight deck communication in aviation. Aviation communication occurs typically through verbal communication either between the aircrew, ATC, and other ground crew, either face-to-face or over a radio by means of special aviation frequencies (Alderson, 2009).

Flight deck communication remains a significant concern for the NTSB, the FAA and leaders in the industry. The failure of effective flight deck communication has resulted in numerous airline accidents (Enomoto, 2017; Gladwell, 2008; Chute & Weiner 1996). I substantiate the findings of this research study with evidence from face-to-face interviews that I conducted with 15 aviation North American pilots, both captains and first officers, to show how the findings confirm, disconfirm, or extend existing knowledge.

Power Differentials Negatively Affects Interpersonal Communication

The concept of interpersonal communication is one of the levels of a four-level network of Ruesch and Bateson's (1951) Observer Model of Communicology. This

model provides the conceptual framework for this research study. Interpersonal communication is an interactive process through which people exchange information in a way that stimulates mutuality, understanding, and rapport (Anyim, 2018). It accommodates sharing of knowledge, experiences, and ideas, and the coordinating and interpreting of general activities and decision making (Owoeye & Dhunsi, 2014). Interpersonal communication can occur between two pilots. The findings of my study confirm existing literature that the interpersonal communication level of Ruesch and Bateson's Observer Model of Communicology is evident in aviation and in particular in-flight deck communication.

Gladwell (2008) refers to numerous instances where aviation accidents resulted from poor communication between a pilot and a copilot or between the pilots and ATC. Foushee and Manos (1981) found that when flight deck communication is not forceful enough, when there is excessive obedience and when there is reluctance by the copilot to correct the captain, then those factors can contribute to airline disasters. According to Gladwell, power differential existed among Korean pilots and that practice has a direct correlation with aviation accidents.

The literature also shows that although the fundamental principle of CRM is to decrease the amount cabin crew and pilots' errors (Helmreich, Merritt, & Wilhelm, 1999), its overall effectiveness remains uncertain (Shuffler, Salas, & Xavier, 2010). According to Helmreich (1994), one example of barriers to the effectiveness of the CRM include power differential among pilots. Consistent with existing literature, power differential exists on the flight deck in aviation and it negatively affects interpersonal

communication on the flight deck. The results of this research study are supported with original qualitative data collected from 15 North American pilots including captains and first officers.

Culture Influences Communication

The concept of cultural communication is one of the levels of a four-level network of Ruesch and Bateson's (1951) Observer Model of Communicology. This model provides the conceptual framework for this research study. Culture can be described a pattern of basic assumptions and shared beliefs of a society (Chen & Starosta, 1998) such as certain practices, values, and norms. According to Reutsch and Bateson, cultural communication occurs between many people of various cultures.

The advancement of technological development and rapid globalization are affecting cultural communication (Bauman & Shcherbina, 2018). In the aviation industry, a flight crew is sometimes comprised of individuals from diverse cultures. North American aviators sometimes operate international flights where pilots and cabin crew face different forms of cultural communication. The findings of my study confirm the existing literature that the cultural communication level of Ruesch and Bateson's (1951) Observer Model of Communicology is evident in aviation and in particular in-flight deck communication.

According to (Peksatici, 2018), culture in aviation is of significant importance, especially in respect to flight deck communication. It is influenced by customs, education, language, and religion; it also influences the way in which an individual perceives the world (Peksatici, 2018). In reference to the case of the Avianca Flight 052,

Helmreich (1994) found that when flight deck communication is not effective, and when there is reluctance by the copilot to challenge the captain, then those cultural factors can contribute to airline disasters. Helmreich concluded that those cultural factors can contribute to airline disasters. Helmreich focuses on the anatomy of an accident through the report of the NTSB on Avianca Flight 052 and further concluded that cultural factors such as a failure to advocate an alternative course of action to the senior pilot or even to question the ATC could result in aviation accidents. Some researchers attributed this breakdown of communication to cross culture (Merritt & Ratwatte, 2004; Stratechuk & Beneigh, 2004).

Kanki, Helmreich, & Anca (2010), acknowledged that although CRM is well-regarded in aviation as the lifeblood of training, its effectiveness is still uncertain as it faces challenges of culture barriers. Researchers have also demonstrated that a national culture significantly influences the effectiveness of the training programs of CRM (Maurino, 1994; Merritt & Helmreich, 1995b). The implementation of CRM worldwide has been ineffective due to the nationwide failure in acknowledging that national culture is a powerful and overarching influence (Helmreich, Wilhelm, Klinect, & Merritt, 2001).

Consistent with existing literature, this research study shows that cross culture and cultural diversification exist in the aviation industry that culture influences communication in aviation and in particular on the flight deck. The results of this research study are supported with original qualitative data collected from 15 North American pilots including captains and first officers.

Departure from the use of Aviation Standard Phraseology Negatively Affects Group Communication

The concept of group communication is one of the levels of a four-level network of Ruesch and Bateson's (1951) Observer Model of Communicology. This model provides the conceptual framework for this research study. Communication among pilots, ATC and ground crew can be categorized as group communication in aviation. The findings of my study confirm existing literature that the group communication level of Ruesch and Bateson's Observer Model of Communicology is evident in aviation and in particular in-flight deck communication.

In the aviation industry, according to Alderson (2009), a significant portion of aviation language could be considered a set of classified codes which is used in a restricted context, known as standard phraseology. One requirement of ICAO is that radio communication between pilots and ATC strictly comply with the use of aviation standard phraseology. The International Air Transport Association (IATA) conducted a Phraseology Study in 2011. They found that the most significant issue for the 2,070 airplane pilots that were surveyed, was communication (IATA, 2011). The report confirmed that the use of standardized phraseology is one of the most fundamental factors in the communication process as it allows effective and efficient communication while simultaneously reducing the risk of mistakes.

According to IATA (2011), vague or non-standard phraseology is a common contributing or casual factor in aviation accidents. In January 1990, the NTSB confirmed that Avianca Ailines a Boeing 707-321B crashed in Long Island, New York. The flight

was bound from Bogota, Colombia to John F. Kennedy International Airport in New York, United States of America. The NTSB determined, among other causes of the accident, that the main cause was that the flight crew did not clearly and accurately communicate that they had a fuel emergency. Instead, they communicated that the fuel in aircraft was depleted. The NTSB further determined that crew had failed to use the standard phraseology for pilots and controllers in minimum fuel and fuel emergency situations. Researchers have shown that sometimes pilots facing emergency situations may fail to use standard phraseology and revert to using plain or natural language (Sarmento, 2005).

The NTSB also documented that in another incident involving Air China 981, which was landing at John F. Kennedy International Airport in New York, United States of America, the English language of the Chinese pilot was incomprehensible. The pilot also failed to comprehend the native-English-speaking ATC. In addition, the ATC also failed to use the standard phraseology in communication with the pilot and a degree of communicative incompetence ensued. (Sarmento, 2005).

One of the world's deadliest aviation accidents occurred in 1977 at the Tenerife airport in Spain (NTSB). On March 27, a Boeing 747 aircraft collided with another similar aircraft on the runway. The main cause for this accident was the result of a miscommunication and misunderstanding of the phraseology "at takeoff" (NTSB). The crash claimed the lives of 583 passengers and the entire crew for both airplanes which is more than any other accident in the history of aviation at that time (NTSB, Safety Recommendation A-86-034). The results of this research study are supported with

original qualitative data collected from 15 North American pilots including captains and first officers. The result of this research study is consistent with existing literature and shows that departure from the use of aviation standard phraseology negatively affects group communication on the flight deck in aviation.

Departure From the use of English Language as the Universal Language in Aviation Negatively Affects Group Communication

Group communication is one of the levels of a four-level network of Ruesch and Bateson's (1951) Observer Model of Communicology. This model provides the conceptual framework for this research study. Group communication in aviation occur among pilots, ATC, and ground crew. The findings of my study confirmed existing literature that the group communication level of Ruesch and Bateson's Observer Model of Communicology is evident in aviation and in particular in-flight deck communication.

The universal language of aviation communication which occurs particularly between pilots and ATC is English (Alderson, 2009). Aviation English concentrates on the particular grammatical structures, pronunciation, vocabulary, and discourse styles that are normally used by aviators (Moder, 2012). Lack of aviation linguistic proficiency may occur among multicultural cockpit crews, where silence, overlapping talk and taking turns to talk, are popular variables. Ripley and Finch (2004) attributed the death of 1,006 people to language issues, which then led to problems of communication in three accidents alone. In India, in November 1996, a midair collision occurred between a Kazakhstan Airline aircraft and a Saudi Arabian Boeing 747 aircraft killing 351 people. The pilots were Saudi and Russian, and the ATC was Indian.

In another incident involving Air China 981 which was landing at John F. Kennedy International Airport in New York, the English language of the Chinese pilot was incomprehensible. The pilot also failed to comprehend the native-English-speaking ATC (Sarmento, 2005). The results of this research study are supported with original qualitative data collected from 15 North American pilots including captains and first officers. Consistent with existing literature, the result of this research study showed that the departure from the use of English language as the universal language in aviation negatively affects group communication on the flight deck in aviation.

Challenges to Interpersonal Communication as a Result of Personality Differences

Interpersonal communication is one of the levels of a four-level network of Ruesch and Bateson's (1951) Observer Model of Communicology. This model provides the conceptual framework for this research study. Interpersonal communication in aviation occur among pilots on the flight deck. The findings of my study confirm that the interpersonal communication level of Ruesch and Bateson's Observer Model of Communicology is evident in aviation and in particular in-flight deck communication.

According to Anyin (2018), interpersonal communication is an interactive process through which people exchange information in a way that stimulates mutuality, understanding, and rapport. Interpersonal communication accommodates knowledge sharing, sharing of experiences and ideas, and the coordinating and interpreting of general activities and decision making (Owoeye & Dhunsi, 2014). This type of communication forms a delicate thread in aviation communication.

In 1979, John Lauber, who was a psychologist for NASA, and studied cockpit communication processes for several years, coined the term cockpit resource management. The term was later generalized to crew resource management (CRM). According to Kelly (2006), some principal problems in aviation were the lack of accurate interpersonal communication, decision making on the flight deck and leadership. In an effort to manage safety issues and teamwork, the concept of CRM was introduced by the aviation industry (Salas, Bowers, & Edens. 2001; Wiener, Kanki, & Helmreich, 1993). Kanki (2010) described communication as one of many tools which can be used to achieve the procedural and technical objectives of the CRM. Kanki (2010) also posited that communication, as a tool, has many functions which can be utilized by CRM. Using communication, information of CRM can be transferred to intended recipients and it can assist in the accomplishment of team building and interpersonal relationships (Kanki (2010).

Archer (2015) suggested that further research on communication is needed, in particular data collection through interviews of aviation professionals, to identify communication styles and linked personality traits, in order to mitigate airline hazards. The main focus of this study was to explore the lived flight deck communication experiences of North American pilots, to provide useful information to the airline industry, for them to develop and implement tools, to increase flight safety and loss prevention. The results of this research study were supported with original qualitative data collected from 15 North American pilots including captains and first officers.

Consistent with existing literature, the results of this research study show that there are challenges to interpersonal communication as a result of personality differences.

Lack of Clarity and Precision in Verbal Group Communication

Group communication is one of the levels of a four-level network of Ruesch and Bateson's (1951) Observer Model of Communicology and this model provides the conceptual framework for this research study. Group communication in aviation occur among pilots, ATC, and ground crew. The findings of my study confirm that the group communication level of Ruesch & Bateson's Observer Model of Communicology is evident in aviation and in particular in-flight deck communication.

According to Enomoto (2017), the failure of effective flight deck communication has resulted in many airline accidents. On the flight deck, pilots mostly practice verbal communication either face to face or via radio between each other, the flight crew, ATC, and other ground crew (Alderson, 2009). Communication is an "extremely dynamic phenomenon with a rapid rate of change of levels of functions, which range from evaluation to transmission and conduction." (Ruesch & Bateson, 1951. p. 274) and is effective when it reaches its goals and accomplishes the intended purpose (Muszyńska, 2018). Effective communication requires precision and clarity.

Communication is based on the message, the sender, the medium or channel used, the receiver and destination of the message (Shannon & Weaver, 1949). There are several well-documented cases in which one of the contributing factors to fatal aviation accidents was inadequate communication (Alderson, 2009). Researchers have documented a strong positive correlation between poor communications and airline

accidents (Gladwell, 2008; Foushee & Manos, 1981). Billings and Cheaney (1981) confirmed that 70% of the Aviation Safety Reporting System (ASRS) at that time, involved some form of information transfer that are primarily related to voice communication. According to the Grayson & Billings (1981), information transfer difficulties included absent communication, incomplete or inaccurate message content, incorrectly perceived messages which were caused by similarities in phonics, ambiguous or distorted phraseology, and the absence of monitoring by receiver. The results of this research study are supported with original qualitative data collected from 15 North American pilots including captains and first officers. Consistent with the literature, the results of this research study show that there is a lack of clarity and precision in verbal group communication on the flight deck in aviation.

Verbal Accents Negatively Affects Group Communication

Group communication is one of the levels of a four-level network of Ruesch and Bateson's (1951) Observer Model of Communicology. Group communication in aviation occur among pilots, ATC, and ground crew. The findings of my study confirm that the group communication level of Ruesch & Bateson's Observer Model of Communicology is evident in aviation and in particular in-flight deck communication.

Foushee & Manos (1981) found that flight deck communication plays a significant role. On the flight deck, pilots mostly practice verbal communication (Alderson, 2009). The universal language in aviation is English and they are required by CRM to practice the usage of aviation standard phraseology. Despite the usage of English and standard phraseology, accents can cause communication to be unclear and

ambiguous. There are aviation cases in which one of the contributing factors to fatal aviation accidents is the inadequate communication between aviation persons from different linguistic environments (Alderson, 2009).

One of the world's deadliest aviation accidents occurred in 1977 at the Tenerife airport in Spain (NTSB). On March 27, a Boeing 747 aircraft collided with another similar aircraft on the runway. The crash claimed the lives of 583 passengers and the entire crew for both airplanes which was more than any other accidents in the history of aviation at that time (NTSB, Safety Recommendation A-86-034). Some researchers attributed this breakdown of communication to cross culture and the lack of aviation linguistic proficiency (Merritt & Ratwatte, 2004; Stratechuk & Beneigh, 2004).

According to Wilson (2016), aviation accidents sometimes occur when an aviation pilot incorrectly reads back a clearance (the readback problem), and the ATC is unable to understand or recognize the read-back (the hearback problem). Verbal accents play a vital role in the aviation industry. The results of this research study are supported with original qualitative data collected from 15 North American pilots including captains and first officers. The results of this research study are consistent with other researchers and show that verbal accents negatively affect group communication on the flight deck in aviation.

Interpersonal Communication Challenges as a Result of Checklist Complacency

The Ruesch and Bateson's (1951) Observer Model of Communicology provides the conceptual framework for this research study and the findings confirm existing literature that the interpersonal communication level of Ruesch & Bateson's Observer

Model of Communicology is evident in aviation and in particular in-flight deck communication.

James Reason (1990) considered two main approaches to human errors. One category is person and the other is system. Reason developed a model that breaks down human error in four different levels of failures. This model is called the "Swiss Cheese Model". The Swiss Cheese Model suggests that multiple contributors (referred to as the holes in cheese slices) must be aligned in order for accidents to occur.

The holes in the Swiss Cheese Model represents latent failures such Unsafe Acts, Preconditions for Safety Acts, Unsafe Supervision and Organizational Influences (Reason. 1990). The barriers in a system (depicted as the cheese slices themselves) are meant to prevent errors. Some of the barriers include education, training, policies, technology, communication and checklists. In the aviation industry and especially on the flight deck, pilots rely on checklists to ensure that all tasks are completed in a timely, methodical, chronical and accurate manner.

One of the elements in the Swiss Cheese Model, being The Unsafe Acts, is more commonly referred to as pilot/aircrew error. Reason (1990) classified these unsafe acts in two further categories: errors and violations. Errors represents physical or mental activities performed by an individual that failed to accomplish the intended goal (Shappell & Wiegman, 2000). The holes in the Swiss cheese represent the opportunity for mistakes (Shappell & Wiegmann, 2000). The researchers developed the Human Factor Analysis and Classification System (HFACS) by building on the four levels of human errors provided in the Swiss Cheese Model (Shappell and Wiegmann, 1997). The

CRM has made some progress in aviation communication training over the past decade so as to reduce the risk of aviation accidents (Helmreich, Wilhelm, Klinect, & Merritt, 2001; Kanki, Helmreich, Anca, 2010; Shuffler, Salas & Xavier, 2010). CRM is the management of all resources that are available for effectiveness and safety and include resources such as people, procedures, equipment (Kern, 2001).

The purpose of a checklist is to increase flight safety by ensuring that no significant tasks are overlooked. There are various checklists that are used at different stages on the flight deck. For example, a preflight checklist is used by pilots before takeoff. It bears a list of tasks that should be performed before takeoff. Often, a first officer reads and performs the tasks and communicates to the captain as he or she completes each task.

Pilots frequently memorize the checklist due to repetition and sometimes one pilot will go through the list, verbalizing confirmation of a task but erroneously omitting to perform the task. It is very easy to verbalize a task, since the checklist is just being run through verbally from one pilot to another. The results of this research study are supported with original qualitative data collected from 15 North American pilots including captains and first officers. The results of this research study are consistent with existing literature and show that there are interpersonal communication challenges as a result of checklist complacency on the flight deck in aviation.

Poor Group Communication Negatively Affects a Pilot's Situational Awareness

Group communication in aviation occurs among pilots, ATC, and ground crew. The findings of my study confirm existing literature that the group communication level

of Ruesch and Bateson's (1951) Observer Model of Communicology is evident in aviation and in particular in-flight deck communication.

According to the FAA, situational awareness is the correct perception and understanding of all factors and conditions of fundamental risks that affect safety before, during, and after a flight. In order to maintain situational awareness, it is essential for a pilot to understand the relative significance of factors such as weather, airport conditions, limitations, equipment, the aircraft position in the air, air traffic and the airworthiness of the aircraft being flown. Situational awareness depends on the pilot's ability to shift rapidly between numerous different, and conceivably competing, tasks and sources of information while maintaining a communal understanding of the environment.

Pilots rely on communication to have situational awareness of their positions in the air in relation to other aircraft to prevent accidents. For example one of the world's deadliest aviation accidents occurred in 1977 at the Tenerife airport in Spain (NTSB). On March 27, a Boeing 747 aircraft collided with another similar aircraft on the runway. The main cause for this accident resulted from a miscommunication (NTSB). The crash claimed the lives of 583 passengers and the entire crew for both airplanes which was more than any other accident in the history of aviation at that time (NTSB, Safety Recommendation A-86-034). Poor group communication affected the pilot's communal understanding of his environment, incoming traffic and limitation which caused the pilot to taxi out on the runway and thus collided with another incoming aircraft. The results of this research study are supported with original qualitative data collected from 15 North American pilots including captains and first officers. The results of this research study

are consistent with other researchers and show that poor group communication challenges exist on the flight deck and that they negatively affect a pilot's situational awareness.

Communication is key in an Emergency Situation

The Ruesch and Bateson's (1951) Observer Model of Communicology demonstrates that communication operates in four ascending levels. In aviation, communication can occur at all levels of this communicological model. Throughout the literature review of this research study, there are well documented evidence of instances where communication is significant in aviation to prevent accident and incidence and is vital in situations of emergency. The NTSB has documented airplane crashes such as the Tenerife accident. Ripley and Finch (2004) attributed the death of 1,006 people to language issues which then led to problems of communication in three accidents alone. In India, in November 1996, a midair collision occurred between a Kazakhstan Airline aircraft and a Saudi Arabian Boeing 747 aircraft killing 351 people. The pilots were Saudi and Russian and the ATC was Indian. Communication was an issue.

Researchers have demonstrated that flight deck communication errors form a major contributor to aviation accidents (Enomoto, 2017; Gladwell, 2008). The problem of lack of effective communication in the aviation industry and especially on safety issues is not an inconsequential matter (Chute & Wiener, 1996). The NTSB's recommends that aviation communication should be addressed in CRM training with cabin crew and pilots (Cardosi & Huntley, 1998; Chute & Wiener, 1994; NTSB, 1992). The seriousness of aviation communication attracts a wide range of commentary, especially in emergency situations. The results of this research study are supported with

original qualitative data collected from 15 North American pilots including captains and first officers. The results of this research study are consistent with existing literature and show that communication is key in an emergency situation on the flight deck in aviation.

Conclusion on Interpretation of Findings

Researchers have documented a robust positive correlation between poor communication and aviation accidents (Gladwell, 2008; Foushee & Manos, 1981). Nearly 75% of aviation accidents are attributed to human factors (Kharoufah, Murray, Baxter, & Wild, 2018). The failure of effective flight deck communication has resulted in a number of airline accidents (Enomoto, 2017; Gladwell, 2008; Chute & Weiner 1996). There are several well-documented cases in which one of the contributing factors to fatal aviation accidents is the inadequate communication (Alderson, 2009). The lack of effective communication in the aviation industry and especially on safety issues is not an inconsequential matter (Chute & Wiener, 1996). My findings are consistent with findings from previous research studies. My findings also show the effectiveness of incorporating the Observer Model of Communicology by Ruesch & Bateson, (1951) in aviation to improve flight deck communication which could prevent aviation accidents.

Limitations of the Study

A research limitation is an element of the study that is uncontrollable by a researcher (Simon & Goes, 2013). It is an imposed restriction which may affect the research design, the results and subsequently the conclusions of a study (Simon & Goes, 2013). There were three limitations in this research study.

The first limitation of this qualitative phenomenological study was geographical region. Data was collected solely from North American pilots. This collected data does not provide an overall scope of responses in this area of study. It is possible that participants in other regions in the United States of America of other international regions may have brought different experiences and perceptions of communication on the flight deck to this study. The voices of a larger sample of pilots who met the inclusion criteria did not have the opportunity to participate in this research study due to the limited sample size in qualitative research studies. I mitigated this limitation by sending invitations to pilots from six different airlines which ensured data collection from participants from various cultures, with different experiences and perceptions.

The second limitation of this research study is that it was limited to aviation pilots. The sample precluded other aviation communicators such as ground crew, air traffic controllers, and cabin crew such as flight attendants. The broader scope of participants in the aviation industry may bring different experiences and perceptions.

The third limitation was years of experience of the aviation pilots. This was mitigated through my careful inclusion criteria strategy. All participants are required to be a commercial aviation pilot, (b) employed with a North American airline organization, and (c) possess a current and valid aviation commercial pilot's license. These requirements ensured that they all had knowledge and experience in communication on the flight deck in an aviation setting. Participants also responded to the pre-interview questions confirming age and years of experience. In an effort to mitigate the limitation of possible small sample size, and the possible challenges generalizability, I carefully

interpreted the collected data and allowed themes to emerge from the data collected from 15 participants.

Possible unbiased responses from participants encroaches on the trustworthiness of a study and can be a limitation (Yin, 2017). I triangulated the data collected from interviews with my field notes to mitigate limitations. The issue of transferability which is attached to qualitative studies was dealt with by providing a detailed procedural account of this research study to ensure that grounded decisions can be concluded in respect to the findings of this research study. Further mitigating efforts were carried out by providing detailed accounts of recruitment, invitations, participants, consents, and interviews, all data recording procedures, data transcriptions, and data analysis. A strict and detailed audit trail is kept of this research study to allow future researchers to use this same methodology in different contextual settings.

Recommendations

Archer (2015) called for qualitative research in communication in the aviation industry, in particular, for interviews to be conducted with current aviation professionals to fill the gap in the literature, and to contribute or to expand the data in this field. Although there are no concrete rules in qualitative research in respect to the number of participants, Guest, Bunce, & Johnson, (2006) suggest that 15 is the smallest acceptable sample. Sample size should follow the concept of saturation (Mason, 2010). Saturation occurs at a stage when the collecting of additional data no longer provides new information on the issue that is being researched (Glaser & Strauss, 1967). For this research study, data was collected from 15 North American aviation pilots. While this

research study contributes to the existing literature, a larger sample could further contribute to the existing literature in this field.

The first recommendation is that future researchers are encouraged to replicate this study using a quantitative approach in a different setting or in a similar context. This methodology will allow for a more correlational, numerical, and experimental or quasi-experimental study and tends to test hypotheses. The quantitative methodology allows for the use of survey, which could be sent to more participants. The quantitative methodology allows for a greater number of participants. It allows for greater objectivity and it could also enhance the generalizability of findings.

The second recommendation for future researchers is for them to consider replicating this study using a wider sample that places no limitation on a geographical region. For this research study, data was collected from North American pilots. Future researchers could consider widening the sample to all of the United States of America and international geographical locations. This would allow for a more diverse set of experiences and perceptions on communication in the flight deck.

Foushee & Manos (1981) drew attention to the rising concerns among aviators about accidents attributable to improper use of resources by human elements in aviation systems. The researchers posited that flight deck communication plays a significant role in aviation communication. The third recommendation for future researchers is that they should consider replicating this research but widening the population to include other aviation communicators such as ground crew, air traffic controllers, and cabin crew such as flight attendants. This wider and varied population will generate diverse experiences

and perceptions in respect to flight deck communication, which could prove a valuable contribution to the existing literature in this field.

The Ruesch and Bateson's (1951) Observer Model of Communicology provides the conceptual framework for this research study. This study is grounded in three of the four levels of communication in that model. The three levels of communication from the Ruesch and Bateson's (1951) Observer Model of Communicology in which the study is grounded are, the interpersonal communication, cultural communication, and group communication. Future researchers could consider replicating this study using the concept of intrapersonal communication as one of the levels of a four-level network of Ruesch and Bateson's (1951) Observer Model of Communicology which was not used in this research study. This element may prove to be a valuable contribution to the existing literature in this field of research.

Implications

The CRM has been celebrated as a practical approach to pilot training, and as a tool to assist in the prevention of aviation accidents (Kanki, Helmreich, & Anca, 2010). Despite the implementation of training tools for aviation communication such as the CRM, some airlines are still failing to implement effective training to prevent flight deck communication errors (Kanki, Helmreich, Anca, 2010). The researchers acknowledged that although CRM is well-regarded in aviation as the lifeblood of training, its effectiveness is still uncertain (Kanki, Helmreich, & Anca, 2010). One specific barrier to the success of the CRM is that it lacks formal instructions in respect to communication (Kanki, Helmreich, Anca, 2010).

Implications to Practice

The findings of this research study may provide meaningful information to ICAO, IATA, FAA, NTSB, aviation pilots, managers and leaders in the aviation industry, and other stakeholders, so they can better understand flight deck communication. Better understanding could contribute to the prevention of aviation accidents and financial losses within the aviation industry and ultimately save lives.

The findings of this research study could also provide useful information to ICAO, IATA, FAA, NTSB, and other stakeholders for them to use so that they can incorporate and implement training tools in the CRM that are concentrated on flight deck communication and specifically geared towards aviation pilots and ATC, to achieve its goal of increasing aviation safety and save lives. Better understanding and implementation of effective training tools geared to flight deck communicators in aviation could assist the industry in increasing safety and decreasing accidents.

Implications to Theory

The challenges of flight deck communication have been an issue for the aviation industry for decades and still remains a significant concern for the aviation authorities. Although quantitative research has been carried out in areas of aviation such as culture, power differential, gender barriers, pilots' fatigue, sleep deprivation of pilots, pilots' cognitive performance, pilots' mistakes, stress, pilots' absent mindedness, extended work hours of pilots, and the disruption of pilots' circadian rhythm, Archer (2015) called for qualitative research in communication in the aviation industry, in particular for interviews to be conducted with current aviation professionals to expand the data in this field.

In answering the call of Archer (2015), the Ruesch and Bateson's (1951) Observer Model of Communicology was used as the conceptual framework for this research study. This model demonstrates that communication operates in four ascending levels, being intrapersonal communication, interpersonal communication, group communication and cultural communication (Ruesch & Bateson, 1951). The findings of this research study show that flight deck communication can be viewed through three of the four levels of human communication presented by Reutsch & Bateson (1951) in their Observer Model of Communicology. The findings of this research study show that there are challenges in interpersonal communication, cultural communication challenges, and group communication challenges in respect to flight deck communication.

The communication levels of the Ruesch and Bateson's (1951) Observer Model of Communicology exists in the aviation industry and in particular in-flight deck communication. The findings of this research study further show the effectiveness of incorporating Ruesch and Bateson's (1951) Observer Model of Communicology in aviation communication to improve flight deck communication. Flight deck communicators communicate through the four levels or the Observer Model of Communicology and if this model is understood by aviation stakeholders, they could use it to implement effective flight deck communication tools to prevent aviation accidents.

Implications to Positive Social Change

The failure of effective flight deck communication has resulted in numerous airline accidents (Enomoto, 2017; Gladwell, 2008; Chute & Weiner 1996) and has claimed thousands of human lives (BAA Archives, 2018). The failure of effective flight

deck communication remains a major contributor to aviation accidents and has cost airline organizations billions of dollars over the years (Daly, 2018; Archer, 2015; Chow, Yortsos & Meshkati, 2014). The findings of this research study may provide meaningful information to pilots, industry leaders, managers, and stakeholders in the aviation industry so they can better understand flight deck communication and may implement more effective flight deck communication techniques.

This study may be significant in respect to social change because in better understanding and implementation of effective flight deck communication, leaders, managers, and stakeholders may use the findings of this research study to implement tools which could contribute to the prevention of aviation accidents and ultimately save human lives and billions of dollars.

Conclusions

Aviation accidents have claimed over 30,000 thousand human lives between 1990 and 2018 (BAA Archives, 2018). The challenges of aviation catastrophes have plagued the aviation industry for decades. Approximately 75% of aviation accidents are attributed to human factors (Kharoufah, Murray, Baxter, & Wild, 2018) and out of that 75%, Archer (2015) found that 60% accounted for communication errors. Flight deck communication remains a significant concern for the NTSB, the FAA, ICAO, IATA, and other aviation industry leaders.

There are several models, systems and training tools that have been established and implemented in the aviation industry to increase aviation safety. Despite these sophisticated models, costly systems and tools, flight deck communication error remains

a significant contributing factor to aviation accidents (Enomoto, 2017) still resulting in the loss of human lives. According to Kanki, Helmreich, and Anca, (2010), the much celebrated and globally accepted CRM training program lacks formal instructions in respect to communication.

The problems that stem from ineffective flight deck communication is not germane to the loss of human lives, it overarches into a general management problem where some airline managers are failing to implement effective training to prevent flight deck communication errors (Kanki, Helmreich, & Anca, 2010). The specific management problem is that standardized flight deck communication of airline pilots may not be sufficient to prevent aviation accidents. These aviation accidents are sometimes so lethal, that they result in astronomical loss of human lives and billions of dollars in cost to the industry.

This research study goes to the heart of the phenomenon of flight deck communication. The findings of this research show that there are still flight deck communication challenges which were viewed through the lens of the ascending network levels of interpersonal, group and cultural levels of communication of the Ruesch and Bateson's Observer Model of Communicology (1951). The purpose of this qualitative, phenomenological study was to explore the lived flight deck communication experiences of North American pilots to provide useful information to the airline industry for them to develop and implement tools to increase flight safety and loss prevention was achieved.

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Appendix A: Letter of Introduction

Dear **Name will be inserted here**,

My name is Sonia Bush and I am currently a doctoral student at Walden University pursuing studies in Management. I am inviting you to participate in my research on flight deck communications in relation to aviation accidents. The purpose of this study is to explore the lived flight deck communication experiences of North American pilots to provide a better understanding of flight deck communication to better understand flight safety and loss prevention.

Participant's eligibility for this study includes the following criteria: (a) must be a commercial aviation pilot, (b) employed with a North American airline organization, and (c) possess a current and valid aviation commercial pilot's license. I am confident that your experience is grounded in the phenomenon of this study and it would significantly contribute to this study. On that basis, I am inviting you to participate in this research.

This study is important to the field of management as the finding could provide meaningful information to the airline industry to assist them in implementing tools to improve flight deck communication which could reduce airplane accidents, save lives and prevent financial loss in the industry.

If you are interested in participating in this study, please review the attached consent form and if it meets your approval, please sign it and return it to me by way of this email address. Should you have any questions or require additional information regarding this research or your intended interest, please do not hesitate to contact me at

this email address. Thank you kindly in advance for your time and your kind consideration.

Yours sincerely,

Sonia Bush

PhD. Candidate-Walden University

Appendix B: Demographic Criteria Questionnaire

Participant number: _____

Date: _____

Location: _____

Email address: _____

1. Are you a current commercial aviation pilot?

   Yes _____

   No _____

2. What is your current job title? _____

3. Are you currently employed with a North American airline organization?

   Yes _____

   No _____

4. Do you possess a current and valid aviation commercial pilot's license?

   Yes _____

   No _____

5. Which age group do you fall in?

   Younger than 26 years ____

   26 – 35 years _____

   36 – 45 years _____

   46 -55 years _____

   56 years and over _____

6. What is your nationality? _____

7. How long have you been working as a commercial airline pilot?

   Less than 3 years _____

   3 – 6 years. _____

   7 – 10 years _____

   More than 10 years ____

8. How long have you been working with your current employer

   Less than 3 years _____

   3 – 6 years _____

   7 – 10 years _____

   More than 10 years ____

Appendix C: Interview Protocol

Introduction:

The purpose of this qualitative, phenomenological study is to explore the lived flight deck communication experiences of North American pilots to provide useful information to the airline industry for them to develop and implement tools to increase flight safety and loss prevention. My questions today will relate to the issue of flight deck communication. For the purposes of this interview, the term *flight deck* refers to the area of a commercial aircraft from which the pilots navigate and control the aircraft. This was also called the cockpit of an aircraft. The term communication includes verbal as well as nonverbal language.

The Central Research Question:

What are the lived experiences of pilots relating to flight deck communication that could help flight safety and loss prevention?

1. Tell me about your experience with communication on the flight deck?
2. Tell me about your experience with flight deck communication between pilots from different cultural background?
3. Tell me your experience with flight deck communication using the standard phraseology in aviation?
4. Describe how effective flight deck communication plays a role in aviation safety?