7-2014

Crew Resource Management Training Attitudes of United States Coast Guard Aviators

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Crew Resource Management Training Attitudes of United States Coast Guard Aviators

A Research Study

Presented to the Graduate Faculty of the

Department of STEM Education and Professional Studies at

Old Dominion University

In Partial Fulfillment of

the Requirements for the Master of Science

in Instructional Design and Technology Degree

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July 2014

APPROVAL PAGE

This research paper was prepared by Cassandra L. Huffman under the direction of Dr. John M. Ritz in SEPS 636, Problems in Occupational and Technical Studies. It was submitted to the faculty as partial fulfillment for the requirements for the Master of Science degree.

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ABSTRACT

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This study presents an investigation of Coast Guard Crew Resource Management attitudes and beliefs. The purpose of this study was to determine if there is a significant difference in the Crew Resource Management attitudes and beliefs of pilots and crew members. The study was guided by two research questions. Research Question 1 asked if there was a significant difference between the CRM attitudes of enlisted flight crew members and pilots. Research Question 2 asked if there was a significant difference between the CRM attitudes of fixed wing HC-130 aviators and rotary wing H60 aviators. Three hundred forty-three aviators from Coast Guard Air Station Clearwater, Florida, were delivered the Cockpit Management Attitudes Questionnaire developed by Gregorich and Helmreich of which 172 responded representing 50.1% of the population.

Data collected revealed that there was not a significant difference between pilots and enlisted aircrew members on the questionnaire as a complete instrument, however individual items did result in t-test analysis representing a significant difference. Investigation of Research Question 2 provided data proving that there is a significant difference between fixed-wing aviators and rotary-wing aviator’s attitudes and beliefs of Crew Resource Management, particularly in the field of recognition of stressor effects.

These findings indicate that the current Crew Resource Management training program employed by the United States Coast Guard is not meeting the learning objectives of all members and requires revision.

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CHAPTER I

INTRODUCTION

The purpose of this study is to examine the attitudes of Coast Guard Pilots and Flight Crew Members on the topic of Crew Resource Management (CRM) training programs currently employed by the United States Coast Guard. Multiple Human Factors aspects within the scope of Crew Resource Management will be discussed to include teamwork, situational awareness, and overall flight crew safety. Human error accounts for over 80% of all Naval Aviation mishaps, and of those over 65% can be attributed to at least one failure in CRM (CNO, 2001). Crew Resource Management is widely accepted by the United States Coast Guard, as well as the world-wide aviation community, to improve upon safety by eliminating distractors and negative behaviors in pilots and crew members (FAA, 1998). The primary focus of the study is to determine if the current CRM training conducted by the Coast Guard instills and enhances the desired attitudes and behaviors of aviators and investigate any possible disparity by crew position or airframe.

For this project, the scope will encompass the United States Coast Guard Aviation Community. A sample population of 343 aviators from US Coast Guard Air Station Clearwater will be given a questionnaire on cockpit management attitudes. Crew Resource Management effectiveness is largely based upon crew coordination and therefore a cross-section of multiple crew positions on multi-crew airframes will be studied and compared. Participants in the study will consist of HC-130 aircraft commanders, co-pilots, flight engineers, navigators, and load masters as well as H-60 aircraft commanders, copilots, flight mechanics, and rescue swimmers. The data collected will be examined to determine if there is a significant difference in the CRM attitudes of individual crew positions and determine if the current training philosophy is meeting the needs of all members.

STATEMENT OF THE PROBLEM

The purpose of this study is to compare the attitudes on Crew Resource Management practices of US Coast Guard enlisted flight crew members to those of pilots to determine if the current blended training is appropriate.

RESEARCH OBJECTIVES

This study was guided by the following research objectives:

RO_1: Is there a significant difference between the CRM attitudes of enlisted flight crew members and pilots?

RO_2: Is there a significant difference between the CRM attitudes of fixed wing HC-130 aviators and rotary wing H60 aviators?

BACKGROUND AND SIGNIFICANCE

The topic of Crew Resource Management has been a key component to pilot and flight crew training in both the military and civilian sector for over three decades. Modern aircraft have advanced to the point where it is extremely rare that mechanical failure is the cause of an aviation mishap. In fact, it is widely accepted that between 60%-80% of all aviation accidents and mishaps can be attributed to human error

(Freeman & Simmons, 1991). Recognizing that human error was now the leading cause of aircraft mishaps, the National Aeronautics and Space Administration, in conjunction with partners from the aviation industry, set forth to devise a training program to mitigate the risks involved. Originally referred to as Cockpit Resource Management, the training has evolved into its new crew concept through research that safety of flight is contingent on all members of a flight crew working cohesively as well as ground crew members. In addition to the evolution from cockpit to crew, CRM training has also advanced from a program focusing on the engineering and psychology within the flight deck primarily centered on instrumentation, to a broader multidisciplinary field. Modern CRM training programs draw upon the methods and principles of behavioral science, engineering, and physiology in an effort to maximize human performance and reduce human error (Helmreich, Anca, & Kanki, 2010).

The United States Coast Guard understands the importance of an effective Crew Resource Management training program. In 2010 the United States Coast Guard aviation community endured its highest class A mishap rate since the birth of Coast Guard aviation in 1916. Fiscal Year 2010 saw the Coast Guard suffer five class A Aviation accidents and three class B accidents. Even more upsetting is the loss of ten Coastguardsmen and women who lost their lives due to these accidents. Previously, the Coast Guard had not lost ten crewmembers in a single year since 1982. Since that time the Coast Guard had enjoyed a long period without loss of life. The Coast Guard has completed an extensive review of Aviation Safety and an analysis on the trends in Coast Guard Mishaps and made several recommendations, most notably in regards to enhancements to Coast Guard Organizational Risk Management as well as Crew

Resource Management (USCG, 2011). It is the goal of this study to determine if the current training in place is meeting the needs of individual crewmembers to ensure that transfer of the key concepts of Crew Resource Management are being met.

LIMITATIONS

The limitations of this study include the following:

1) The time since last annual refresher CRM training varies among crewmembers.
2) The instruction provided to each member during training is standardized, however there are differences in the delivery methods of individual instructors.
3) The Cockpit Attitudes Questionnaire utilized was developed by Steven Gregorich and Robert Helmreich in 1990.

ASSUMPTIONS

The following assumptions were made regarding this study:

1) The survey participants from Air Station Clearwater are representative of the population of Coast Guard Aviators.
2) All survey participants have completed Crew Resource Management training and/or a refresher course within a 12 month period.

3) All survey participants are on flight orders and maintain a minimum of four flight hours monthly to maintain qualification.

PROCEDURES

Data will be collected from pilots and aircrew on cockpit safety attitudes and behaviors presented in Coast Guard Crew Resource Management training. This will be accomplished using the validated Flight Deck Management Attitudes Questionnaire developed by Steven Gregorich and Robert Helmreich (Gregorich, Helmreich, & Wilhelm, 1990). The questionnaire will be given to the entire population of 343 Coast Guard aviators at Air Station Clearwater Florida. The survey takers will be divided into demographic categories of air crew position and aircraft type. Survey questions will be asked using a five-point Likert scale for collection of data. The data will then be analyzed utilizing t-tests to determine if there is a significant relationship between crew positions and CRM attitudes and behaviors. The results from the aviators will determine the evidence of a significant relationship between Coast Guard Pilot and Air Crew safety attitudes and behavior in Crew Resource Management training.

DEFINITION OF TERMS

The following terms are defined to aid the reader:

Aircraft Commander– A highly qualified pilot who is in charge of the aircraft and the crew during mission execution.

Crew Resource Management– The effective utilization of all available resources-hardware, software, and liveware to achieve safe, efficient flight operations.

Human Factors– The scientific discipline concerned with the understanding of interactions among humans and other elements of a system.

HC-130– Fixed wing turboprop cargo aircraft with four propellers operated in the US Coast Guard with a standard seven man crew.

H-60– Medium range recovery helicopter operated by the US Coast Guard with a standard four man crew.

Organizational Risk Management– A continual cyclic process which includes risk assessment, risk decision making, and implementation of risk controls, which results in acceptance, mitigation, or avoidance of risk.

OVERVIEW OF CHAPTERS

Chapter I of this study provides an overview of Crew Resource Management and how it impacts human factors and safety of flight components of aviation. The recent mishaps in Coast Guard aviation were presented as well as the results of a mishap analysis that identified Crew Resource Management as a key factor in the incidents. Currently Coast Guard aviators participate in Crew Resource Management refresher training annually, however it is undetermined if the training is meeting the needs and requirements of individual members.

The research problem is to determine if there is a significant difference in the attitudes and behaviors as they relate to Crew Resource Management of Coast Guard aviators by crew position. 343 aviators from Coast Guard Air Station Clearwater representing the various crew positions of the HC-130 and H-60 were given a survey relating to safety attitudes and behaviors. The results of the survey were then analyzed to determine if there was a significant difference between crew position attitudes and behaviors in an effort to ensure that the training provided is meeting the needs of all crewmembers.

Chapter II examines literature related to this study and presents an in-depth study of Crew Resource Management concepts. Special attention is given to how the Coast Guard implements CRM training as well as an analysis of CRM breakdowns in Coast Guard mishaps. The Cockpit Management Attitude Questionnaire (CMAQ) survey instrument developed by Gregorich and Wilhelm is discussed as well as an extensive review of studies performed that have utilized the CMAQ.

Chapter III covers the methods and procedures used during the study of the research problem. These include population, research variables, and use of the CMAQ during the study. The sample population included 343 aviators from Air Station Clearwater. Variables were represented by the attitudes and behaviors exhibited by crewmembers on the CMAQ. The t-test was utilized after results were collected for analysis.

Chapter IV provides an explanation of the findings of the research. Chapter V is the final chapter in which the research is summarized, and conclusions are presented.

The chapter concludes with recommendations regarding the future of the Coast Guard Crew Resource Management training program.

CHAPTER II

REVIEW OF LITERATURE

This review is organized based upon the problem statement and research question descriptors supporting Crew Resource Management curriculum including a brief history of Crew Resource Management and the United States Coast Guard CRM curricula. Coast Guard mishaps in which Crew Resource Management was a causal factor are briefly reviewed. Finally, the instrument developed by Gregorich and Helmreich is investigated as well as relevant research in which the instrument was utilized. The intent of the review is to consider Crew Resource Management Requirements for the Coast Guard and provide a thorough introduction to CRM and the assessment of CRM behaviors and attitudes.

HISTORY AND EVOLUTION OF CREW RESOUCE MANAGEMENT CURRICULA

Crew Resource Management was first introduced to the aviation community during a workshop conducted by the National Aeronautics and Space Administration in 1979 entitled Resource Management on the Flight Deck (Cooper, White, & Lauber, 1980). During the workshop, research was presented that identified human factors aspects such as interpersonal communications, decision making and leadership as the greatest factors in aviation accidents (Helmreich, Merritt, & Wilhelm, 1999). In the decades since the first generation of CRM training, there have been many different training programs introduced worldwide in both military and commercial aviation. A comprehensive history of the evolution of Crew Resource Management will be discussed in this section.

Frank Hawkins is credited with initiating the first course in human factors training at KLM, Royal Dutch Airlines, in the late 1970s (Kanki, Helmreich, & Anca, 2010). The first CRM program in United States aviation was introduced in 1981 by United Airlines. This program and others that soon followed were modeled after a form of training termed the Managerial Grid developed by psychologists Robert Blake and Jane Mouton. Courses were titled Cockpit Resource Management as opposed to modern day Crew Resource Management because popular belief at the time was that all decision making and input should come from the pilots in the cockpit and that the crew provided little or no benefit to the decision making process. These early CRM programs drew heavily on the managerial approaches to cockpit management and included detailed investigation into the managerial attitudes of the participants in the seminar style setting (Helmreich, Merritt, & Wilhelm, 1999). The training programs focused heavily on psychological testing and general concepts of leadership. Many programs included exercises outside of aviation in order to illustrate concepts of teamwork as well as simulator training or Line Oriented Flight Training where crews could develop interpersonal skills necessary for teamwork. Most aviators recognized the need for CRM training, however a smaller but substantial population resisted the new training referring to it as a “charm school” used to manipulate their personalities and foster interpersonal relations without regard for mission effectiveness (Helmreich, Merritt, & Wilhelm, 1999).

Second generation CRM brought forth the change from Cockpit Resource Management to Crew Resource Management. This new training enforced effective behaviors of both pilots and aircrew and established requirements for recurrent classroom training as well as Line Oriented Flight Training. Findings from a second workshop conducted by NASA along with the Military Airlift Command of the U.S. Air Force in 1986 highlighted the effectiveness of early CRM training programs and identified the need to incorporate CRM training in initial and recurrent flight training (Orlady & Foushee, 1987). Pan Am World Airways and Delta Airlines were among the first airlines to incorporate new CRM training techniques that were team oriented in nature including seminars on concepts such as team building, briefing strategies, situational awareness and stress management (Helmreich, Merritt, & Wilhelm, 1999). The concepts of decision making strategies and breaking the chain of errors that may result in mishaps were developed in the updated training programs. Second generation CRM training was more readily accepted by the aviation community than its first generation predecessor, however some critics still believed the training to be irrelevant to effective crew coordination and deemed the training as “psycho-babble”.

In the early 1990s, a third generation of Crew Resource Management training was developed. This third generation implemented a greater importance on developing the interpersonal skills and behaviors of crew members outside of the flight deck. Human factors issues and the emerging issues with flight deck automation and the human machine interface were introduced in this training. In addition, advanced CRM training for airmen responsible for the training and evaluation of pilots and aircrew was introduced in third generation CRM (Kanki, Helmreich, & Anca, 2010).

Fourth generation CRM was introduced shortly after third generation CRM and is highlighted by the Advanced Qualification Program (AQP) introduced by the Federal

Aviation Administration. The AQP is a voluntary program in which carriers are able to develop their own custom training programs to meet their specific needs. The FAA must approve the training developed by the carriers and the training is required to include CRM and LOFT for all flight crew members as well as special training for instructors and flight examiners. Fourth generation CRM programs also require that CRM is included as an integral part of all aspects of flight training.

The fifth generation of Crew Resource Management focuses on a universal and global rationale. In previous CRM training programs, the message was not exported well. National culture conflicts made it difficult for US carriers to utilize programs developed overseas, and programs developed in the United States and delivered to overseas carriers were even less effective (Helmreich, Merritt, & Wilhelm, 1999). Fifth generation CRM focuses on error management. Due to the fact that some error is inevitable, the goal is to minimize error. This management is accomplished by a three level defense including the avoidance of error, the containment of initial errors, and the mitigation of the errors that occur and are not capable of being contained.

REVIEW OF COAST GUARD AVIATION MISHAPS

In 2010 the United States Coast Guard aviation community endured its highest class A mishap rate since the birth of Coast Guard aviation in 1916. Fiscal Year 2010 saw the Coast Guard suffer five class A Aviation accidents and three class B accidents. Even more upsetting is the loss of 10 Coastguardsmen and women who lost their lives due to these accidents. Previously, the Coast Guard had not lost ten crewmembers in a single year since 1982. Since that time the Coast Guard had enjoyed a long period without loss of life. In response to this dramatic increase, the Coast Guard completed an extensive review of Aviation Safety and an analysis on the trends in Coast Guard Mishaps and made several recommendations, most notably in regards to enhancements to Coast Guard Organizational Risk Management as well as Crew Resource Management (USCG, 2011).

The Coast Guard identifies class A mishaps as those accidents that cause damage to Coast Guard aircraft in excess of $2,000,000 or there is a loss of life associated with the accident. These values were increased on 1 October 2009 from the previous threshold of $1,000,000. Class B Mishaps are those mishaps in which costs range from $500,000 to $1,999,999, increased from the previous amounts of $200,000 to $999,999. These amounts reflect the inflated costs of aircraft, in particular the modern avionics and electrical systems integrated in aircraft. Previous to 2010, the Coast Guard maintained a mishap ratio of less than one Class A mishap per year for over a twenty year span. 2010's five Class A mishaps signaled a red flag to safety advocates and indicated a need to reevaluate current practices (USCG, 2011). The following pages will document the Class A mishaps suffered by the Coast Guard in 2010 and attempt to identify breakdowns in CRM related to each accident.

On March 3, 2010, U.S. Coast Guard 6028, a Sikorsky MH-60T helicopter was returning to its home base of Elizabeth City, NC, after providing security for the 2010 Winter Olympic Games in Vancouver, BC. Shortly after getting airborne from Salt Lake City, Utah, following a scheduled stop there, the aircraft entered zero visibility instrument meteorological conditions (IMC) and attempted to descend below what was believed to be a thin cloud and snow layer. Upon descent, the aircraft lost power and collided with the snow covered mountainous terrain at approximately 40 MPH. Fortunately, the 6028 was traveling with another Coast Guard helicopter. During the crash however, the accompanying H60 did not have visual contact with the 6028 and all communications systems were inoperable. Luckily the pilot on command (PIC) of Coast Guard Helo 6028 was able to reach the other helicopter via the pilot's cellular phone. The airborne H60 then located the 6028 and landed within 300 yards of the crash site where, along with mountain rescue, they provided assistance for the downed aircrew. All five members of the 6028 aircrew survived the crash; however two members of the crew sustained critical injuries, forcing one member to medically retire due to injuries sustained in the crash. The aircraft was deemed to be damaged beyond economical repair (Liesik, 2010).

Crew Resource Management breakdowns were apparent during the crash of Coast Guard 6028. The crew lost Situational Awareness when what they believed to be a thin cloud layer in actuality was IMC all the way to the deck. The crew was not prepared for the high altitude flying and mountainous terrain in which they were operating. In addition, when the aircraft lost power, no one on the crew was able to get off a distress call to notify the company H60 with whom they were traveling. The crew was very lucky to receive such fast response to what could have been a much worse scenario.

April 20th 2010, the U.S. Coast Guard 6523, an MH-65 Dolphin home based at Air Station Detroit, was conducting night time boat operations with Coast Guard Small Boat Station Port Huron. During a standard basket hoist evolution, while transitioning from hover to forward flight, the aircraft impacted the water and sank into Lake Huron. The aircraft reportedly entered an aggressive nose-up attitude, causing the tail to impact the water and become uncontrollable sending the 6523 into the lake. All three crew members were able to egress the aircraft without serious injury.

Investigation by the Coast Guard revealed multiple breakdowns in Crew Resource Management onboard Coast Guard 6523 at the time of the crash. The accident occurred when the 6523 had completed hoist evolutions with the Coast Guard small boat from Station Point Huron. The PIC directed the Co-pilot to handle all communications with both the boat as well as air traffic control. In addition, the co-pilot was wearing night vision goggles while the PIC was not and it was the responsibility of the Co-pilot to assure safety during the flight. The 6523 had completed hoisting and requested that the small boat stay on scene as they practiced low approaches to the water. It was at this time that the PIC requested four times that the co-pilot disengage from hover augmentation flight director mode. Due to his radio communications, the co-pilot did not hear the PICs command until the fourth request, and disengaged as he was wrapping up his conversation with the small boat. At this time the 6523 entered forward flight and lost sight of the small boat. The PIC recognized he had no visual cues as to attitude and attempted to take a quick look at his instruments. Upon returning his view outside the cockpit, the PIC realized he had lost Situational Awareness and instructed the co-pilot to assume control two times. The Co-pilot acknowledged but could not gain control of the aircraft from its low attitude altitude and nose attitude before impact. The crew had attempted to rush through their evolutions too fast and did not allow the proper time for the copilot to handle all communications before moving to the next phase of the training flight. This hurried approach led to the co-pilot disengaging hover before the two pilots were prepared. In addition the copilot did not maintain an adequate level of awareness about the attitude of the aircraft before the pilot requested him to take control (Salerno, 2012).

April 29th 2010, U.S. Coast Guard 6581, another MH65 Dolphin based at Air Station Humboldt Bay, while performing practice emergency procedures impacted the runway and rolled at the Arcata Airport in Eureka, California. The crew was conducting a practice fixed pitch tail rotor malfunction when the aircraft impacted the runway and rolled. All crewmembers were able to egress the aircraft without injury. Investigation later revealed that the aircrew decided together to change their training during the evolution which contributed to the mishap. The PIC who was conducting the training initially simulated a stuck left pedal which the copilot correctly diagnosed the reduced rotor thrust as a stuck pedal. The two agreed that with a slight left crosswind, it may be better to simulate a stuck right pedal. The PIC induced the right stuck pedal and the copilot attempted to line up on the runway. During the approach, the copilot never lined up properly on the runway, and the aircraft yawed excessively to the left. The copilot attempted to slow the aircraft which only increased the yaw. At this time the copilot advised the PIC that he intended to attempt a non-standard maneuver and follow the yaw through a complete 360 degree turn of the aircraft and line up correctly. Shortly into his attempt, the 6581 collided with the runway collapsing the right landing gear and impacting the runway with the rotor blades before coming to a rest on the side of the aircraft.

July 7th 2010, U.S. Coast Guard 6010, a Sikorsky MH-60T Jayhawk, struck electrical transmission wires and crashed into the surf destroying the aircraft and fatally injuring the Pilot in Charge and both aircrew members in the back of the aircraft off the coast of La Push, Washington. The aircraft was being ferried from Aviation Logistics Command Elizabeth City, NC, to Air Station Sitka after its 60T upgrade. The 60T upgrade involves a completely new avionics package to include moving map features as well as a new sensor system. The crew had last stopped at Air Station Astoria, Oregon, before proceeding on to Sitka, Alaska. Co-pilot LT Lance Leone was the only survivor of the accident. On September 30th 2011, nearly a year and a half after the accident Lt. Leone was charged with negligent homicide, dereliction of duty, and destruction of government property in the amount of $18 million (Goldston, 2011). On December 7, 2011, Lt. Leone faced an Article 32 hearing in Juneau, Alaska, to determine if he would face Court Martial. During the Article 32 investigation lead investigator Capt. Timothy Heitsch argued that the aircraft had no reason to be traveling as low or as fast as it was. Cockpit Voice Recorder data indicates that the crew was in fact sight-seeing. In addition, the altitude alerter horn is audible several times during the flight (Goldston, 2011). The crew lost track of the electrical transmission wires that run the 1900 feet from La Push, Washington, out to James Island. The wires are owned and maintained by the Coast Guard and have been the cause of two previous aviation accidents. LT Leone's lawyer has argued that the wires are improperly marked, although they are clearly identified on the VFR Chart for the area. Although Leone had initially programmed his navigation unit to safely avoid the wires prior to flight, his Pilot in Charge LT Sam Kreuger descended from 240 ft. to under 115 ft. MSL before striking the wires (Bohrer, 2011). Investigators argued that Leone was not actively navigating the aircraft and should have alerted the pilot of the dangers. Leone was not charged in the death of LT Kreuger, only the two crewmembers in the back of the aircraft. After thousands of hours of investigation, USCG RADM Ostebo determined that a Court Martial was not warranted in this situation, although he did in his final report indicate that as the copilot, Leone should have informed LT Krueger that he was operating the aircraft at too low an altitude "under the circumstances of flight" (Bohrer, 2011). Although Leone was not charged with any criminal misconduct, there is currently a special review board ongoing to relieve LT Leone of all Coast Guard duties, therefore ending his career in the Coast Guard. A memorial has been erected at Air Station Sitka, Alaska, where the three crew members who lost their lives were stationed.

On December 29, 2009, the lives of seven United States Coast Guardsmen and two members of the United States Marine Corps were tragically lost. Coast Guard rescue aircraft 1705 was actively engaged in a Search and Rescue operation searching for an overdue skiff in the vicinity of San Clemente Island, California. The Search pattern assigned to CG 1705 had the aircraft operating in and out of warning area W-291. At 1854 a Marine Corps flight of four made up of two heavy lift transport helicopters (CH-53Es) Warhorse 53 and Warhorse 50 along with two escort AH-1W Cobras V38 and V39 entered W-291. As is typical with flights of four operating as a single aircraft in respect to navigation, only the lead aircraft WH53 had its Identify friend or Foe (IFF) transponder activated and only the trailing helicopter Cobra V39 displayed its red anti-collision light. The mishap helicopter, Cobra V38 was completely darkened ship and was not squawking IFF. At 1907:37, roughly one hour after sunset and two minutes prior to crash, the crew of CG 1705 received their first information of another aircraft operating in the vicinity when their Traffic Collision Avoidance System (TCAS) displayed a proximity target which was visually identified as Navy Helicopter Lonewolf 55 a US

Navy SH-60 also operating in W-291 with its anti-collision light, position lights, and search light illuminated. Lonewolf 55 was determined to be low and flying away from the 1705 and determined not be a factor. At 1909:16, twenty seconds prior to collision, the CG1705's left hand scanner reported "traffic on the left, appears to be crossing". Later recreation by investigators determined that the traffic reported by the left hand scanner was likely the trail cobra V39 which was displaying its red anti-collision light, but was approximately one mile abeam the CG 1705 at the time. Investigators determined that it is highly unlikely that the scanner ever saw the Mishap helicopter V38 which only had its green NVG compatible position lights illuminated ascend underneath the aircraft. At 1909:53, four seconds before impact, the Flight Engineer of CG 1705 unemotionally called "traffic, flight of two going in front". One second later, the CG 1705's TCAS issued an aural warning of "traffic, traffic" meaning it had acquired a transponding aircraft which could only have been WH-53, the only member of the flight of four squawking TCAS at the time, three-quarters of a mile ahead (Brice-O'Hara, 2010). At 1909:57, Coast Guard Rescue 1705 collided with Marine V39 killing all nine aviators involved in the accident. Later investigation indicated that flight of four had initiated a right hand climbing turn in an effort to create space between themselves and the Navy SH-60 Lonewolf 55. This brought the mishap Cobra V38 directly into CG 1705. The Coast Guard C-130 and Marine Cobra were never located.

August 3rd of 2010, Vice Commandant of the United States Coast Guard, Sally Brice-O'Hara signed the Final Action on the Administrative Investigation completed by the Coast Guard. In the report she stated that no single factor or individual act or omission caused this mishap. It was the product of a tragic confluence of events, missed opportunities, and procedure/policy issues in airspace where most aircraft fly under a "see and avoid" regime wherein individual aircraft deconflict themselves (Brice-O'Hara, 2010). In the report, Vice-Commandant Brice-O'Hara did however state that FACSFAC San Diego by not providing operational priority to Coast Guard Rescue 1705 was a contributing factor in the accident. FACSFAC SD is a US Navy Air Traffic Control facility based at Naval Air Station North Island, California, tasked with providing off-shore ATC control and surveillance as well as management of the Southern California offshore military operating area to include W-291 which is denoted as "special use airspace" wherein military aircraft are confined and civil aircraft are given limited access. As a result of the investigation, Vice-Admiral Brice-O'Hara recommended in her final report that the Commander of Naval Aviation Forces review the SAR prioritization policies so that all FACSFAC controllers enforce operational priority and de-confliction for all SAR cases. An additional contributing factor to the accident noted in the Coast Guard report was the USMC flight of four formation size and aircraft lighting. Although not in violation of regulation, the fact that only one of the aircraft in formation was illuminated, and the formation had spread out so far, afforded CG 1705's flight crew little opportunity to see and avoid the mishap aircraft V-38 (Brice-O'Hara, 2010). This caused a lack of situational awareness on the part of the crew of CG 1705 due to the misperception that the TCAS alert received was the Lonewolf 55. In addition the poor execution and formation of the flight of four was a contributing factor in the collision. In fact at the time of the collision, V39 pilots estimated they trailed WH53, the lead CH-53E by 10-12 rotor lengths or approximately 500-1000' when in actuality they were nearly 150 rotor lengths behind, roughly 7500' or 1.42 statute miles, much greater than the briefed five rotor diameters briefed prior to the flight. Her recommendations include expediting the push for US Coast Guard aircraft to become NVG compatible so that traffic aircraft as well as other obstacles to flight are more visible in low light.

United States Navy Admiral Patrick Walsh, Commander of the US Pacific Fleet, and an aviator himself, took a more blunt approach in his statements. In the Navy's report, Admiral Walsh states that "this mishap and tragic loss of life that resulted was entirely preventable" (Coast Guard Digest, 2010). In the report he states that although both mishap aircraft were operating under VFR rules with the responsibility to maintain aircraft separation, that more rigorous airspace management advisory procedures along with better use of communications protocols by controllers and aircrews could have prevented the accident. In fact San Diego FACSFAC was in regular contact with CG Rescue 1705 for nearly two and one half hours as the aircraft transitioned in and out of the warning area and had vectored the aircraft around other activity. SD FACSFAC was also in contact with the Marine flight of four, however neither was ever informed of the presence of the other. Admiral Walsh goes on to state that resulting from this investigation, all commands possessing air traffic control responsibilities shall review all policies and procedures to ensure compliance and standardization. In the final report submitted by the United States Navy in the findings of fact heading provide a troubling picture, and portray a watch stander who did not understand the policies and procedures in place (Coast Guard Digest, 2011). Both the final report for the Coast Guard as well as the Navy share that a large factor in the accident was that the FACSFAC SD controllers were operating under conflicting and inadequate written policies and procedures which were misinterpreted by controllers. Three errors were noted in the handling by

FACSFAC SD. First, they did not prioritize the actual Search and Rescue mission above scheduled training events. Second, they did not prioritize their aircraft handling, and lastly that they failed to provide safety alerts and traffic advisories to the crews operating in W-291.

In addition to being unfamiliar with the responsibilities they had to the two aircraft operating in warning areas under their watch, it seems that the controllers at FACSFAC SD also were unaware of their own operating procedures after an accident occurs. Although the Radar Branch Chief reported to the watch floor within thirty minutes, the Facility Watch Supervisor and Approach Controller were not relieved of duty until more than two hours later (Coast Guard Digest, 2011). The Radar Branch Chief collected statements from both the AC and FWS and then sent them home unaware that the FACSFAC SD standard operating procedures stated that the watch standers were required to report to the flight surgeon immediately, regardless of whether the watch standers directly caused the accident or were a contributing factor. This becomes even more interesting after learning that the Facility Watch Stander had dental work completed earlier in the day that involved the use of Novocain. This creates speculation that perhaps the FSW had taken a pain reliever that may have affected his reaction time and judgment. Upon review of the files of the controllers on duty at FACSFAC SD that evening, it was discovered that the FWS, the individual who had dental work that evening had only three months prior had his NOCAL sector qualification suspended. On 27 July 2009, the qualification was pulled for “failure to apply proper handoff procedures and ensure proper separation from adjacent airspace”. He completed the remediation syllabus and was re-qualified to stand watch stander duty. FACSFAC SD continues to take the approach that their controllers were not the causal factor in the accident, and therefore refused to hand down any punitive action against the controllers. However, corrective measures were installed, as the Approach Controller and Facility Watch Stander were suspended from all Air Traffic Control duties on October 30, 2009.

Four months after the accident in a periodic Air Traffic Control NATOPS evaluation investigation was conducted at FACSFAC SD. In the report, the investigator called the unit "satisfactory" and noted that young controllers appeared loose on radar coordination and that traffic calls needed work. The investigator concludes his report with a harsh criticism of FACSFAC SD. He states that on October 29, 2009, the AC failed to provide an appropriate level of service to CG 1705 upon its final return into W-291 airspace. The aircraft was not radar identified upon re-entry, and a traffic advisory reporting the presence of the USMC flight of four should have been passed. In addition, the investigator concluded that the USMC flight of four was also given an inadequate level of service. The USMC crew was never informed that the Coast Guard was conducting an active Search and Rescue case. The USMC aircraft was never in radar contact due to a late squawk assignment and lack of confirmation that the assigned code was activated.

During the twenty-seven year period from 1983 to 2009, the Coast Guard averaged only one Class A mishap per year. The stability of these low mishap rates lulled the United States Coast Guard aviation program into a sense that there was no need to update the current service safety policies and programs. The series of mishaps in 2010 led to a unique examination of Coast Guard aviation to determine what if any common factors are present in the mishaps, and what we can do to prevent another. In May of

2010 while in the midst of four class A mishap investigations and one class B investigation, the Chief of Staff and Deputy Commandant for operations jointly chartered the Aviation Safety Assessment Action Plan. This group was then divided into five Analysis Components: Occupational Hazard Analysis, Data Set Analysis, Aviation Leadership Improvement Focus Group, Booz Allen Hamilton Independent Analysis, and Coast Guard Aviation Association. The results of these Analysis Boards were a total reworking of the Coast Guard Organizational Risk Management program and the Crew Resource Management program. The previous Organizational Risk Management program is now over twelve years old and relied heavily upon crew experience and was highly subjective. The new ORM program centers on a standardized risk assessment tool and a comprehensive ORM training program. Crew Resource Management has traditionally been a very strong and well supported program in the US Coast Guard. The Analysis components determined that while CRM was intended to be delivered in groups of pilots along with aircrew, the training had become separate, and rarely where pilots and crew participated in the same training. In addition to correcting this discrepancy, the Coast Guard has instituted several C schools in Aircraft Accident Investigation, Investigation Management, and Safety Management Systems. These new programs, accompanied by a safety conscious environment are the cornerstones to the new safety program in the Coast Guard

CREW RESOURCE MANAGEMENT ATTITUDE AND BEHAVIORS TESTING

With any training program it is necessary to evaluate the outcome in order to validate the training and ensure that the program is meeting its intended goals. Goldstein (1993) defines training evaluation as the systematic collection of descriptive and judgmental information necessary to make effective training decisions related to the selection, adoption, value and modification of various instructional activities. The evaluation of a training program such as Crew Resource Management is acknowledged as being very difficult due to results being largely based upon the attitudes and behaviors of those who have completed the training; however, there are many benefits of the testing (Cannon-Bowers et al., 1989). First among these benefits is determining if the goals and objectives of the program are appropriate to achieve the desired outcome. Second, the evaluation can determine if the content and delivery of the subject matter are appropriate to achieve the overall program goal. Third the evaluation may help to maximize the transfer of training. Finally, it may be used as a tool to indicate areas at both the individual and team level that require improvement or complete overhaul.

First developed in 1976, Kirkpatrick’s typology remains the most popular framework for assessing the effectiveness of training programs (Salas et al., 2001). Kirkpatrick’s typology utilizes a multi-level approach in the evaluation of training programs consisting of four levels: (1) reactions, (2) learning, (3) behaviors, and (4) results. The first level of evaluation, reactions, is a measure of the trainee’s impression of the course. Kirkpatrick has identified two primary reasons for evaluating customer reaction. First, the decisions of management are often based on the feedback of trainees (Kirkpatrick, 1996). Training programs are very expensive and occupy many man-hours, therefore it is extremely important that the programs meet the needs of trainees. Secondly, reactions are believed to influence learning. Trainees are much less likely to gain the desired knowledge, skills and behavior if they feel that the training was of little value (Kirkpatrick, 1996). The second tier of evaluation in Kirkpatrick’s typology is that of learning. Learning is generally broken into two components: learned skills and learned attitudes. Skills are most commonly assessed by administering some form of knowledge assessment to determine if the individual has learned the desired material. In aviation, this assessment is often done by Line Oriented Flight Training (LOFT). LOFT is a scripted or scenario based training evolution utilizing a training simulator for the purpose of training flight crews with an emphasis on Crew Resource Management (Kanki, Helmreich, & Anca, 2010). The assessment of attitudes is most commonly conducted by the use of a survey. For Crew Resource Management, the most common and validated tool for attitude assessment is the Cockpit Management Attitudes Questionnaire (CMAQ) (Gregorich, Helmreich, & Wilhelm, 1990). The CMAQ has been validated as an effective predictor of outcome factors in the field of Crew Resource Management (Helmreich, Foushee, Benson, & Russinin, 1986). However, there are scholars who dispute the validity of the CMAQ in the modern aviation environment citing the lack of key cognitive aspects being addressed such as situational awareness, decision making, and workload management (O'Connor et al., 2002). The greatest goal of CRM training is to change crew members' attitudes and make them aware of the pitfalls and negative behaviors that can jeopardize safety. For this reason, the evaluation of attitude learning is an integral component in the overall assessment of the training. The third tier of evaluation in Kirkpatrick's typology, behavior deals with examining whether the training has developed the desired behaviors for effective CRM. The observation of behaviors, much like learned skill is best performed by a structured LOFT. Surveys such as the CMAQ also have proven to be effective tools in recognizing behaviors in crew members. The fourth and final tier of Kirkpatrick's typology is results. The evaluation of results is a measure of the effectiveness of the training on the organization as a whole. Measuring the effectiveness of Crew Resource Management training during a mission is difficult due to the many variables that are involved (O'Connor et al., 2002). One accepted method of analyzing the results of CRM training on the organization is by analyzing historical mishap and safety data. In a study by Alkov (1989), there was a noted decrease in mishap rates as a result of CRM training. In another study, Kayten (1993) cited multiple examples of good CRM practices from National Transportation Safety Board reports that helped to limit or prevent accidents where human or mechanical error existed.

SUMMARY

Crew Resource Management has been proven to reduce the prevalence of human error in aviation mishaps (Alkov, 1989; Kayten, 1993). As aircraft become more reliable, and more reliant upon automation, the human component and potential for error must be minimized. The extremely high mishap rate experienced by the Coast Guard in 2010 has uncovered a threat to the safety of Coast Guard aviators. Coast Guard Crew Resource Management has been revamped, but is there a one size fits all training that is best for both pilots as well as crewmembers? The Cockpit Management Attitudes Questionnaire is the proven instrument of choice for validating CRM training and analyzing the attitudes and behaviors of aviators (Gregorich, Helmreich, & Wilhelm, 1990). This study will evaluate the differences in regards to behavior and attitudes in airmen of multiple crew positions as well as any differences between rotary and fixed wing aviators. Chapter III will address the methodology of the study. A review of the population, survey instrument, and method of analysis will be presented

CHAPTER III

METHODS AND PROCEDURES

This chapter covers the methods and procedures used in this descriptive survey study designed to determine Coast Guard aviator's Crew Resource Management attitudes and behaviors. The methods and procedures include defining the population for the study, describing the instrument's design, explaining the methods of data collection, and addressing the statistical analysis methods used to treat the data and develop meaning.

Population

Population for this study is based upon the number of aviators that currently fly as pilots and crew members attached to the Coast Guard's largest Air Station in Clearwater, Florida. The population for the study consisted of pilots, co-pilots, and crewmembers assigned to both the HC-130 Hercules turbo-prop fixed-wing aircraft and the H60 helicopter. There were 343 total Coast Guard aviators that made up the sample population at Air Station Clearwater.

Instrument Design

An electronic survey was developed utilizing the validated Cockpit Management Attitudes Questionnaire developed by Gregorich, Helmreich, and Wilhelm (1990). The survey was designed to measure the attitudes and beliefs of aviators on the topics of flight safety, flight management, and Crew Resource Management. It is comprised of 25 questions answered utilizing a five-point Likert scale to rate the individual's opinion of a given statement regarding cockpit management from the choices of strongly disagree, disagree, neutral, agree, and strongly agree. A copy of the survey is provided in Appendix A.

Methods of Data Collection

The survey was emailed utilizing the Coast Guard email server along with a cover letter detailing the study to all aviators currently on flight orders at Air Station Clearwater. The cover letter email provided the survey purpose, addressee response encouragement, human subject protection measures, and the notice of agency. The email also included electronic survey instructions. Respondents were made aware that participation in the survey was optional, but that the success of the study depended on their contribution. While there is no direct benefit to any participant, the goal of the study is to improve the safety program for all aviators with the Coast Guard. All responses were collected by the survey program and coded as to provide anonymity to all participants. Respondents were asked to complete the survey within ten days. A follow-up email was sent one week after the initial email including the link to the electronic survey. The electronic survey collected the data anonymously and provided aggregated responses to the researcher. A copy of the cover letter is included as Appendix B.

Statistical Analysis

Electronic survey responses were received by the researcher and organized by question. Responses to each question were calculated based upon crew position and air frame. T-tests comparing the sample responses on each item within three factors were then conducted to determine if there is a significant difference between the cockpit management attitudes of crewmembers as compared to pilots as well as t-tests to determine if there is a significant difference between the cockpit management attitudes of HC-130 aviators as compared to H60 Aviators. Statistical analysis was then utilized to answer the two research questions.

Summary

Chapter III covered the methods and procedures used to conduct the study of cockpit management attitudes of Coast Guard aviators. The methods and procedures included the population, survey instrument design, methods of data collection, and statistical analysis of the survey responses. The sample was the aviators currently on flight orders assigned to Air Station Clearwater, Florida. The instrument design was validate by the research of Gregorich, Helmreich, and Wilhelm (1990). The methods of data collection consisted of an email via the Coast Guard message system to the sample containing a link to the electronic survey that collected and reported the data upon completion of the survey period. Respondents were made aware that participation was optional and all information collected would remain anonymous. Statistical analysis of the question response data using descriptive methods was accomplished utilizing independent t-tests to answer the study's research questions. Chapter IV, Findings, presents the survey data and analysis of that data.

Chapter IV

Findings

The problem of this study was to compare the attitudes on Crew Resource Management practices of US Coast Guard enlisted flight crew members to those of pilots to determine if the current blended training is appropriate. This chapter will consist of an analysis of each research question proposed for the study. The data collected will be analyzed to determine if there is a significant difference between the Crew Resource Management attitudes and behaviors of Coast Guard pilots and crew members. The second section will investigate if there is a significant difference between the Crew Resource Management attitudes and behaviors of Coast Guard C-130 fixed wing aircrew members and H60 helicopter aviators.

Respondents

Respondents for this study are from the population of aviators stationed at Coast Guard Air Station Clearwater. One hundred seventy-two members out of a population of 343 aviators at Air Station Clearwater responded to the Cockpit Management Attitudes Questionnaire representing a 50.1% response rate. Among those that responded, 40 were pilots and 132 were aircrew members. Respondents consisted of 92 C-130 fixed wing aviators and 80 rotary wing helicopter aviators.

Crew Position

Research Question 1 of this study asks if there is a significant difference between the Crew Resource Management attitudes of pilots and aircrew members. Questionnaire items were separated into three factors: communication and coordination, command responsibility, and recognition of stressor effects. The first factor, communication and coordination, investigates crew attitudes pertaining to teamwork and individual crew responsibilities. Factor 2, command responsibility, focuses on the leadership needs for the crew as well as the belief in the appropriateness of shared responsibility of crew members in flight operations. The final factor, recognition of stressor effects, includes items related to consideration and possible compensation for stress due to situational adversity. Analysis of cumulative responses from each of the three factors indicate that there is no significant difference between the responses of pilots and crew members on the Cockpit Management Attitudes Questionnaire for any factor. However, individual item t-test results did indicate a significant difference at the 95% confidence interval for multiple items. Each individual factor is analyzed in the following section.

Communication and coordination. Factor 1, communication and coordination analysis, revealed a t-test p value of .0848 which is not statistically significant at the 95% confidence interval. With a sample size of 40 pilots and 132 crewmembers, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 1.73 is less than 1.97, we can assume that the observed difference between the means is not significant at the .05 level of significance. Therefore the researcher cannot assume that pilots and crewmembers have differing attitudes towards communication and coordination factors of Crew Resource Management. Factor one is made up of eleven items which cumulatively do not represent a significance difference between pilots and aircrew members CRM attitudes and behaviors, however, four items did exhibit a significant difference between the two populations. Item 8 asked respondent opinion of the statement “pilots should be aware of and sensitive to the personal problems of their crew members”. With a sample size of 40 pilots and 132 crewmembers, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.18 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that pilots and crewmembers have differing attitudes in regards to the pilot’s responsibility to be aware and sensitive to the personal problems of crew members. Item 10 asked respondents opinion of the statement “The pilot flying the aircraft should verbalize plans for procedures or maneuvers and should be sure that the information is understood and acknowledged by the other crew members”. Again, pilots responded higher on this item with all 40 pilots responding unanimously that they strongly agreed with this statement. With a sample size of 40 pilots and 132 crewmembers, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.48 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that pilots and crewmembers have differing attitudes in regards to the pilot’s responsibility to verbalize plans for procedures or maneuvers and the requirement that information passed is comprehended by all crew members. Item 22 states “Effective crew coordination requires crew members to take into account the personalities of other crew members”. Yet again, pilots answered strongly agree more often than crew members. With a sample size of 40 pilots and 132 crewmembers, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.79 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that pilots and crewmembers have differing attitudes regarding whether effective crew coordination requires crew members to take into account the personalities of other crew members. The greatest difference between the attitudes of pilots and crew members was indicated on Item 23 of the questionnaire which stated "The Aircraft Commander's responsibilities include coordination of cabin crew activities". Pilots overwhelming responded higher on the Likert scale than crew members with a mean score of 4.62 as compared to the crew members score of 3.85. With a sample size of 40 pilots and 132 crewmembers, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 4.98 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that pilots and crewmembers have differing attitudes regarding the duties of the Aircraft Commander as they pertain to cabin crew activities. Data collected from pilots and crew members on factor 1 of the questionnaire titled communication and coordination is included in Table 1.

Command Responsibility. This factor of the questionnaire focuses on the leadership needs for the crew as well as the belief in the appropriateness of shared responsibility of crew members in flight operations. Like factor 1, this factor did not reveal a significant difference cumulatively; however two of the items did uncover a significant difference in the beliefs of pilots and crew members on the topic of command responsibility. Item 9 states "The Aircraft Commander should take control and fly the aircraft in emergency and nonstandard situations". On this item aircrew agreed more

Table 1

Pilot and crewmember attitudes of Communication and Coordination.

Item #	**PILOTS**	**40**	**CREW**	**132**		t-test
FACTOR 1	M	SD	M	SD	t-ratio	p value
2	4.23	1.3	4.22	1.22	0.04	0.9644
6	4.85	0.55	4.81	0.48	0.45	0.6562
7	4.77	0.43	4.89	0.32	1.91	0.058
8	4.46	0.66	4.15	0.82	**2.18**	**0.0303**
10	5	0	4.56	1.12	**2.48**	**0.0141**
12	4.85	0.38	4.72	0.54	1.42	0.1579
14	3.38	1.3	3.67	1.07	1.43	0.1558
16	4.77	0.44	4.6	0.76	1.35	0.18
21	4.85	0.38	4.6	0.76	2	0.0468
22	4.54	0.52	4.11	0.93	**2.79**	**0.0059**
23	4.62	0.65	3.85	0.91	**4.98**	**0.0001**
Totals	4.57	0.6	4.33	0.81	1.73	0.0848

often than pilots with a mean score of 3.85, while pilots averaged a 3.38, closer to neutral score on the five-point Likert scale. T-test results indicated a p value of .0175 representing a significant difference at the 95% confidence interval. With a sample size of 40 pilots and 132 crewmembers, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.40 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that pilots and crewmembers attitudes differ significantly in regards to what circumstances require the aircraft commander to take control of the aircraft. Item 18 saw pilots answer more favorably to the statement "Overall, successful flight deck management is primarily a function of the Aircraft Commander's flying proficiency". Using a sample size of 40 pilots and 132 crewmembers, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.03 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that pilots and crewmembers have differing attitudes regarding successful flight deck management and its relationship to pilot flying proficiency. Factor 2 results are indicated on the following page on Table 2.

Table 2

Pilot and crewmember attitudes on command responsibility.

Item #	**PILOTS**	**40**	**CREW**	**132**		t-test
FACTOR 2	M	SD	M	SD	t-ratio	p value
9	3.38	.96	3.85	1.12	2.40	0.0175
11	2.77	1.36	2.59	1.42	.71	0.4792
15	2.15	1.34	1.89	1.15	1.20	0.2302
18	3.08	1.66	2.56	1.34	2.03	0.044
Totals	4.57	0.6	4.33	0.81	1.73	0.0848

Recognition of Stressor Effects. The factor entitled recognition of stressor effects featured items related to consideration and possible compensation for stress due to situational adversity. This factor did not present a significant difference between the attitudes of pilots and crew members cumulatively or on any individual item. Results of the data analysis of factor 3, recognition of stressor effects is included on Table 3.

Table 3

Pilot and crewmember attitudes on recognition of stressor effects.

Item #	**PILOTS**	**40**	**CREW**	**132**		t-test
FACTOR 3	M	SD	M	SD	t-ratio	p value
13	3.54	1.13	3.3	1.23	1.10	0.2725
17	2.85	1.14	2.96	1.34	.47	0.639
24	3.62	.96	3.3	1.23	1.51	0.1327
25	3.62	1.19	3.89	.97	1.46	0.1461
Totals	3.41	0.6	4.33	0.81	.24	0.8131

Designated Airframe

Research Question 2 investigates whether there is a significant difference in the Crew Resource Management attitudes between fixed wing aviators and rotary wing aviators in the United States Coast Guard. This study specifically investigates the attitudes of fixed wing aviators on the C-130 Hercules and the H60 Jayhawk helicopter. These are the two most common aircraft in the modern Coast Guard aviation fleet and are the only assets at Coast Guard Air Station Clearwater where there are six C-130 aircraft and twelve H60 helicopters assigned. Analysis of the results from t-tests performed on each of the three factors of Crew Coordination, Command Responsibility, and Recognition of Stressor Effects is detailed in the following sections.

Crew Coordination. Results from the t-tests on crew coordination between the sample populations of 92 C130 members and 80 H60 aviators did not reveal a significant difference for the factor as a whole; however, six of the 11 items on the questionnaire did result in a significant difference of attitude at the 95% confidence interval. On Item 2, H60 personnel responded in agreement more often with a mean score of 4.73 as compared to the mean of 4.16 from C130 personnel. These responses resulted in a p value of .0008 indicating a significant difference in attitude regarding the statement "Crew members should feel obligated to mention their own psychological stress or physical problems to other flight crew personnel before or during a flight". Using a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 3.42 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding how crewmembers should handle psychological stress or physical issues. Likewise, H60 aviators responded more favorably to Item 8 as well that states “Pilots should be aware of and sensitive to the personal problems of their crew members”. With a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 3.01 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding the level to which pilots need to be aware and sensitive of the personal problems of crewmembers. Item 10 states that “The pilot flying the aircraft should verbalize plans for procedures or maneuvers and should be sure that the information is understood and acknowledged by the other crew members”. Again, H60 crews agreed more frequently with this statement resulting in a t-test p value of .0058 indicating a significant difference in attitudes between the two samples. Using a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.79 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding pilot responsibilities in verbalizing plans or procedures. Item 12 was also agreed with more frequently by H60 personnel resulting in a t-test p value of .0033 indicating a significant difference in attitude to the statement “Crew members should alert others to their actual or potential overwork loads”. With a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.98 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding crewmember responsibility to alert others to actual or potential overwork loads. Item 14 states "Aircraft Commanders should encourage crew members to question procedures during normal flight operations and emergencies". Like the previous statements, H60 personnel responded in agreement with this item more often than their C130 counterparts resulting in a p value <.0001 indicating a very significant difference in attitude. Using a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 4.26 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding the encouragement of aircraft commanders of crewmembers to question procedures. Item 23 was the only statement of the eleven item factor wherein C130 personnel responded more in agreement than did H60 personnel. This item states "The Air craft Commander's responsibilities include coordination of cabin crew activities". C130 personnel responded with a mean score of 4.48 while H60 aviators had a mean of 3.67 reflected a t-test p value of <.0001 indicating a very significant difference in attitude. Using a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 4.52 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding aircraft commander responsibility of the aircrew cabin. Data from Factor 1, Communication and Coordination illustrating attitudes of C130 and H60 aviators is presented below in Table 4.

Table 4

C130 and H60 attitudes on Communication and Coordination.

Item #	**C130**	**92**	**H60**	**80**		t-test
FACTOR 1	M	SD	M	SD	t-ratio	p value
2	4.16	1.14	4.73	1.03	**3.42**	**0.0008**
6	4.84	0.47	4.87	0.52	0.40	0.6916
7	4.76	0.44	4.87	0.35	1.80	0.0743
8	4.12	0.78	4.47	0.74	**3.01**	**0.0030**
10	4.56	1.16	4.93	0.26	**2.79**	**0.0058**
12	4.72	0.54	4.92	0.28	**2.98**	**0.0033**
14	3.32	1.03	4.07	1.28	**4.26**	**0.0001**
16	4.68	0.69	4.67	0.62	.10	0.9210
21	4.64	0.57	4.73	0.8	.86	0.3924
22	4.2	0.96	4.33	0.62	1.04	0.3010
23	4.48	1.12	3.67	1.23	**4.52**	**0.0001**
Totals	4.41	0.81	4.57	0.70	1.38	0.0848

Command Responsibility. Factor 2 titled Command Responsibility included one item that provided a significant difference in opinion, however the cumulative factor was not determined to provide a significant difference at the 95% confidence interval resulting in a .3249 p value from the t-test. Using a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of .99 does not exceed 1.97, we can assume that the observed difference between the means is not significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators do not have significantly differing attitudes regarding command responsibility. Only item 11 represented a significant difference resulting in a t-test p value of <.0001. This item states that “Crew members should not question the decisions or actions of the Aircraft Commander except when they threaten the safety of the flight”. C130 aviators agreed with this statement with a mean of 2.83, just below the neutral score while H60 aviators had a mean score of 2.00 indicating a response of disagree with this statement. With a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 4.39 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding whether crewmembers should question the decisions or actions of the Aircraft Commander. Results of Factor 2 are detailed in Table 5.

Table 5

C130 and H60 attitudes on Command Responsibility.

Item #	**C130**	**92**	**H60**	**80**		t-test
FACTOR 2	M	SD	M	SD	t-ratio	p value
9	3.72	1.10	3.62	1.04	0.61	0.5427
11	2.80	1.38	2.00	0.93	4.39	0.0001
15	1.84	1.07	2.10	1.01	1.63	0.1047
18	2.76	1.48	2.67	1.45	0.40	0.6885
Totals	2.78	1.26	2.60	1.11	0.99	0.3249

Recognition of Stressor Effects. This factor investigated the differing opinions between C130 crews and H60 crews regarding consideration and possible compensation for stress due to situational adversity. Not only did a t-test of the cumulative scores from the factor reveal a significant difference at the 95% confidence interval, but three of four individual items indicated a significant difference in attitude with C130 crews responding higher in agreement on each item. Item 13 states “Even when fatigued, I perform effectively during critical flight maneuvers”. C130 aviators responded with a mean score of 3.60, while H60 averaged 3.00 resulting in a t-test p value of .0003 indicating a very significant difference. Using a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 3.32 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding their recognition of performance while fatigued. Item 24 states “A truly professional crew member can leave personal problems behind while performing flight duties”. C130 crews responded to this statement with a mean score of 3.80 indicating an agreement with the statement while H60 crews responded with a mean of 3.07 indicating a neutral opinion of the statement. These scores resulted in a t-test p value of <.0001 indicating a very significant difference at the 95% confidence interval. With a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 3.85 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding how crewmembers should handle personal problems. Finally, Item 25 states “My decision making ability is as good in emergencies as in routine flying situations”. Again C130 aviators responded in agreement more frequently resulting in a t-test p value of

.0006 indicating a significant difference in attitude between the two sample populations. Using a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.64 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding decision making abilities during high and low stress situations. For the factor as a cumulative sum, C130 crews agreed with a mean of 3.64 and a standard distribution of 1.05 while H60 crew averaged a mean of 3.12 and a standard distribution of 1.3. T-test analysis revealed a p value of .0017 indicating a very significant difference between the Crew Resource Management attitudes in the factor of recognition of stressors between C130 and H60 personnel. Using a sample size of 92 fixed wing aviators and 80 rotary wing aviators, we use the normal-curve value of 1.97 (5 percent) to determine the significance of difference. Since the obtained t-ratio of 2.90 exceeds 1.97, we can assume that the observed difference between the means is significant at the .05 level of significance. Therefore the researcher can assume that fixed wing and rotary wing aviators have differing attitudes regarding the recognition of stressor effects. Data from Factor 3, recognition of stressors from C130 and H60 personnel is provided in Table 6 on the following page.

Table 6

C130 and H60 personnel recognition of stressor effects.

Item #	**C130**	**92**	**H60**	**80**		t-test
FACTOR 3	M	SD	M	SD	t-ratio	p value
13	3.60	1.12	3.00	1.25	3.32	0.0003
17	3.08	1.35	2.73	1.22	1.77	0.0444
24	3.80	1.04	3.07	1.44	3.85	0.0001
25	0.70	0.70	3.67	1.29	2.64	0.0060
Totals	3.64	1.05	3.12	1.30	2.90	0.8131

Summary

Chapter IV provided results of the data collected utilizing the Cockpit Management Attitudes Questionnaire to determine if there was a significant difference in the attitudes of pilots and air crew or between H60 and C130 personnel. Multiple t tests were utilized to determine if a significant difference was observed utilizing the confidence interval of 95%. Analysis of data indicated that while t-tests of some individual items produced a t-ratio that was determined to be significant at the 95% confidence interval, only factor 3 entitled Recognition of Stressor Effects resulted in a significant difference between C-130 fixed wing aviators and H60 rotary wing aviators. Chapter V will provide the summary, conclusions and future recommendations related to this study.

Chapter V

Summary, Conclusions, and Recommendations

The information gathered on Crew Resource Management attitudes and behaviors are presented. Based on the findings of this study, the research question of if there is a significant difference in the Crew Resource Management attitudes and beliefs of pilots as compared to crew members will be discussed as well as the research question of if there is a significant difference between the attitudes and beliefs of fixed wing aviators as compared to rotary wing aviators. The conclusions from these research questions will answer the problem of the study determining if there is a difference in the attitudes on Crew Resource Management practices of US Coast Guard enlisted flight crew members to those of pilots to determine if the current blended training is appropriate.

Summary

The purpose of this study is to compare the attitudes on Crew Resource Management practices of US Coast Guard enlisted flight crew members to those of pilots to determine if the current blended training is appropriate. This problem was analyzed by the investigation of two research questions. The first research question of the study asks is there a significant difference between the Crew Resource Management attitudes and beliefs of pilots in relation to air crew members. A second research question seeks to find an answer to the question is there a significant difference between the Crew Resource management attitudes and beliefs of fixed wing aviators as compared to rotary wing aviators.

Due to the overwhelming documentation citing human error as the single largest contributor to aviation mishaps, it is vitally important that Crew Resource Management training is as effective as possible. Modern aircraft have advanced to the point where it is extremely rare that mechanical failure is the cause of an aviation mishap. An estimated 60%-80% of all aviation accidents and mishaps can be attributed to human error (Freeman & Simmons, 1991). With five class A mishaps resulting in over two million dollars in damages and/or loss of life and three class B mishaps resulting in over five hundred thousand dollars as well as the loss of ten Coast Guard aviators in fiscal year 2010, the Coast Guard understands the risks associated with human error as a result of a breakdown in Crew Resource Management. This study is limited by the fact that Crew Resource Management training is given to Coast Guard members annually at different times throughout the year. Therefore, the time since the last refresher training for participants may vary between one day and twelve months. Another limitation is presented by the fact that there are multiple Crew Resource Management instructors for our sample population at Coast Guard Air Station Clearwater. Although the CRM training curriculum is standardized and there is a course for instructors, instructor characteristics and styles will vary and may affect the outcome of learning objectives. For this study the researcher employs a number of assumptions. First it is assumed that the sample population at Coast Guard Air Station Clearwater is representative of the Crew Resource Management attitudes and beliefs of aviators throughout the Coast Guard. Second it is assumed that all respondents have completed an initial Crew Resource Management training course within the past 12 months or have attended the mandatory CRM refresher course within the past 12 months. Lastly, it is assumed that all respondents are currently on flight orders maintaining a minimum of four flight hours per month.

The population for this study consisted of all qualified aviators at Coast Guard Air Station Clearwater. At the time of the study in June of 2014 this totaled 343 aviators of which 80 were pilots and 263 were enlisted air crew members. All 343 Coast Guard aviators were provided the Cockpit Management Attitudes Questionnaire developed by Steven Gregorich and Robert Helmreich (Gregorich, Helmreich, & Wilhelm, 1990). One hundred seventy two members responded to the survey representing 50.1% of the population. The results of t-tests were used to determine evidence of a significant difference between Coast Guard pilot and aircrew safety attitudes and behavior in Crew Resource Management as well as if there were significant differences between those attitudes and behaviors of C130 and H60 personnel. Survey questions will be asked using a five-point Likert scale for collection of data in three factors. Those factors included communication and coordination, command responsibility, and recognition of stressor effects. The data were analyzed utilizing t-tests to determine if there is a significant difference for any of the three factors between crew position and airframe.

Conclusions

A discussion of how the Coast Guard is meeting the training needs of independent crew positions will be presented by analyzing the results of the data collected on the research questions associated with this study. Research Question 1 of the study asked if there was a significant difference between the Crew Resource Management attitudes and beliefs of pilots in relation to air crew members. Research Question 2 investigated the question if there was a significant difference between the Crew Resource Management attitudes and beliefs of fixed wing aviators as compared to rotary wing aviators. An analysis of the data collected for each question divided into the three factors of communication and coordination, command responsibility and recognition of stressor effects is presented in the following sections.

Crew Position

Research Question 1 of this study asks if there is a significant difference between the Crew Resource Management attitudes and beliefs of pilots compared to aircrew members. Data collected on the Cockpit Management Attitudes Questionnaire from a sample of 40 pilots and 132 aircrew members suggests that there is not a significant difference in these attitudes and beliefs. Of the three factors tested during the study, only communication and coordination approached the 95% confidence interval to be considered significant.

The communication and coordination factor t-test resulted in a p value of .0848 and a t-ratio of 1.73, making it not a significant difference. Four items within the eleven items that comprise Factor 1 however did result in a significant difference and those items will be discussed here. Item 8 states "Pilots should be aware of and sensitive to the personal problems of their crew members". For this item, pilots responded more favorably with a t-test p value of .0303 making this a significant difference. From this we can conclude that pilots believe that they should account for the personal issues of the entire crew more than the crewmembers feel that they should. Item 10 states "The pilot flying the aircraft should verbalize plans for procedures or maneuvers and should be sure that the information is understood and acknowledged by the other crew members". On this item, all 40 pilot respondents replied with a response of strongly agree while crew members responded with a mean score of 4.56. This would suggest that some aircrew members did not feel strongly that they needed the pilot in command to verbalize all plans and confirm that they and the rest of the crew understood their responsibility. Item 22 states that "Effective crew coordination requires crew members to take into account the personalities of other crew members". This item is closely related with Item 8 and therefore it is not surprising that pilots agree more frequently resulting in a t-test p value of .0059. This correlation with Item 8 adds validity evidence that the questionnaire is correctly evaluating the attitudes of pilots and aircrew members on the factor of communication and coordination. Although the overall factor did not yield a significantly different p value at the 95% confidence interval, analysis of individual items reveals a significant difference between the communication and coordination attitudes of pilots and aircrew members. This difference is particularly evident on those items related to the personal problems and personalities of other crew members. One explanation for this difference could be the extensive leadership training delivered to junior officers as opposed to the minimal leadership training given to junior enlisted members of the United States Coast Guard.

Factor 2 of the survey consisted of items on command responsibility. T-test results of Factor two items resulted in a p value of .5733 and a t-ratio of 0.56 indicating that there is no significant difference between the CRM attitudes on command responsibility between pilots and crewmembers. Similar to Factor 1, there are two items within Factor 2 that represent a significant difference between the attitudes and beliefs on Crew Resource Management command responsibility between pilots and crewmembers.

Item 9 states that “The Aircraft Commander should take control and fly the aircraft in emergency and nonstandard situations”. Crewmembers agreed with this statement more often than pilots resulting in a mean score of 3.85, at the agree score on the five-point Likert scale, while pilots had a mean score of 3.38, the neutral score. T-test analysis of this item resulted in a p value of .0175 indicating a significant difference between the opinions of the two sample populations. From this we can determine that crewmembers believe that during emergency and nonstandard situations, the aircraft commander should assume control of the aircraft while pilots remained neutral on this topic. Item 18 states “Overall, successful flight deck management is primarily a function of the Aircraft Commander’s flying proficiency”. On this item pilots agreed more frequently than crew members with a mean score of 3.08 indicating a neutral response on the five-point Likert scale while crew members averaged a mean score of 2.56. A t-test of the data collected on Item 18 revealed a p value of .044, indicating a slightly significant difference at the 95% confidence interval. This data would suggest that pilots believe that effective flight management is a result of the aircraft commander’s flying proficiency with more frequency than aircrew members believe this statement to be true.

Factor 3 data resulted in the highest p value scores on the cumulative factor t-test of all three factors at .8131. This factor evaluates the member’s attitudes towards recognition of stressor effects featuring items related to consideration and possible compensation for stress due to situational adversity. The data suggest that there is very little difference in the attitudes and beliefs between pilots and crewmembers on these items. We can therefore conclude that the training provided on recognition of stressor effects is equally effective for both pilots and aircrew members.

Designated Airframe

Research Question 2 investigates if there is a significant difference in the Crew Resource Management attitudes and beliefs of fixed wing aviators compared to rotary wing aviators. Survey items were again separated into the three factors of communication and coordination, command responsibility, and recognition of stressor effects. Of these three factors, Factor 3, the recognition of stressor effects resulted in the greatest statistical difference resulting in t-test p values considered significantly different on all items within the factor. This result would indicate that attitudes and beliefs on the recognition of stressor effects are different between airframes and that special consideration may need to be given to ensuring that each airframe community is receiving the learning outcomes required.

Factor 1 investigated the opinions of C130 and H60 aviators on the topics of communication and coordination. A t-test of the cumulative scores from this factor resulted in a p value of .1708 indicating that there is not a significant difference between the attitudes and behaviors of C130 and H60 aviators on topics of communication and coordination. Item analysis however reveals six item that result in a significantly different p value at the 95% confidence interval. Item 2 states “Crew members should feel obligated to mention their own psychological stress or physical problems to other flight crew personnel before or during a flight”. H60 aviators agreed with this statement more often than C130 members resulting in a mean score of 4.73 for H60 personnel and a mean score of 4.16 for C130 aviators. This resulted in a t-test p value of .0008 indicating a very significant difference. Review of individual items indicates that H60 members answered more in agreement with items relating to communication and coordination than C-130 aviators on all but one item. This is likely due to the smaller crew profile associated with the airframe. While the C130 operates with a standard configuration of seven personnel, the H60 routinely operates with only three aviators. This configuration requires that the small crew takes into account the factors of communication and coordination ensuring that all crew members may perform to their full capacity. Larger fixed wing crews often mistakenly underestimate the possible errors and complications that may be presented by not accounting for each individual in regards to communication and coordination. The only item agreed upon more frequently by C130 personnel that H60 members was Item 23 that states “The Air craft Commander’s responsibilities include coordination of cabin crew activities”. This anomaly is likely a result of the fact that the H60 generally has one individual in the cabin of the aircraft and therefore is delegated more responsibility. C130 crews routinely fly with a minimum of two crewmembers in the cabin which unlike the H60 is not visible from the flight deck making communication and coordination of cabin activities a challenge and priority of the aircraft commander. The results of the analysis of this factor indicates that a t-test of Factor 1 responses did not indicate a significant difference between the communication and coordination attitudes and beliefs of C130 aviators as compared to H60 aviators. However, there are differences in beliefs between the two sample populations on individual items that should be addressed through individual training.

Factor 2 investigated attitudes and behaviors related to command responsibility. This factor resulted in a t-test p value of .3249 that was not determined to be significantly different at the 95% confidence interval. Of the four items included in factor two, only item 11 resulted in a significant difference between the attitudes and beliefs of C130 members and H60 aviators. Item 11 states “Crew members should not question the decisions or actions of the Aircraft Commander except when they threaten the safety of the flight”. While both samples responded below the neutral score, C130 members agreed with a mean value of 2.8 just below neutral, while H60 members averaged a score of 2.0 representative of the disagree score on the five-point Likert scale. This indicates that H60 aviators are more likely to question the decisions of the aircraft commander. This likely reflects the common crew configuration of more experienced members on the H60 platform. Whereas the C130 is commonly crewed by two pilots and five enlisted members, three of whom are very junior, the H60 crew is comprised of two pilots and one to two enlisted members. This smaller more experienced crew encourages greater crew coordination and likely impacts the crew’s initiative to question the decisions and actions of the aircraft commander.

Factor 3 of the survey pertains to items related to the recognition of stressor effects featuring items related to consideration and possible compensation for stress due to situational adversity. While this factor represented the least difference between the attitudes and beliefs of pilots as compared to crew members, it represents the greatest difference between C130 and H60 aviators. In fact, attitudes and beliefs towards each of the four items when analyzed using a t-test were determined to be significantly different at the confidence interval of 95%. Item 13 states “Even when fatigued, I perform effectively during critical flight maneuvers”. C130 members agreed with statement with a mean score of 3.60, while H60 members averaged a score of 3.00 indicating a neutral score. T-test results indicated a p value of .0003 making this a very significant difference. Item 17 states that "My performance is not adversely affected by working with an inexperienced or less capable crew member". Again, C130 members agreed at a higher rate just above the neutral score compared to H60 members who averaged a score below neutral. T-test results for Item 17 resulted in a p value of .0444 indicating a slightly significant difference. Item 24 states "A truly professional crew member can leave personal problems behind while performing flight duties". C130 aviators responded to this item with a mean score of 3.8 at the agree rating while H60 aviators had a mean score of 3.07, the neutral rating. This item resulted in a p value of <.0001 indicating a very significant difference. Lastly, Item 25 states "My decision making ability is as good in emergencies as in routine flying situations". Similar to the preceding items, C130 aviators agreed with statement more frequently than H60 personnel resulting in a mean score of 4.08 while H60 personnel had a mean score of 3.67. The data resulted in a t-test p value of .0006 indicating a very significant difference at the 95% confidence interval. Review of this data provides evidence that C130 personnel mistakenly believe that they can overcome stressors. In fact, even the scores of H60 members appear to be higher than expected. While the topics of stressors and their effects are core to Crew Resource Management training, it would appear that the learning outcomes are not being effectively transferred particularly in the C130 community.

Recommendations

As a result of the findings presented in this study it is reasonable to conclude that there are significant challenges that affect each of the four represented demographics of pilots, crew, H60 aviators and C130 aviators. Due to these individual challenges, it is recommended that at a minimum portions of Coast Guard Crew Resource Management training programs should be conducted catering to the specific needs of each individual demographic. There is evidence that there is a significant difference in the attitudes and beliefs on Crew Resource Management between each population sample making this personalized training a necessity to achieve the learning outcomes desired for CRM training.

One of the assumptions of this study was that the population of aviators at Coast Guard Air Station Clearwater is representative of the global Coast Guard aviator population on attitudes and beliefs on Crew Resource Management. Future study recommendations include evaluating members from other Coast Guard Air Stations. Additionally, a survey of other government agencies such as the Navy and Air Force CRM attitudes and beliefs utilizing the CMAQ instrument would provide informative data on how Coast Guard aviators compare to other services.

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Appendix A

Cockpit Management Attitudes Questionnaire

Purpose: The purpose of this study is to examine the attitudes of Coast Guard Pilots and Flight Crew Members on the topic of Crew Resource Management (CRM) training programs currently employed by the United States Coast Guard. Multiple human factors aspects within the scope of Crew Resource Management will be studied to include teamwork, situational awareness, and overall flight crew safety. Human error accounts for over 80% of all Naval Aviation mishaps, and of those over 65% can be attributed to at least one failure in CRM. Crew Resource Management has been determined by the United States Coast Guard, as well as the world-wide aviation community, to improve upon safety by eliminating distractors and negative behaviors in pilots and crew members. The primary focus of the study is to determine if the current CRM training conducted by the Coast Guard instills and enhances the desired attitudes and behaviors of aviators and investigate any possible disparity by crew position or airframe. Analysis of data will be utilized to prescribe recommendations for future instructional design of Coast Guard Crew Resource Management training.

Directions: Please respond to the following items by using the following scale to select your response for each survey question:

A	B	C	D	E
Strongly Disagree	**Slightly Disagree**	**Neutral**	**Slightly Agree**	**Strongly Agree**

1. **Crew members should avoid disagreeing with others because conflicts create tension and reduce crew effectiveness.**
2. **Crew members should feel obligated to mention their own psychological stress or physical problems to other flight crew personnel before or during a flight.**
3. **It is important to avoid negative comments about the procedures and techniques of other crew members.**
4. **Aircraft Commanders should not dictate flight procedures to their copilots.**

A	B	C	D	E
Strongly Disagree	**Slightly Disagree**	**Neutral**	**Slightly Agree**	**Strongly Agree**

5. **Casual, social conversation in the cockpit during periods of low workload can improve crew coordination.**
6. **Each crew member should monitor other crew members for signs of stress or fatigue and should discuss the situation with the crew member.**
7. **Good communications and crew coordination are as important as technical proficiency.**
8. **Pilots should be aware of and sensitive to the personal problems of their crew members.**
9. **The Aircraft Commander should take control and fly the aircraft in emergency and nonstandard situations.**

10. The pilot flying the aircraft should verbalize plans for procedures or maneuvers and should be sure that the information is understood and acknowledged by the other crew members.

11. Crew members should not question the decisions or actions of the Aircraft Commander except when they threaten the safety of the flight.

12. Crew members should alert others to their actual or potential overwork loads.

13. Even when fatigued, I perform effectively during critical flight maneuvers.

14. Aircraft Commanders should encourage crew members to question procedures during normal flight operations and emergencies.

15. There are no circumstances (except total incapacitation) where the copilot should assume command of the aircraft.

16. A debriefing and critique of procedures and decisions after each flight is an important part of developing and maintaining effective crew coordination.

17. My performance is not adversely affected by working with an inexperienced or less capable crew member.

18. Overall, successful flight deck management is primarily a function of the Air craft Commander's flying proficiency.

19. Training is one of the Aircraft Commander's most important responsibilities.

20. Because individuals function less effectively under high stress, good crew coordination is more important in emergency and abnormal situations.

A	B	C	D	E
Strongly Disagree	**Slightly Disagree**	**Neutral**	**Slightly Agree**	**Strongly Agree**

21. The pre-flight crew briefing is important for safety and for effective crew management.

22. Effective crew coordination requires crew members to take into account the personalities of other crew members.

23. **The Air craft Commander’s responsibilities include coordination of cabin crew activities.**

24. **A truly professional crew member can leave personal problems behind while performing flight duties.**

25. **My decision making ability is as good in emergencies as in routine flying situations.**

26. **What aircraft do you currently fly on?**

27. **What is your crew position?**

Appendix B

Cover Letter

This survey is part of the research for a Graduate Research Project for completion of the Master of Secondary Education Instructional Design and Technology at Old Dominion University.

Participation in the survey will take approximately 15 minutes. 25 Survey questions will assess cockpit management attitudes. The data collected will be used to determine Crew Resource Management training effectiveness as well as indicate any differences in safety attitudes and behaviors between crew position and airframe. This data will be used to make recommendations for future instruction of Crew Resource Management training to increase flight safety for Coast Guard Aviators. The success of this study is reliant upon your participation.

You are not required to participate in this study, and may withdraw at any time. Data will be collected anonymously and will not be linked to consent forms or email.

If you should have any questions, please feel free to contact AETC Greg Stewart at gstew010@odu.edu

If you agree to participate in this study, please access the survey at https://www.surveymonkey.com/s/F9YHHKC