MAJOR (PART 121) UNITED STATES AIR CARRIER

IMPLEMENTATION OF CREW RESOURCE

MANAGEMENT TRAINING CONCEPTS AS

OUTLINED IN THE FEDERAL AVIATION

ADMINISTRATION'S ADVISORY

CIRCULAR 120-51C

By

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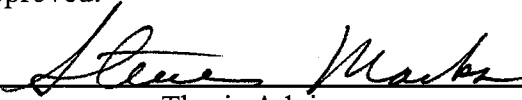Oklahoma State University
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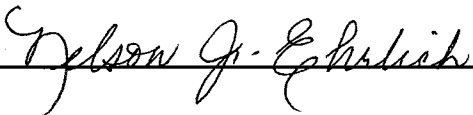DOCTOR OF EDUCATION
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CHAPTER I

INTRODUCTION

Background

FAA aircraft accident investigations have revealed that human error was a

significant factor in about 60% to 80% of all incidents. (FAA, 1998) These discoveries

prompted the flying community, with specific guidance from the FAA; to develop a

program based upon crew performance behavior. Research for this foundation and the

evolution of crew coordination, cockpit resource management or other terms used by both

military and civilian aviation programs started from this embryonic stage in the mid-

1970s. The ideas that surfaced from these initial studies centered on leadership,

command, communications, decision-making, and similar concepts. (FAA, 1998) The

FAA along with the air carrier industry led the way in development of the emerging

philosophy of Crew Resource Management (CRM) training. The FAA in particular

published Advisory Circular (AC) No: 120-51A as their initial response to this growing

need. AC No: 120-51B followed iteration 120-51A in 1995. AC No: 120-51B focused

on the accident findings of the National Transportation Safety Board (NTSB). The NTSB

revealed that many accidents were caused by crewmembers who may not have been

knowledgeable of and/or properly trained in Crew Resource Management. (FAA, 1995).

The continued evolution of CRM training, according to the FAA Advisory Circular (AC)

No: 120-51C, focused on the application of team management concepts in the flight deck environment (FAA, 1998).

CRM was originally the exclusive venue of the flight deck crew. It was called cockpit resource management, however with the advent of teams and team processes and the realization of the total crew concept the term evolved into its present day format. According to FAA AC 120-51C, CRM

> . . . is one way of addressing the challenge of optimizing the human/machine interface and accompanying interpersonal activities. These activities include team building and maintenance, information transfer, problem solving, decision making, maintaining situational awareness, and dealing with automated systems. CRM training is comprised of three components: initial indoctrination/awareness, recurrent practice and feedback, and continual reinforcement. (FAA, 1998)

The topics suggested by the FAA focused on the components of communications and teambuilding. Each subject's basic foundation dealt with individual effectiveness and personal understanding particularly as it pertained to dealing with groups of people. However, there was not a clear direction concerning the formulation of a plan to teach crewmembers the individual characteristics that would enable them to work effectively with others.

Effective understanding of ourselves, especially the ability to work well with others, is based on identification and understanding of our own personality traits. There are two reasons why we should understand personality. First, it helps individuals understand themselves and thus relate better with others. Second, it helps an individual understand others so that they are better able to relate with you - not only for personal relationships such as friendships, but for other relationships as well (business, etc.). The basis for this understanding comes from Carl Jung who published a book called

Psychological Types in the early 1920s. His theory explained human behavior in a way that made sense to many people. His theory of Personality Types contends that each of us has a natural preference that falls into one specific category and that our native Personality Type indicates how we deal with different life situations. Learning about Personality Type helps us understand why certain areas in life come easily, and others are more of a struggle. Learning about others' Personality Types help us understand the most effective way to communicate with them, and how others function best.

While the FAA provided the basic foundation to start CRM training there were varying views of program content. According to Richard Reinhart, MD, CRM is a philosophy on how people should get things done in a team environment. He also stressed that CRM revolved around people working together in unpredictable situations to ensure the safe conduct of flight. (Reinhart, 1994) Reinhart's comments parallel Jung's philosophy of personality trait/type understanding. John Lauber from the National Transportation and Safety Board (NTSB) also agrees with Reinhart's comments. He added that CRM uses all available resources to effect safe operations. (Wierner, 1993) Robert Helmreich's, view of CRM training involves training in the basic knowledge of human factors. Helmreich stressed that CRM and technical training should be enhanced through the use of human factors throughout every aspect of flight training. He added that human factors incorporate the methods and principles of the behavioral and social sciences, engineer, and physiology to optimize human performance. (Wiermer, 1993) The evolution of the CRM philosophy combined the concepts of psychology, learning, and sociology into an effective training program, one that enhanced the concepts involved in CRM training.

Statement of the Problem

Currently, the accepted approach to CRM training is based upon theory immersion and practiced and/or demonstrated skills. As recent as August 1998, the FAA's Chief Scientific and Technical Advisor for Human Factors office published AAR-100. This manual, Developing Advanced Crew Resource Management (ACRM) Training: A Training Manual, specified that a thorough crew training program should be based on specific behavioral objectives such as those developed under an AQP. Objectives are essential for training development and ultimately direct crew performance assessment. (Seamster, Boehm-Davis, Holt & Schultz, 1998) Foushee and Helmreich proposed a complimentary addition to this CRM approach. Their focus, however, was on the softer human performance and teamwork issues to be legitimate concerns…The success of these scientists was to shift the emphasis in aviation training onto social interactions in the cockpit. (Salas, Prince, Bowers, Stout, Oser & Cannon-Bowers, 1999) Now with an emphasis on crews and teamwork, individual flight crewmembers needed to understand group dynamics and how that effects their flight crew duty roles. One such approach for understanding these concepts is the identification and awareness of individual personality traits. The extent of this awareness and integration is not fully known and it should be determined.

Purpose of the Study

The purpose was to determine the depth of CRM component incorporation as specified in FAA AC 120-51C and the extent of personality trait adaptation in CRM

training and the degree of integration of these concepts into normal, flight, operational procedures of the major (Part 121) United States air carriers. Determination of the depth and breadth of personality trait integration should help identify progress in aircrew effectiveness, more specifically, effectiveness in team performance.

According to Sandra Hirsh, people concerned about effective teams need to understand themselves first. They also need to know how they best function in group settings. By analyzing the collective preferences on a team, the team can discover and appropriately manage potential areas of strength and weakness. (Hirsh, 1992) Whether it is on the ground or in the air, teamwork is essential to all groups who must rely on the performance of others to safely accomplish assigned tasks.

Assumptions

The major (Part 121) U.S. air carriers participating in this study are looking for additional information to enhance their CRM training program. All air carriers who were asked to respond will fill out the questionnaire and return it within a short period of time.

Hypothesis

Computation of a contingency coefficient will determine whether to accept or reject the null hypothesis. The null hypothesis, H_0, and the alternative hypothesis, H_1, state:

H_0:   *There Is No Relationship Between the Two Variables* of the survey,

development of a CRM program in accordance with AC 120-51C and each

individual company's understanding and integration of personality trait awareness into their CRM training program.

H_1:   *There Is a Relationship Between the Two Variables,* of the survey, development of a CRM program in accordance with AC 120-51C and each individual company's understanding and integration of personality trait awareness into their CRM training program.

More specifically, is there or is there not, a relationship between incorporation of the concepts of AC 120-51C and the inclusion of personality trait identification and training as part of a CRM curriculum.

Research Questions

The research questions of this study were to:

1.   Determine to what extent major United States air carriers are following the current FAA directive, AC 120-51C, concerning CRM training.

2.   Determine if major United States air carriers are familiar with the use of individual awareness of personality traits in crew resource management training.

3.   Determine if a personality trait awareness and training concept has been extended into the flight crew training team environment.

4.   Determine to what extent major United States air carriers are utilizing individual awareness of personality traits in crew resource management training.

5.   Determine to what extent major United States air carrier flight

        crewmembers demonstrate an awareness of individual personality traits in

        flight crew performance.

Scope and Limitations of the Study

This study was limited to, major, (Part 121) air carriers. To be included in this

category these companies must have had reported annual gross revenues that exceeded $1

billion. (Air Transport Association, 2000) This revenue base limits the population size to

15 major U.S. airlines. The latest statistics, 2000 data, presented by the Air Transport

Association identified the following as major airlines: Airborne Express, Alaska, America

West, American, American Trans Air, Continental, Delta, DHL Airways, Federal

Express, Northwest, Southwest, TWA, United, UPS, and US Airways. Due to the limited

number in this population survey solicitation and follow-up will take relatively little time.

Additionally, information derived from this study was made available to all respondents.

Definitions

ACRM – Developing Advanced Crew Resource Management (Training).

Air Carrier – The commercial system of air transportation, consisting of domestic

and international certificated charter carriers (Wells, 1999).

AQP – Advanced Qualification Program, an alternative training and assessment

program based on proficiency-based training where the proficiency objectives are

systematically developed, maintained, and validated (Seamster, Boehm-Davis, Holt,

Schultz, 1998).

Communications Processes and Decision Behavior – FAA AC 120-51C concept

of communication focuses on topics which cover internal and external influences of

interpersonal communications. External factors include communications barriers such as

rank, age, gender, and organizational culture. Internal factors include speaking skills,

listening skills and decisin making skills…and the use of appropriate assertiveness. The

importance of clear and unambiguous communication must be stressed in all training

activities involving pilots, flight attendants, and aircraft dispatchers (FAA, 1998, p. 9).

Crew Resource Management – The application of human factors in the aviation

system…includes optimizing not only the person-machine interface and the acquisition of

timely, appropriate information, but also interpersonal activities including leadership,

effective team formation and maintenance, problem-solving, decision-making, and

maintaining situation awareness (Wiener, Kanki & Helmreich, 1993).

Crew Resource Management Training – The application of team management

concepts in the flight deck environment was initially known as Cockpit Resource

Management. As CRM training programs evolved to include flight attendants,

maintenance personnel and others, the phrase Crew Resource Management has been

adopted. (FAA, 1998)

DRU – Direct Report Units

FAA – an independent agency of the U.S. government charged with controlling

the use of U.S. Airspace to obtain the maximum efficiency and safety (Wells, 1999).

FOA – Field Operating Agencies

Flight Crew Performance – Observed behaviors by aircrew members.

Forced Choice – A selected-response format used in questionnaire surveys. Forced-choice items for which the respondent selects from two or more options are presented in the questionnaire. Forced-choice items enhance consistency of response across respondents; data tabulation generally is straightforward and less time-consuming than for open-ended items. Adequately constructing forced-choice items generally requires more time and effort, primarily because more of them are needed to cover a research topic. But this time is usually well spent and is more than made up when the responses are tabulated and interpreted (Wiersma, 1995).

LOFT – Line-oriented flight training.

MAJCOM – Major Commands

Major Airline – An air carrier whose annual revenues exceed $1 billion (Wells, 1999).

NTSB – An autonomous agency established in 1975 by the Independent Safety Board Act. The board seeks to ensure that all types of transportation in the United States are conducted safely (Wells, 1999).

Pareto Chart – A statistical method of measurement to identify the most important problems through different measurement scales; e.g., frequency, cost, etc. It directs attention and efforts to the most significant problems. (Kucharczyk, Fiumara, 1995)

Part 121 – Operating certificates issued by the Federal Aviation Administration (FAA) under Part 121 of the Federal Aviation Regulations, which spells out numerous requirements for operating aircraft with 10 or more seats or more than 7,500 pounds payload capacity. The requirements cover such things as the training of flight crews and aircraft maintenance programs (Air Transport Association, 1997).

Personality Trait – Personality is a word that signifies the personal traits and patterns of behavior that are unique to the individual. You experience these traits and patterns of behavior as your own; others observe them directly or through your communication with them. Personality includes attitudes, modes of thought, feelings, impulses, strivings, actions, responses to opportunity and stress and everyday modes of interacting with others (Young, 1978).

Teambuilding and Maintenance – According to FAA AC 120-51C, this "includes interpersonal relationships and practices. Effective leadership/followership and interpersonal relationships are key concepts to be stressed" (FAA, 1998, p. 10).

CHAPTER II

REVIEW OF THE LITERATURE

A thorough search of informational sources should reveal the facts to support the

foundation of the research problem. Areas such as, Teams, Crew Resource

Management/Cockpit Resource Management, government documents research

techniques, psychology, statistical methods of research, and teamwork/teambuilding

should be reviewed and studied to show the usefulness of the study. (Key, 1998) The

combination of topics in this fashion gave an overall ideal mix that better indicated the

individual's effective development in any organizational setting; specifically in teams.

Because all of the above items impact individual interaction in group or team settings all

were used as background information during the research to promote connectivity the

organization, teams and the individual. Teams, the first topic addressed focused on the

inherent nature of teams in the organizational context.

Teams

In Team Players and Teamwork, the New Competitive Business Strategy, Glenn

Parker addresses the idea of what makes a good team player? The author outlines key

topic that focused on nine areas. These nine areas were: the key to organizational

success, what makes a team effective or ineffective, effective team members, ineffective

team members, team members and team leaders, adaptive team members, analyzing team strengths and weaknesses, developing a team member culture, and challenges for teams and their members.

Parker's comments on the key to organizational success focused on change as a norm, productivity, use of resources, problem solving, quality products and services, and creativity and innovation. His second topic, what makes a team effective or ineffective, concentrates on lessons of teamwork, a new mode of effectiveness, troubling signs, and building your own team. Building your own team leads directly to topics three and four, effective and ineffective team members. The concepts of effective team members highlight personal style, team member styles, and the effective behaviors of team member types. Ineffective team member types were then addressed. Parker's focus centered on the cost of ineffective team members and ineffective team type behavior. He concluded this section with comments on how to deal with ineffective team members. The next topic, team members and team leaders, dealt with the concepts of leadership style and team type. He also outlined strategies team leaders could use in team building sessions. Topic six, adaptive team members, concentrated on the stages of team building and formation. The four stages of forming, storming, norming, and performing dealt with team member adaptation in team development. The next area, analyzing team strengths and weaknesses, examined the stages and strategies of developing team strength and the need to improve team weakness. It also explored team style diversity. Topic eight, developing a team member culture, outlined current methods, strategies, and a rewards system to help develop and encourage team culture. Challenges for teams and team members, the final area, and probes the endeavors facing management in the development

of teams. The overall focus of Parker dealt with the individual and how that individual fit into a team and contributed to team effectiveness. Learning or understanding these concepts was key to this progression.

Peter Senge's book, The Fifth Discipline, also dealt with team, specifically learning in teams.

> Senge talked about the three concepts of team learning. The first was to think insightfully about critical dimensions. This concept directs team members to find some way to use the collective power of thinking as a group to solve problems. The second concept stresses the need for innovative, coordinated actions . . . team members remain conscious of other team members and can be counted on to act in ways that complement each others' actions. The third element deals with the role of team members on other teams. An element that deals with the creation of other teams through the inculcation of practices and skills of broadly applied team learning concepts. (1990, pp. 236-238)

Senge (1990) pointed out that despite the importance team learning is sorely misunderstood and will remain mysterious until that time when team learning can be better described. "Until we have some theory of what happens when teams learn (as opposed to individuals in teams learning), we will be unable to distinguish group intelligence from 'groupthink,' when individuals succumb to group pressures for conformity" (p. 238). So, when groupthink or conformity replaces teamwork, ineffectiveness will most likely be the effect or the bottom line.

<div align="center">Teamwork and the Bottom Line</div>

Teamwork is exactly the bottom line in all, effective, teams and the individual is the key. The effectiveness of teamwork by all individuals in the organization must be understood. While Teamwork and the Bottom Line had many interesting elements, the

most significant chapters were: How Groups Affect Their Members; The Mature Work Group; Stress, Strain, and Conflict, By-Products of Group Process; and Participation in Decision Making.

How Groups Affect their Members, addressed the impact groups have on their members. People think and act differently as group members than as individuals. Because groups influence the behavior, attitudes, and motives of their members, it's important for managers to understand how and why that happens. (Rosen, 1989)

The Mature Work Group, Chapter five, focused on how membership mix affects cohesion, group size, physical boundaries, and communication patterns—the most important.

Stress, Strain, and Conflict: By-Products of Group Process, Chapter six, highlighted the many different combinations of things that people bring to any work situation, such as different agendas, moods, personalities, and cultural backgrounds.

The final chapter of this book, Participation in Decision Making, listed and discussed the benefits of team participation in the team decision making process. Such things as improved productivity, effective development of human resources, greater commitment to organizational and group goals as well as improved team spirit, increased group cohesion, reduced turnover and absenteeism, and more widespread knowledge of goals among team members (Rosen, 1989). Participation by team members was shown to have a dramatic effect on team effectiveness. This "working in a team" concept was highlighted as the route to success.

Working in Teams

The many facets of team development were addressed in <u>Working in Teams.</u> The author's seven topics: who needs team development, the factors that influence team effectiveness, starting a team development effort, analyzing team performance, planning team development activities, implementing team improvement activities, and team evaluation focused on the concepts of individual or group interaction on teams.

Chapter two addressed factors which influence team effectiveness. Specifically, environmental issues that focused on the team's organization and the outside world that influenced the organization. More precisely, in order for teams to function effectively, they must manage how they work together and how they interact with the rest of the organization. In his research, Richard Beckhard postulates that teams, to be effective, must manage four areas that are internal to the team: goals, roles, processes and relationships (as cited in Shonk, 1982). These ideas were further developed by Rubin, Plovnik, and Fry (as cited in Shonk, 1982) who determined that these variables were causally related and that a fifth dimension to team life that must be managed is the team's interaction with its organizational environment. Whether the focus was on the individual, group effectiveness, environmental impact on teams or evaluation and follow-up all were key elements in continuous improvement.

Evaluation and Follow-up—Chapter seven present two factors which were looked at during team evaluation. The first evaluated whether or not the team was meeting team goals. The second, and more significant section, analyzes the team process, how decisions are made, how communications are handled, and the planning process (Shonk,

1982). To accurately analyze individual and environmental impact, organizations need to focus on team improvement and effectiveness.

Teams in Organizations

Teams, whether defined as crewmembers or business teams, have one thing in common—they act the same. Many similarities can be found and identified when comparing the two. Specifically, Hollenbeck, LePine, and Ilgen, (1996) found that it is critical that team members obtain information from those peers who have differentiated knowledge structures relevant to the decision at hand when participating in teams characterized by interdependence and distributed expertise. This understanding comes from the proper education of the individual in organizations. For example, Baron (1996) found that

> Interpersonal relations are truly a crucial determinant of what goes on in any organization—how it functions, how effectively it performs its central tasks, and how it reacts to changing external conditions. In fact, interpersonal relations between organizational members are at least as important as other factors that have received more attention from industrial and organizational psychologists when addressing organizational behavior. (p. 334)

Personality trait identification and education could be the focus for current or future training programs. For instance, Schneider (1996) specified that the

> systematic research on personality and related topics has greatly enhanced our understanding of the key dimensions along with which human beings differ. This basic research has in turn placed efforts to identify possible links between individual difference factors and organizational behavior (p. 363)

Because each individual differs in abilities, topical personality information is the

key to increased organization, or team effectiveness. More specifically, because

> people differ in their abilities, their personality, their interests, their role-
> taking readiness, their interpersonal predilections, and so forth it behooves
> researchers to conceptualize people in terms of these multiple constructs.
> By beginning to ask questions about the degree to which different "modal"
> configurations of constructs are likely to produce more effective
> organizations that behave differently. (Schneider, 1996, pp. 565-566)

More effective organizations can be created. Narrowing this topic further,

individual understanding of personal strengths and weaknesses during team interactions

enable organizational teams to effectively use the intricacies of small groups and their

effectiveness in organizations.

<center>Small Group Interaction</center>

In the book <u>Small Book Interaction</u> the author blends a series of case studies,

concepts, theories, and techniques to explain the complexities of group interaction.

Several of the chapters in the book present interesting information. Chapter two's focus

on relevant background factors pays particular attention to personality. Additionally,

Chapter four, Internal Influences on Leadership and Social Influence Processes addressed

components of leadership and personal understanding by the individual. Chapter five

dealt entirely with communication, both verbal and non-verbal.

As a whole the authors presented an overview of the connection between

personality and its positive effect on communication when there was individual

awareness.

Government Documents

One of the foremost trainers of CRM concepts are governmental agencies. Published references from the Federal Aviation Administration and the U.S. Air Force, both major contributors to and advocates of CRM, can be found in the world arena. Several articles highlighted the evolution of these concepts in CRM.

> Iteration "B" of AC 120-51 presents guidelines for developing, implementing, reinforcing, and assessing Crew Resource Management (CRM) training programs for flight crewmembers and other personnel essential to flight safety. These programs are designed to become an integral part of training and operations. Guidelines are for reference by Federal Aviation Regulations (FAR) Parts 121 and 135 certificate holders to increase flight personnel performance efficiency by focusing on communication skills, teamwork, task allocation, and decision making. (FAA, 1995)

Advisory Circular 120-51C identifies FAR sections related to training and crew member qualifications as well as other advisory circulars relating to Line Operational Simulations, AC-120-35B, Advanced Qualification Program, AC 120-54, and Communication and Coordination Between Flight Crewmembers and Flight Attendants, AC 120-48. Additional suggested readings include *Crew Resource Management: An Introductory Handbook* published by the Federal Aviation Administration (Document No. DOT/FAA/RD-92/26), *Cockpit Resource Management Training: Proceedings of a NASA.MAC Workshop,* 1987, and the *National Aeronautics and Space Administration Conference Proceedings* number 2455.

> Previous analysis and conclusions of gathered data and/or information by both NASA and the FAA determined that: the impact of CRM training show that after initial indoctrination significant improvement in attitudes occurs regarding crew coordination and flight deck management. In programs that also provide recurrent training and practice in CRM concepts, significant changes have been recorded in flightcrew

performance during Line Oriented Flight Training (LOFT) and during actual flight. CRM-trained crews operate more effectively as teams and cope more effectively with non-routine situations. (FAA, 1998)

Several additional, significant, items were enumerated in this circular. It listed specific CRM definitions that include: fundamentals of CRM training implementation, components of CRM training, continuing reinforcement, additional curriculum topics, specialized training in CRM concepts, assessment of CRM training programs, the critical role of check airmen and instructors, and the evolving concepts or CRM: extending training beyond the cockpit. The FAA has now defined the evolution of CRM as:

> The application of team management concepts in the flight deck environment (and) was initially known as Cockpit Resource Management. As CRM programs evolved to include flight attendants, maintenance personnel and others, the phrase Crew Resource Management has been adopted. It now refers to the effective use of all available resources; human resources, hardware, and information. A current definition includes all other groups routinely working with the cockpit crew who are involved in decisions required to operate a flight safely. These groups include but are not limited to: aircraft dispatchers, flight attendants, maintenance personnel, and air traffic controllers. CRM is one way of addressing the challenge of optimizing the human/machine interface and accompanying interpersonal activities. These activities include team building and maintenance, information transfer, problem solving, decision making, maintaining situational awareness, and dealing with automated systems. CRM training is comprised of three components; initial indoctrination/awareness, recurrent practice and feedback, and continual reinforcement. (FAA, 1998)

Only two places in iteration 120-51B specifically identify the aircrew complement that should be involved in CRM training. Although the inference in the circular is toward crew, there is no doubt that the emphasis is on flight deck coordination. The cabin crew (flight attendants) is only mentioned twice. A strange situation because at the very front of the circular the FAA states training programs should place emphasis on the factors, which influence crew coordination and the management of crew resources. The need for

additional training in communications between cockpit crewmembers and flight

attendants has been specifically identified. (FAA, 1995)

Iteration 120-51C, however, now states that Part 121 operators will be required to

provide, by March 20,1999, CRM and dispatch resource management (DRM) training to

flight attendants (FA) and aircraft dispatchers. (FAA, 1998) An interesting development

which has taken the FAA a minimum of 4 years to correct a situation which had been

identified as probable causes in more than one NTSB report. Specifically, NTSB Report

No. DCA94MA027 stated that the company's failure to provide adequate Crew Resource

Management training and the FAA's failure to require such training. (NTSB, 1994) Also,

NTSB Report No. ATL96FA101 highlighted that the company did not provide "Joint"

Crew Resource Management (CRM) training to flight deck crews and flight attendants.

Two of the 3 flight attendants said they had not received company CRM training. (NTSB,

1996) Advisory Circular 120-51C goes on to recommend that recurrent CRM exercises

take place with a full crew each member operating in his or her normal crew position.

Additionally, CRM training works best in the context of the entire crew. (NTSB, 1996)

The United States Air Force's current publication addressing crew interaction is

Air Force Instruction (AFI) 11-290, 1 Jul 1998, Cockpit/Crew Resource Management

Training Program. It states that the

> Air Force CRM program provides crewmembers with performance-
> enhancing knowledge and skills directly applicable to their roles in the
> aerospace mission of the Air Force. CRM training is a key component of a
> combined effort to identify and manage the conditions that lead to error.
> The CRM program begins with crewmembers' initial Air Force flying
> training and is continuously built upon throughout their operational
> careers. Training objectives will be tailored to the knowledge and skill
> level of the aircrew member. As the aircrew member becomes more

proficient, CRM training should emphasize performance skill more than academic objectives. (AFI 11-290, 1998)

AFI 11-290 outlines six specific items of the Air Forces' core CRM curriculum situational awareness, crew coordination/flight integrity, communications, risk management/decision making, task management, and mission planning/debrief (mission analysis). This Air Force instruction further breaks down training into five phases. First, an introduction or awareness of CRM training has been designed as the crewmember's first exposure to CRM. In this phase aircrews learn standard AF CRM terminology. During phase two, formal training unit/combat crew training school CRM training, crewmembers learn the CRM techniques and their application to assigned aircraft. Phase three, mission-specific continuation training, has been delegated to MAJCOMs, FOAs, and DRUs. These organizations have been tasked with conducting and reinforcing flight crew CRM knowledge. The focus is on mission specific CRM for each organization. Flight Instructor training is the topic for phase four. In this phase all flight and simulator instructors complete instructor specific CRM training. This training would normally be accomplished as part of an instructor upgrade program. Courseware must build upon the previous blocks of training, both to reacquaint candidates with CRM fundamentals and to maintain continuity of terminology and techniques. (AFI 11-290, 1998) The next and final phase deals with facilitator training. The heart of this curriculum deals with the development of facilitator knowledge and capabilities. Training subjects include running exercises, structured crew observation, and feedback.

Taken in total, governmental directives on CRM are well defined, however, they are not the only sources for CRM development. Dr. Robert Helmreich at the University

of Texas has written what is considered the bible of CRM, a book covering the evolution

of CRM in the civil aviation field.

Crew Resource Management/Cockpit Resource Management

A leader in the field of CRM research is Robert Helmreich. He along with Earl

Wiener and Barbara Kanki wrote what is recognized as the preeminent resource of CRM,

Cockpit Resource Management. Helmreich states that

> CRM includes optimizing not only the person-machine interface and the
> acquisition of timely, appropriate information, but also interpersonal
> activities including leadership, effective team formation and maintenance,
> problem-solving, decision-making, and maintaining situation awareness.
> Thus training in CRM involves communicating basic knowledge of human
> factors concepts that relate to aviation and providing the tools necessary to
> apply these concepts operationally. (Wiener, Kanki & Helmreich, 1993)

With this philosophy in mind their book, Cockpit Resource Management addressed three

categories: the nature of CRM, perspectives, and conclusions about CRM and

recommendations for future research.

In the nature of CRM, these authors highlighted the reasons behind CRM and the

empirical and theoretical basis for the use of human factors in aviation. This section

addressed the need to look at CRM as an eclectic approach in training. Specifically, the

concept of teams and teamwork, communications, decision making, training assessment,

CRM and automation integration, and LOFT.

The "perspective" portion of their book looked at seven topics. Topic one,

government regulations, outlines the historical aspects of CRM. Additionally, the

rationale for CRM training and the associated implications in FAR Part 121 and 135

operations. Next, accident investigation examined the role of the NTSB in the

development and recognition of CRM. The third topic, critical issues in CRM training and research, outlined government recommendations and the constraints that face the aviation industry based upon these recommendations. Additionally, the needs of the aviation community are addressed and call for a direction in future research based upon these needs that were discussed. Since the military is considered one of the three major aviation components, a section on military aircrews—research and training was included. This areas deals with the military's CRM program, aircrew coordination and research, and the future of CRM in military aviation. Topic five, cross-culture, seeks to provide insight into the variability of international aviation without losing sight of the fact that safe and efficient flight is a shared objective across the international aviation industry. (Wiener, Kanki & Helmreich, 1993) The next area, CRM's impact on the safety of flight, dealt with post-training questions and answers. The final topic in "perspectives," developing and implementing CRM programs, addressed approaches to implementing programs with certain things in mind. Specifically, these areas highlighted corporate culture's CRM techniques, methodology and research in CRM, curriculum development, module development of CRM training, CRM facilitator training, check airman and management CRM training, classroom use, LOFT, and CRM and automation.

The concluding category addressed two topics. The first is airline pilot training now and in the future and the second is CRM in the cockpit and elsewhere. Airline pilot training analyzed the aviation system, safety, airline pilot training, new concepts, and the airline pilot of today and tomorrow. The second topic, the future of CRM, highlighted issues in CRM, extending CRM beyond the cockpit, approaches and research challenges

and educational implications. The comprehensive evolution of CRM by Helmreich et al.,

presented a formidable resource for reference and guidance.

The Structure of Cockpit Management Attitudes

The enhancement of crew coordination and resource management in multipilot

aircraft have become topics of increased attention in the aviation community (Gregorich,

1990). This articles looks at the list of desired attitudes that have been identified as

positive behaviors in aircrews, both civil and military. The Cockpit Management

Attitude Questionnaire provided an indexof chosen items which measure attitudes that are

either conceptually or empirically related to CRM (as cited in Gregorich, Helreich, &

Wilhelm, 1984).

Pilot Personality and Crew Coordination:
Implications for Training and Selection

Pilot performance is a product of individual capabilities. Specifically, each

individual must have certain abilities such as skill or physical coordination, the correct

attitude, and personality factors. The latter of this list, personality factors have been for

the most part unexamined (Chidester, 1991). This journal article focused on the

optimization of crew performance through the identification of personality factors.

Personality Style Learning Dissertations

Distribution of Psychological Types Among Students in a

Professional Pilot Baccalaureate Degree Program and

Associated Attitudes Towards Teaching

Other areas of research were also identified as lending support to the evolution of

CRM. Specifically, personality style learning studies by three different doctoral

candidates highlighted the significance of personality type identification as associated

with learning. More specifically three studies were used. The first was Distribution of

Psychological Types Among Students in a Professional Pilot Baccalaureate Degree

Program and Associated Attitudes Towards Teaching. The second was The Learning

Styles of Pilots Currently Qualified in U.S. Air Force Aircraft. The final study was the

Relationships Between Learning Preferences of Federal Aviation Administration Flight

Inspection Operations Personnel and Outcome Scores on Crew Resource Management

Training Courses.

Based upon his research, one particular recommendation by Wiggins was

significant. Specifically, faculty and instructors should determine the psychological type

of students in their courses and degree programs. Additionally, determining the

psychological type of faculty and instructors will more effectively integrate the strengths

and weakness and understanding of faculty preferences and student preferences when it

comes to interaction, teaching, and learning (Wiggins, 1998).

Wiggins concludes that type is a powerful tool that facilitates understanding

between faculty and students. The preponderance of evidence suggests that to ignore type

is to do a great disservice to people involved in the learning process. Type gives insight into how people relate to one another and how they organized their lives. All of these factors are critical to interaction of faculty and students in the educational process (Wiggins).

The Learning Styles of Pilots Currently Qualified

In U.S. Air Force Aircraft

In Kanske's research with U.S. Air Force pilots he addressed the apparent differences between all individuals. More specifically, he pointed out that each individual learns in different ways and that individual understanding of one's strengths and weaknesses enables improvement.

Driskell and Adams (as cited in Kanske, 1998) outlined one of the current issues in aviation training as crew resource management. They stressed that individuals need to understand their own skills when relating to other individuals. This was especially true when the focus of this interaction was on team coordination, attitudes, behaviors, and communications. Learning style recognition, particularly in crew resource management training courses, provide a better understanding of individual differences and a critical path toward improvement of crew within these areas.

Teambuilding

The significance and impact of individuals on teams is only now being understood. As organizations put their employees into team environments for the express purpose of synergy and effective utilization of personnel the organization has determined

that additional individual training is necessary to reach these results. Many have turned to one of the most reliable and valid personality indicators, Myers-Briggs Type Indicator (MBTI). Through the use of the MBTI,

> team members are able to determine what their major personality preference is as well as those on their team. This knowledge serves to encourage team members to try to understand that everyone has a different way of receiving information, forming opinions, and communicating with others. (Mutchler, 1998)

Hirsh (1992) expands on this topic by addressing the use of the MBTI in the teambuilding process. She specifies that it is paramount that team-members understand themselves before they recognize or see effective use of individuals in the team setting.

Summary

The literature indicates that the development of CRM training has been a focus of the federal government and the commercial aviation community. This philosophy began in the 1970s and evolved into programs that centered on specific aircrew behaviors. Specifically, FAA Advisory Circular 120-51C, the current iteration of the FAA's directive on crew resource management, specifies that CRM includes definitions which address the fundamentals of CRM training implementation, components of CRM training, CRM reinforcement, specialized CRM training, and the extension of CRM training beyond the cockpit.

Additionally, Wiener, Kanki, and Helmreich proposed that the optimization of CRM include not only the interface between person-machine, but also the interpersonal activities of leadership, teambuilding, problem solving, decision making, and situational

awareness. Their stance highlights the integration of personal awareness and ability into the effectiveness of aircrew interaction.

Overall the use of personality focuses on the use of personality characteristics or attributes as an indicator of a good crewmember. There is little to no discussion about personality trait identification and training as it applies to each crewmember's understanding of oneself. Additionally, although CRM is in essence teams, there was very little discussion about actual teambuilding, let alone the use of personality trait identification in the team process. Finally, even though still emerging, the belief in CRM has evolved from the recognition of the problem to the actual deployment of conceptual processes.

CHAPTER III

PROCEDURES

Introduction

This chapter outlines and presents research information as it relates to the design of the study, population, sample, instrument description, data gathering procedures, and data analysis techniques. This approach supported the purpose of the study. Specifically, forced choice survey questions were used to determine the depth of CRM component incorporation as specified in FAA AC 120-51C. It was also used to determine the extent of personality trait adaptation in CRM training and the degree of integration of these concepts into normal, flight, operational procedures of the major (Part 121) United States air carriers. Additionally, research questions helped determine the extent and depth of use of the concepts outlined in FAA Advisory Circular 120-51C.

Data for this discovery was collected via the use of a survey sent to a specific group of individuals in the population. The population was determined from a standard industry description accepted by the aviation community. Information from the surveys was collected via U.S. mail, email, and the telephone. This descriptive approach focused on categorization, description, and synthesis of data to determine the description and interpretation of the phenomenon under study—CRM (Wiersma, 1995).

Study Design

The design of the study determined the depth of CRM component incorporation as specified in FAA AC 120-51C and the extent of personality trait adaptation in CRM training and the degree of integration of these concepts into normal, flight, operational procedures of the major (Part 121) air carriers.

This foundation stipulates the use of descriptive research to collect data via the use of a survey or questionnaire. Data analysis is then based within descriptive methods of study. Specifically, descriptive research is used to obtain information concerning the current status of the phenomena to describe "what exists" with respect to variables or conditions in a situation (Key, 1998). Additionally, a survey is broad in scope including status quo studies to those in which relationships of sociological and psychological variables are determined and interpreted. This approach enabled the identification of the current status of CRM training just as historical research, a systematic process of searching for facts and then using the information to describe, analyze, and interpret the past (Wiersma, 1995) would do.

Population

Information was gathered from a population or census of 15. The population's limited numbers were due to topic narrowing. This study focused on major, (Part 121) air carriers. To be included in this category these companies must have had reported annual gross revenues that exceeded $1 billion (Air Transport Association, 2000). This revenue base limited the population size to 15 major U.S. airlines. The latest statistics, 2000 data,

presented by the Air Transport Association identified the following as major airlines:

Airborne Express, Alaska, America West, American, American Trans Air, Continental,

Delta, DHL Airways, Federal Express, Northwest, Southwest, TWA, United, UPS, and

US Airways.

Sample

Surveying a very specific population was not a normal situation. According to

Gephart (1969) the

> approach to sample design must be flexible, and avoid rote use of
> techniques regardless of their applicability. We must take into account the
> factors of the particular sampling situation, remembering that what is most
> efficient for one situation may be most inefficient for another situation.
> Above all, sample design must look to the purpose of the study and reject
> all solutions—no matter how "elegant" they may be—which do not
> achieve those purposes. (p. 260)

By focusing on the purpose of the study the population was limited—to an

exclusive group. This exclusive group by definition, major Part 121 Air Carrier, limited

the possible survey respondents to 15. This in effect was the beginning of one particular

sampling technique called purposive sampling. It was used to gather data because of the

purpose in mind—determine the training propensities of the 15 major Part 121 Air

Carriers. Accordingly, purposive sampling is useful for situations where you need to

reach a targeted sample quickly and where sampling for proportionality is not the primary

concern. (Trochim, 1999) With a purposive sample, you will likely obtain the opinions of

your target population. This target was further delineated through expert sampling.

Expert sampling explained the population determination. Expert sampling

involved the surveying of a group of individuals or organizations with known or

demonstrable experience and expertise in some area or a "panel of experts." There were two reasons why this technique was used. First, this technique was the best way to obtain the expert views or knowledge on a particular subject. Secondly, expert sampling is essentially just a specific subcase of purposive sampling (Trochim, 1999).

Instrument Description

A questionnaire was developed based upon a forced choice structured design. This was coupled with open-ended, unstructured, questions. The approach was used to ascertain the extent of integration and the scope of the population's CRM training program into normal flight operations. The questionnaire had seven specific characteristics. First, it dealt with a significant topic. The FAA has mandated CRM training program implementation. Additionally, the overall safety benefits of CRM training have the possibility of reducing accidents before the realization of the effects of bad publicity. Second, the questionnaire was short and to the point and was designed to take approximately 20 to 25 minutes on the average to complete. Next, because of a limited population size, each questionnaire was separately printed; thus it was neat and attractive. Fourth, directions were positioned at the top of the questionnaire and were easily followed. Fifth, the open-ended questions were subjective and enabled the respondents to provide answers based upon their interpretations. Sixth, there were two methods of survey returns offered, USPS and electronic mail. Sixth, there were two methods of survey returns offered, United States Postal Service and electronic mail. Finally, forced choice data was easy to extract and put into a data matrix (Key, 1998).

A specific question, based on a forced choice structure, used the following

statements as the basis for making a selection:

> Current Federal Aviation Administration emphasis, AC 120-51C, on Crew
> Resource Management (CRM) and the need to insure the flying public of
> the safe and efficient operation of aircraft is a driving force in today's
> aircrew training. It is vital that we do all that we can to gain the
> knowledge that enables us to better understand the intricate dynamics that
> occur between aircrew members. This research is but one step in that
> process.

Survey question number one was based upon an understanding of FAA AC 120-

51C. It specified:

> Our CRM program, as it is currently implemented, incorporates
>   [ ] none
>   [ ] very few
>   [ ] some
>   [ ] most
>   [ ] all
> of the components of a CRM program developed in accordance with AC 120-51C.

Survey question number two was based upon the use of personality trait

identification and awareness as a CRM training tool. It asked the respondents to select

one of the following that best described their CRM training program's association with

personality trait integration.

1.   No, we are not aware nor do we use this concept.

2.   Yes, we are aware, however, we do not use this concept.

3.   Yes, we are aware, and we have integrated its use into our training program.

4.   Yes, we are aware and we have integrated its use into our training program and give individual feedback to flight crew participants.

5.   Yes, we are aware. We have also integrated its use into our training program, give flight crew participant's individual feedback, and have developed techniques to analyze and determine its impact during aircrew training and evaluation.

To help understand the depth and breadth of this integration six open-ended survey questions were developed. The following statement prefaced these questions. To adequately describe your CRM program, please write a response to each open-ended question.

1.   Please explain how you provide *feedback* to your aircrews *during* CRM training.

2.   Please explain how you provide *feedback* to your aircrews *after* CRM training.

3.   Please explain what techniques you use to *analyze* the impact of CRM training during aircrew evaluations.

4.   Please describe how you have *integrated* personality trait awareness into your CRM training?

5.   If you use something other than personality trait identification in your CRM training program, please comment on the special process or technique you use.

6.   What *additional comments or observations* of any type would you like to make?

This instrument was used to collect data from the census based on a two-step approach. The questionnaire was mailed with an introductory letter coupled with a consent form to each airline's director of flight operations and director of training. It requested their help to determine vital information about the techniques, concepts, and approaches used in their CRM training as well as their integration of these concepts into their normal flight operations. It also specified that their identities would remain anonymous and that the results of this study would be shared with them.

Before finalization and mailing, the questionnaire was pilot-tested for content with several airline pilots and several individuals not associated with any airline. This approach was taken to ensure that the questionnaire was properly constructed. According to Trochim (1999), "survey research is one of the most important areas of measurement in applied social research. The broad area of survey research encompasses any measurement procedures that involve asking questions of respondents" (p. 9). Whether it is a telephone, pencil and paper, or email survey one thing remained constant; was the survey designed to do what you wanted it to do and can others duplicate it. The first refers to validity the second reliability.

> Validity and reliability have a complicated relationship. If a test is valid, it must also be reliable. However, it is possible for a test to be reliable without being valid. That is, a test can give the same result time after time but not be measuring what it was intended to measure. (Kitao, 2000)

Key suggests that "to determine content validity a panel of experts in the field to be studied should be used to identify the survey's subject composition" (p. 101). This was accomplished by solicitation of various members of the aviation community to read and verify survey content. Specifically, three individuals hold FAA certification as

commercial airline pilots and one currently works as a FAA full time employee. Each commented that the survey clearly identified the requirement to follow FAA directive AC 120-51C and addressed personality trait identification and usage thus validating content validity. Since this survey met validity requirements it can also be judged to be reliable. Gay agreed with Key concerning the relationship of validity and reliability. Specifically, "an interesting relationship between validity and reliability: a valid test is always reliable but a reliable test is not necessarily valid" (Gay, 1992, p. 162). The introductory letter, which held the consent authorization, and the full survey is located in the appendix.

<div align="center">Data Gathering and Analysis</div>

To help insure that the survey focus interested respondents, the appropriate study population was prudently selected. In this case, the 15 major Part 121 air carriers were carefully selected because of their size. Specifically, the generation of over $1 billion in annual revenue points toward the existence of an extensive training programs. Using these concepts, two or more individuals in each of the 15 major Part 121 air carriers were sent surveys.

Survey packages included a letter of introduction explaining who the researcher is; why the research was being done, points of contact, the researcher's aviation background, consent form, and the survey. Also included was a self addressed stamped envelope to facilitate the return of the survey. One additional option was integrated into the process, the inclusion of a floppy disk that included two files. The first file was the letter of introduction and the second file was the survey. The introductory letter

explained that electronic mail might be a preferable mode of communication. A home email address was also listed to facilitate this transfer of data.

The introductory letter and survey were taken to the post office to determine weight and postage needs for the return envelopes. These envelopes were subsequently mailed.

The mailing targeted respondents in two particular areas, either the director of flight operations or the director of training. These individuals were chosen because of their day-to-day contact with the actual company operations of aircraft and flight crew interface and their ability to direct the completion of the survey.

Data was returned via a self-address stamped envelope, email, and/or through telephonic conversation. The easiest, yet the most difficult, situation to deal with was email, because it was quick and efficient. Difficult because internet correspondence, until the enactment of the Electronic Signatures in Global and National Commerce of 2000, was not recognized as legally sufficient for documentation purposes. According to Rep. Thomas Bliley (R-Va), chairman of the House Commerce committee, the bill is founded on the simple premise: Any requirement in law that a contract be signed or that a document be in writing, can be met by an electronically signed contract or an electronic document (Mosquera, 2000). The E-Sign Bill, popular title, or Millennium Digital Commerce Act, short title, defines electronic documents or records as a record created, stored, generated, received, or communicated by electronic means ("Electronic Signatures," 2000). Because of this act and the structure of the survey's introductory letter that offered electronic document transfer for the ease of the respondent, email became the easiest and most widely used form of response.

A nominal approach was used on the forced choice questionnaire to provide information about the reported use of the concepts outlined in FAA AC 120-51C and the extent of personality trait integration. First, forced choice question one data, which sought to determine the depth of CRM component incorporation as directed by FAA Advisory Circular 120-51C, was put into a type of distribution or histogram called a Pareto chart. Pareto is a frequency distribution prepared by collecting data on numbers of different types of topics or causes. Data was plotted in descending order of frequency from left to right using a Y1 axis as the total number of items in the sample or population and the Y2 axis as the cumulative total of this sample or population (Ishikawa, 1990). Analyzing the first two or three data entries on the left side of any Pareto chart identifies or accounts for 70-80% of the sample or population. This chart identified the significant few rather than the trivial many. Put another way, it identified the most prevalent approach, or frequency of responses, to integration or a graphical representation of the mode. The mode, a measure of central tendency, indicated population stance on use of the concepts of FAA AC 120-51C and personality trait integration.

Forced choice question 2 responses, which sought to determine the extent of personality trait awareness and integration into each company's CRM training program, were also graphed in a Pareto chart to indicate the most widely reported approach to personality trait integration in each air carrier's CRM program.

An analysis of the open-ended questions determined key words, phrases, and patterns from all returned surveys. This process looked for concepts that were repeated with some frequency to convey an idea to either support or refute the forced choice survey data and/or research questions. These research questions were:

1. Determine to what extent major United States air carriers are following the current FAA directive, AC 120-51C, concerning CRM training.

2. Determine if major United States air carriers are familiar with the use of individual awareness of personality traits in crew resource management training.

3. Determine if a personality trait awareness and training concept has been extended into the flight crew training team environment.

4. Determine to what extent major United States air carriers are utilizing individual awareness of personality traits in crew resource management training.

5. Determine to what extent major United States air carrier flight crewmembers demonstrate an awareness of individual personality traits in flight crew performance.

Finally, contingency coefficient, a nonparametric measure of correlation, tells the extent of the relationship between two sets of variables. In testing the significance of this correlation the null hypothesis is tested. This states that there is zero correlation in the population. (Sharp, 1979) The data used in contingency coefficient statistics must be discrete and categorical. To determine the significance of the contingency coefficient chi square must be used. By first arranging the response frequencies in a contingency table expected frequencies can be determined and the data used in a chi square formula to find chi square. After finding chi square, a determination must be made to find out whether or not there is significance by using a level of significance of .05. If it is significant, there is

most likely a relationship. Next the contingency coefficient, C, must be computed to indicate the degree of the relationship.

Find C (contingency coefficient) by inserting the value of chi square into a contingency coefficient formula. C identifies the strength of the relationship between the two variables. If C is equal to zero there is not a relationship. If C is close to its upper limit the relationship is strong. By definition the upper limit is a range of 0 to 1.0.

Summary

The purpose of this chapter was to outline the methods used to answer the research questions of the study as well as to determine whether or not to accept or reject the null hypothesis. The study design, population, sample determination, instrument description, and finally data gathering and analysis were developed to explain how the study was going to discover findings.

CHAPTER IV

FINDINGS

Introduction

The previous chapters outlined the steps used to define, identify, and collect

information to explain what was found in order to clarify or answer questions surrounding

the purpose of the study. Chapter I defined the problem, presented the situational

background, and included assumptions and definitions of the study. Chapter II identified

other research and literature based upon the theoretical construct of the study. Chapter III

provided an overview of the methods used to collect and analyze the data to produce

findings. This chapter analyzes and reports the information based upon the purpose of the

study, the survey items used to collect data, and the demographics/percentages of data

tabulation. These items are used to compute a contingency coefficient and the mode.

The research purpose was to determine the depth of CRM component

incorporation as specified in FAA AC 120-51C and the extent of personality trait

adaptation in CRM training and the degree of integration of these concepts into normal,

flight, operational procedures. To facilitate data collection a survey was sent to a defined

population of 15 whose annual revenue equaled or exceeded $1 billion per year. The

survey included two forced choice questions that collected frequencies and percentages

and six open-ended questions to help support and/or determine depth and breadth of

CRM integration. All question data were used to answer the query presented by each of the five research questions.

The two forced choice questions sought to determine if there was a relationship between the use of FAA AC 120-51C and the extent of personality trait integration. The two questions were:

1.   Determine the depth of CRM component incorporation as directed by FAA Advisory Circular 120-51C.

2.   Determine the extent of personality trait awareness and integration into each company's CRM training program, were used to collect frequencies and percentages to determine the possibility of a relationship.

The five research questions were:

1.   Determine to what extent major United States air carriers are following the current FAA directive, AC 120-51C, concerning CRM training.

2.   Determine if major United States air carriers are familiar with the use of individual awareness of personality traits in crew resource management training.

3.   Determine if a personality trait awareness and training concept has been extended into the flight crew training team environment.

4.   Determine to what extent major United States air carriers are utilizing individual awareness of personality traits in crew resource management training.

5.   Determine to what extent major United States air carrier flight

crewmembers demonstrate an awareness of individual personality traits in

flight crew performance.

Demographic Data and Return Percentages

The survey was used to gather data because of the purpose in mind—determine

the training propensities of the 15 major Part 121 Air Carriers. On more than one

occasion someone from the company's CRM department filled out the questionnaire.

Additionally, telephone responses came from individuals that worked in or were

associated with each air carriers training or CRM departments.

Several problems arouse during the collection period. Two individuals in separate

companies refused to return the survey. Each sited their busy schedule. When asked via

a telephone conversation if they would respond over the phone to the survey or answer it

at some future date, their reply was negative. Although expected, this truly reflected the

non-response bias that the literature addressed and some of the suggestions that were

listed as possible avenues to enhance survey return rates.

Specifically, the literature indicated that response rate enhancement techniques

have been grouped into several general categories: "(1) motivating a response; (2) content

and appearance of correspondence; and (3) postage supplied. Additional research

recommendations mentioned that the use of multiple contacts was the most effective way

to increase response rates as well as making the questionnaires briefer and easier to

complete" (Cole, 1997, p. 1). The CRM survey concentrated on each of these

components. First, a focus on motivation and the need for public safety and the

avoidance of bad publicity was addressed. Secondly, the letter of introduction and the survey were neat and respectively printed on contrasting ivory and white linen paper. Third, a self addressed stamped envelope was included in the packet along with an option to use electronic mail. Finally, the survey was short and took only a few minutes to complete. It was also sent to two or more individuals in each company.

Extensive telephone follow-up was required after mailing. In all approximately 100 follow-up calls were made either to ascertain status, obtain results, or to receive a rejection acknowledgment. In total, telephone follow-up garnered an additional 50% return of information. These additional responses were gathered from company representatives who would only verbally answer by telephone the forced choice questions of the survey. Their hesitancy to respond centered on comments about trying to change someone's personality to overwhelming day-to-day work activities.

This follow-up response rate was significant when compared to literature resources. Specifically, data from a study designed to determine if an increase in survey response rate from individuals who recently graduated from a teacher preparation program would affect survey results provided a significant comparison of data.

> At the University of Tennessee, Knoxville 284 graduates of the 1992 teacher education program were identified as the target population for the 1993 survey. A total of 184 individuals responded to the mail survey (64.8%), with 33.8% responding to the first wave, 17.2% responding to the second, 6.3% to the third wave, and 7.4% responding late. The researchers found that there was no evidence that data collected after about 50% of the sample had responded resulted in any meaningful differences in survey results. These results suggest that concentrating on potential nonresponse bias may not be as important as attending to other aspects of survey methodology, such as sample size and questionnaire design. (Clark, 1995)

Overall, a response rate, 12 of 15, or 80% was realized. According to Gay (1992) well-constructed questionnaires and well-written cover letters should get at least an adequate response rate. Her research suggests that the first mailing typically results in a 50% return rate, and the second will increase the overall percentage to 70%. With this as a basis, the 80% return rate was beyond what is considered a good or adequate response rate and provided sufficient information to compute chi square for the contingency coefficient.

Data Summarization

Survey Question Number One

Survey question number one was based upon an understanding of FAA AC 120-51C. It specified:

Our CRM program, as it is currently implemented, incorporates

[ ] none
[ ] very few
[ ] some
[ ] most
[ ] all

of the components of a CRM program developed in accordance with AC 120-51C.

This question was used to determine to what extent the major (Part 121) air carriers had integrated the concepts of AC 120-51C into their CRM training programs. Responses were summarized in Table I as item selection, frequency of each selection, and the percentages for each selection. Additionally, a Pareto chart, Figure 1, was used to organize and explain the selection of each respondent as cumulative frequencies. It also

TABLE I

FREQUENCY AND PERCENTAGE OF CRM COMPONENT
INCORPORATION AS DIRECTED BY FAA
ADVISORY CIRCULAR 120-15C

Item Selection	Frequency	Percent
None	0	0
Very few	0	0
Some	0	0
Most	0	0
All	12	100
Total	12	100
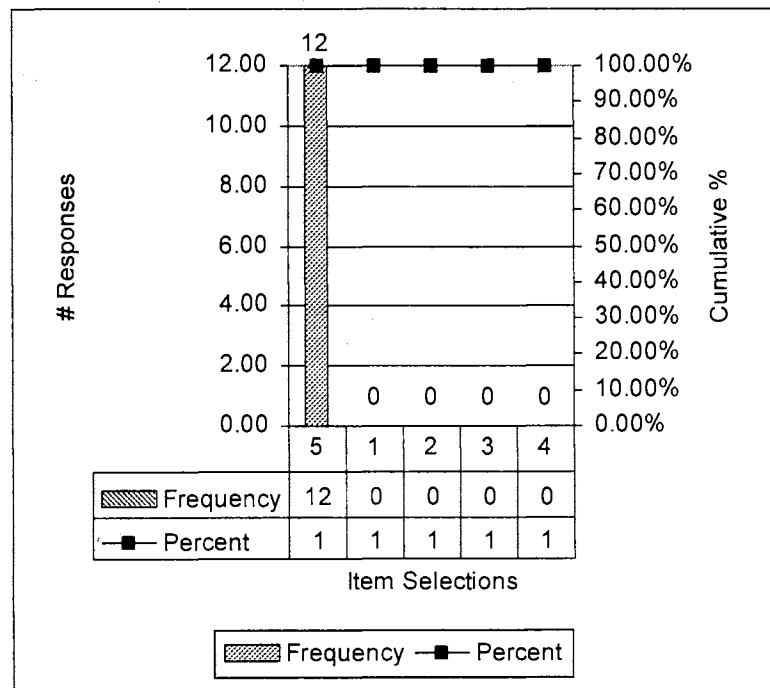
Figure 1. Graphical Representation of the Mode for Survey
Question Number One Displaying Frequency and
Percentages of CRM Component Incorporation as
Directed by FAA AC 120-51C.

displayed the graphical representation of the mode or the significant few or the most frequent selection. All air carriers, or 100%, reported item 5 or "All" for their selection concerning the incorporation of the concepts in FAA Advisory Circular 120-51C. Their responses indicated a frequency or mode of "All" or 5. No other responses were given.

Survey Question Number Two

Survey question number two was based upon the use of personality trait identification and awareness as a CRM training tool. It asked the respondents to select one of the following that best described their CRM training program's association with personality trait integration.

1. No, we are not aware nor do we use this concept.

2. Yes, we are aware, however, we do not use this concept.

3. Yes, we are aware, and we have integrated its use into our training program.

4. Yes, we are aware and we have integrated its use into our training program and give individual feedback to flight crew participants.

5. Yes, we are aware. We have also integrated its use into our training program, give flight crew participant's individual feedback, and have developed techniques to analyze and determine its impact during aircrew training and evaluation.

This question was used to collect frequencies and percentages to determine the extent and depth of personality trait awareness and integration into each company's CRM training program.

Responses were summarized in Table II as item selections, frequencies and percentages of each selection option. Additionally, a Pareto chart, Figure 2, was again used to organize data and display frequencies and cumulative percentages of the respondent's selections. It also displayed the graphical representation of the mode or the significant few or the most frequent selection as indicated on the far-left side of the graph. Respondents reported a variety of options. In this case option 3, "Yes, we are aware, and we have integrated its use into our training program" was the mode with a selection rate of 50%. The next closest frequency was 33% or item 2. Both items 4 and 5 had a frequency of 1 or a percentage of 8%. Item number 1 had zero responses.

The graphical representation of these survey questions reflects the mode or measure of central tendency. In this case the reported tendencies were full incorporation of the concepts outlined in AC 120-51C and the knowledge of personality traits and partial integration of their concepts into CRM training programs.

An integral part of this research is the determination of the relationship and the possible strength of the relationship between the development of a CRM program in accordance with AC 120-51C and each individual company's understanding and integration of personality trait awareness into their CRM training program. The relationship between these variables decided the acceptance or rejection of the null hypothesis.

TABLE II

FREQUENCY AND PERCENTAGE OF PERSONALITY
TRAIT AWARENESS AND INTEGRATION INTO
EACH COMPANY'S CRM TRAINING
PROGRAM

	Item Selection	Frequency	Percentage
1.	No, we are not aware nor do we use this concept.	0	0
2.	Yes, we are aware, however, we do not use this concept.	4	33.3
3.	Yes, we are aware, and we have integrated its use into our training program.	6	50.0
4.	Yes, we are aware and we have integrated its use into our training program and give individual feedback to flight crew participants.	1	8.3
5.	Yes, we are aware. We have also integrated its use into our training program, give flight crew participants individual feedback, and have developed techniques to analyze and determine its impact during aircrew training and evaluation.	1	8.3
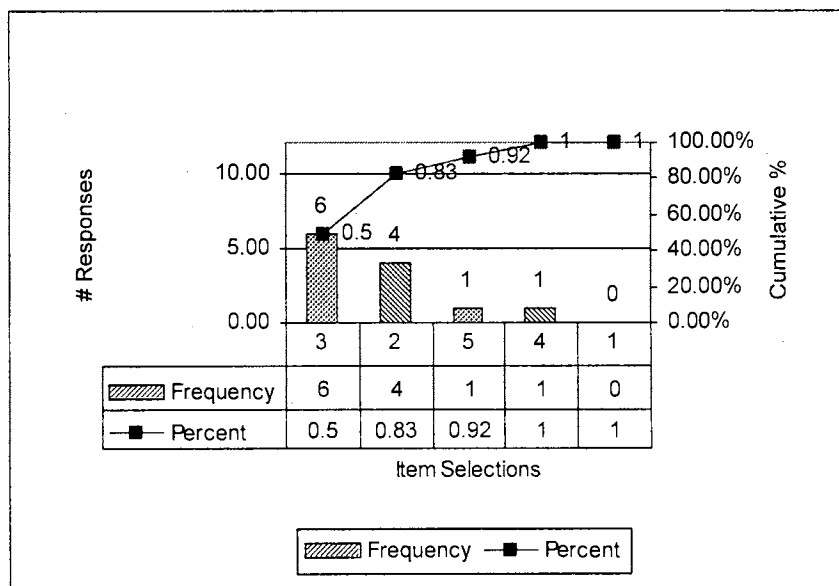
Figure 2. Graphical Representation of the Mode for Survey
Question Number Two Displaying the Frequency and
Percentages of Reported Personality Awareness and
Integration into CRM Training Programs.

This first step in determining this relationship is the computation of chi square based upon the frequency responses of the sample. Table I and II frequency data was used in a chi square computation Table III to determine chi square. A critical component in this chi square computation was the use of the respondent sample, n, of 12. According to Wiersma, "for most nonparametric analysis, assumptions about the shape of the population distribution are not required. For that reason, they are often used when small sample sizes are involved" (p. 378).

Data in Table III was used to compute a chi square of 3.625. As an additional step, the chi square computation was accomplished on a web-based statistical program that was accessible to all that can use the Internet. The statistical program's web site was http://www.stat.sc.edu/webstat/version2.0/.

This value was compared to a table of critical values of chi square located in the appendix. Referring to the chi square critical values table of X^2 in the appendix with the degrees of freedom or df of 4 and a .05 level of significance, the table value was 9.48773. This value was compared to the chi square value of 3.625 to ascertain whether or not the relationship was significant. If significant there is probably a relationship. If not, there is no relationship. In this case, the computed chi square, 3.625, is less than the critical table value of X^2, 9.48773 so the null hypothesis should not be rejected. Since there is a relationship the next step is to determine the contingency coefficient, C.

C is computed using chi square of 3.625 and an N of 24 which was the grand total of the column and row observed frequency computation shown in Table III. Data computation resulted in a contingency coefficient, C, of .36.

TABLE III

CHI SQUARE COMPUTATION

Item Selection	Observed (O)		Row Total	Expected (E)		(O-E)		$(O-E)^2$		$(O-E)^2/E$		Chi Square
	Q1[a]	Q2[b]		Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	
1	0	0	0	0	0	0	0	0	0	0	0	
2	0	4	4	2	2	-2	2	4	4	.167	.167	
3	0	6	6	3	3	3-3	3	9	9	.375	.375	
4	0	1	1	.5	.5	.5-.5	.5	.25	.25	.01	.01	
5	12	1	13	6.5	6.5	5.5	-5.5	30.25	30.2	1.26	1.26	
Col Total	12	12	24							1.81	1.81	3.625

Note: Q1[a] = the designation for the frequencies and subsequent computations that relate to Survey Question Number One, Determine the depth of CRM component incorporation as directed by FAA Advisory Circular 120-51C; Q2[b] = the designation for the frequencies and subsequent computations that relate to Survey Question Number Two, Determine the extent of personality trait awareness and integration into each company's CRM training program.

To adequately determine the strength of this relationship the upper limit of the contingency coefficient must be identified. By definition C can only range from a low of 0 to the maximum limit of 1.0. (Sharp, 1979) C in this case was .36 which is less than 50% or in the lower 50% of the 0 - 1.0 range. This indicates little or no relationship between survey question number one, "Determine the depth of CRM component incorporation as directed by FAA Advisory Circular 120-51C" and survey question number two, "Determine the extent of personality trait awareness and integration into each company's CRM training program."

Although there was not a significant relationship between survey question number one and survey question number two; they provided information to determine answers to the research questions. Additionally, the six open-ended questions were charted with comments to describe the air carrier responses in order to help provide research question answers.

Research Question Number One

Determine to What Extent Major United States Air Carriers Are

Following the Current FAA Directive, AC 120-51C, Concerning CRM

Training.

All respondent comments from survey question number one, 100%, reported that they had fully implemented these concepts. The concepts according to the FAA AC 120-51C identified the following three primary components of a CRM program: initial indoctrination/ awareness, recurrent practice and feedback, and continual reinforcement

(FAA, 1998) Additionally, open-ended survey question number one, "Please explain how you provide *feedback* to your aircrews *during* CRM training" and open-ended survey question number two, "Please explain how you provide *feedback* to your aircrews *after* CRM training" provided limited information about feedback to aircrews during CRM training. Responses, however, focused on feedback for technical performance or on particular aspects of appropriate CRM behaviors. One additional comment about analyzing the impact of CRM training during aircrew evaluations focused on the trend analysis of accepted CRM behaviors. Unfortunately, respondents provide no other comments that would suggest that all of these components were being utilized.

Research Question Number Two

Determine If Major United States Air Carriers Are Familiar with the Use of Individual Awareness of Personality Traits in Crew Resource Management Training.

Research question number two answers were based upon the data collected from survey question number two. Specifically, the mode, or item selection 3, which specified that "Yes, we are aware, and we have integrated its use into our training program," was the most frequent response at 50%. The second most submitted response was item selection 2, which specified "Yes, we are aware, however, we do not use this concept." This frequency was 33% providing a total for both items 1 and 2 of 83%.

Research Question Number Three

Determine If a Personality Trait Awareness and Training Concept Has

Been Extended into the Flight Crew Training Team Environment.

Open-ended survey question number 4, "Please describe how you have integrated personality trait awareness into your CRM training" provided the bulk of this information. Indications were that only a few personality trait concepts had been extended into the training environment. However, the only comments that centered on this objective dealt with initial training. Other comments alluded to watching behaviors or developing an awareness of appropriate behaviors, but there was not a focus on personality traits.

Research Question Number Four

Determine to What Extent Major United States Air Carriers Are Utilizing

Individual Awareness of Personality Traits in Crew Resource

Management Training.

There were no specific comments about what each air carrier was doing with personality trait identification other than using it during initial training.

Research Question Number Five

Determine to What Extent Major United States Air Carrier Flight

Crewmembers Demonstrate an Awareness of Individual Personality Traits

in Flight Crew Performance.

Finally, there were no comments that would have highlighted the information sought to answer this research question. Specifically, nothing could be determined that would tell to what extent the major United States air carrier flight crew members demonstrate an awareness of individual personality traits in flight crew performance.

Finally, one other comment from the open-ended questions of the survey provided interesting insight into the organizational climate of the air carrier industry. Open-ended survey question, 5, which asks "If you use something other than personality trait identification in your CRM training program, please comment on the special process or technique you use," provided comments that centered on the use of trend analysis or a captain's advocacy board to resolve personal conflict.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to determine the depth of CRM component

incorporation as specified in FAA AC 120-51C and the extent of personality trait

adaptation in CRM training and the degree of integration of these concepts into normal,

flight, operational procedures. Additionally, a determination of whether or not there was

a relationship between incorporation of FAA AC 120-51C and personality trait awareness

and integration was sought. Information was gathered from two survey questions, which

determined whether or not to accept or reject the null hypothesis, and six open-ended

questions in order to answer the five research questions.

Survey Question Number One

Survey question number one was based upon an understanding of FAA AC 120-

51C. It specified:

Our CRM program, as it is currently implemented, incorporates
     [ ] none
     [ ] very few
     [ ] some
     [ ] most
     [ ] all
of the components of a CRM program developed in accordance with AC 120-51C.

Survey Question Number Two

Survey question number two was based upon the use of personality trait identification and awareness as a CRM training tool. It asked the respondents to select one of the following that best described their CRM training program's association with personality trait integration.

1. No, we are not aware nor do we use this concept.

2. Yes, we are aware, however, we do not use this concept.

3. Yes, we are aware, and we have integrated its use into our training program.

4. Yes, we are aware and we have integrated its use into our training program and give individual feedback to flight crew participants.

5. Yes, we are aware. We have also integrated its use into our training program, give flight crew participant's individual feedback, and have developed techniques to analyze and determine its impact during aircrew training and evaluation.

The five research questions were:

1. Determine to what extent major United States air carriers are following the current FAA directive, AC 120-51C, concerning CRM training.

2. Determine if major United States air carriers are familiar with the use of individual awareness of personality traits in crew resource management training.

3.   Determine if a personality trait awareness and training concept has been extended into the flight crew training team environment.

4.   Determine to what extent major United States air carriers are utilizing individual awareness of personality traits in crew resource management training.

5.   Determine to what extent major United States air carrier flight crewmembers demonstrate an awareness of individual personality traits in flight crew performance.

By definition, the population of this study was narrowed to 15. To be included in this group each respondent had to be designated a major air carrier. Current industry standards specify that to be identified as a major air carrier an airline must have annual revenue, which is equal to or exceeds $1 billion. In all, 12 of the 15 major (Part 121) United States air carriers provided information to help determine answers to each of these questions.

Summary

The FAA defined CRM evolution as the application of team management concepts in the flight deck environment. It was initially known as Cockpit Resource Management, but today Crew has replaced the word Cockpit with several implications (FAA, 1998). As CRM programs evolved to include flight attendants, maintenance personnel, air traffic controllers and others, the phrase Crew Resource Management was adopted. It now refers to the effective use of all-available resources: human resources, hardware, and information--a description outlining the components of a team. So as the

"C" in the CRM acronym evolved from cockpit to crew, a new emphasis was placed upon team effectiveness. Currently, the FAA includes the concepts of team building and maintenance, information transfer, problem solving, decision making, maintaining situational awareness, and dealing with automated systems. The FAA stresses that CRM training should be comprised of three components; initial indoctrination/ awareness, recurrent practice and feedback, and continual reinforcement (FAA, 1998). According to the FAA this is but one avenue and therefore it leaves interpretation of these requirements to each individual air carrier. So, one approach for optimizing the human/machine interface and accompanying interpersonal activities, may be the identification and understanding of individual personality traits. So the problem exists, which approach to use?

Problem

Currently, the accepted approach to CRM training is based upon theory immersion and practiced and/or demonstrated skills. Now with an emphasis on crews and teamwork, individual flight crewmembers need to understand group dynamics and how that effects their flight crew duty roles. One such approach for understanding these concepts is the identification and awareness of individual personality traits. However, the situation is not clear as to whether or not the major Part 121 Air Carriers use this concept in their training programs.

Conclusion

Based upon respondent comments on survey question number one, all major Part 121 Air Carriers reported that they follow the Federal Aviation Administration's AC 120-51C guidelines. Their 100% response for item selection 5 or "All" graphically indicated by a Pareto chart, Figure 1, strongly indicates that the air carriers truly believe that they are following this directive.

Figure 2, graphically indicates survey question number two responses that 50% of respondents reported option 3, "Yes, we are aware, and we have integrated its use into our training program," as the best way to describe their CRM training program's association with personality trait integration. This mode of 3 indicates the fact that the air carriers were aware of the possible uses of personality traits in their training programs. The data in this case indicated that the air carriers know about the concepts of personality trait identification, however, open-ended question responses actually indicate that few have taken the initiative to integrate these ideas into their CRM training programs beyond initial training.

To either confirm or refute this idea a contingency coefficient was calculated. The chi squared of 3.625 was computed and compared to the critical table value of X^2 with a significance level of .05. This value was 9.48773. Since chi square, 3.625, is less that the critical table value of 9.48773 the H_o null hypothesis, should not be rejected. With this decision, C was calculated to be .36 and compared to the contingency coefficient range for tables. By definition this range can only be between 0 and 1.0. The nearer C is to the upper limit of 1.0 the stronger the relationship. However, since C was less than 50% of

the total C interval, $0 - 1.0$, it indicated very little or no relationship between the two variables. The variables were survey question number one which sought to, "Determine the depth of CRM component incorporation as directed by FAA Advisory Circular 120-51C," and survey question number two which wanted to, "Determine the extent of personality trait awareness and integration into each company's CRM training program." So, even though the H_o was not rejected, the relationship between full integration of the FAA directive, AC 120-51C, and personality trait identification and use was very weak, and virtually non-existent.

Because there was little or no relationship involved, the open-ended questions were analyzed to determine the current CRM approach to training and to answer the research questions. Specifically, the majority of comments focused on the technical proficiency or behaviors that were either identified in FAA AC 120-51C or developed within each company's CRM program as allowed by the FAA. Comments about the components that the FAA suggests in their AC 120-51C concerning concepts of team building and maintenance, information transfer, problem solving, decision making, maintaining situational awareness, and dealing with automated systems were non-existent.

Some referenced AQP but never divulged just exactly what they were doing. It may very well be what Seamster (1998) specified in the Advanced Crew Resource Management (ACRM) Manual. Specifically, that the industry complaint concerning a lack of training standards was addressed by listing two specific objectives of ACRM. More precisely, the ACRM provided clear procedures for aircrew use as well as the deployment of unambiguous standards for use during aircrew assessment. In all cases

where these government publications were referenced there was no provided supporting

information to adequately explain each air carriers training program with one exception.

Most all air carriers mentioned the need to master technical performance as the primary

focus for their CRM programs.

Although the open-ended survey questions provided some information about the

various approaches or attitudes of these air carriers there were three glaring omissions.

Precisely, the paucity in emphasis on communication, teambuilding, and an overall dearth

on just *how* to do things was lacking.

First, communication and teambuilding are related when it comes to team

performance. Comments about communication focused on feedback, one way,

concerning technical performance. Additionally, one air carrier mentioned that the

concern to maintain or uphold the Captain's authority was paramount. One way

communication in an industry or organizational culture can only mean that effective team

performance in most cases is not at maximum levels. Again, because communication and

teambuilding go hand in hand, effective teamwork can not occur when individuals, who

make up teams, do not know and nor understand their own strengths and weaknesses.

According to Hirsh (1992)

> a team that works well together is not a chance event. People concerned
> about effective teams need to understand themselves first. They also need
> to know how they function best in a group setting. By analyzing the
> collective preferences on a team, the team can discover and appropriately
> manage potential areas of strength and weaknesses.

While the concept of teams is inherent in CRM, the technical aspects of flying seem to

outweigh the understanding of group dynamics. Thus the persistence to maintain the

Captain's authority as sacrosanct actually perpetuates a groupthink atmosphere and diminishes the chances for truly effective team efficacy.

Although there was no significant relationship between survey question number one and survey question number two, some of the other objectives of this study needed to be addressed. Specifically the open-ended questions were designed to gather data, which would either shed some light upon or answer the research questions. These results follow.

Research Question Number One

Determine to What Extent Major United States Air Carriers Are

Following the Current FAA Directive, AC 120-51C, Concerning CRM

Training.

According to the mode for survey question number one, air carriers reported the incorporation of "All" the components of FAA AC 120-51C. They did not however address just exactly what they were doing. However, based upon the original purpose of this question, to determine the extent of each air carriers use of FAA AC 120-51C concepts, the assessment must be that this was accomplished. All air carriers reported using all of these concepts.

Research Question Number Two

Determine If Major United States Air Carriers Are Familiar with the Use

of Individual Awareness of Personality Traits in Crew Resource

Management Training.

The mode, for survey question number two, indicated that the majority of the respondents knew about and understood the concept of personality trait identification and use. Fifty percent of the respondents reported using some personality trait information in their CRM training programs. An additional 33 percent reported knowing about personality traits, however, they had not incorporated any of these concepts into their CRM programs. Although the vast majority of respondents reported this knowledge, there was a lack of comments concerning the exact use or deployment of personality trait awareness and identification beyond an initial pilot training class.

Overall, the data clearly indicated that there was an awareness of personality trait use. Therefore, the objective of this research question was adequately determined.

Research Question Number Three

Determine If a Personality Trait Awareness and Training Concept Has Been Extended into the Flight Crew Training Team Environment.

Open-ended question number four, "Please describe how you have integrated personality trait awareness into your CRM training," provided limited information about the use of personality trait awareness. Specifically, some air carriers commented that they use personality trait awareness and identification during their initial pilot training classes. There were not, however, any comments about personality trait use in a team environment. Based upon these limited and indefinite comments, this research question could not be adequately answered.

Research Question Number Four

Determine to What Extent Major United States Air Carriers Are Utilizing

Individual Awareness of Personality Traits in Crew Resource

Management Training.

Again, open-ended question number four, "Please describe how you have

integrated personality trait awareness into your CRM training," was the only question that

provided information to address this research question. Specifically, the only area where

personality trait awareness was being utilized was during an initial pilot training class.

There were no other comments submitted that would have significantly added to the

conclusion that this research question could not be sufficiently answered.

Research Question Number Five

Determine to What Extent Major United States Air Carrier Flight

Crewmembers Demonstrate an Awareness of Individual Personality Traits

in Flight Crew Performance.

There was not enough submitted information to acceptably address this research

question.

Recommendations

Over the many years air carriers have an excellent record when it comes to

preventing accidents or incidents which could have been caused by a lack of coordination

between flight crew members. When the public is concerned, however, even one is

unacceptable. So, major airlines use the concepts that evolved from the iterations of AC 120-51A/B/C as a basis or starting point for their own CRM programs. These programs have evolved from a focus on the flight deck or pilots and now include the entire cabin crew and even ground personnel. However, with this evolution comes more personal interaction with others. This interaction means communication and this in itself is a major subset of CRM, being able to effectively communicate with other crewmembers or ground personnel. What this suggests is that individual's must become aware of their own strengths and weaknesses in communication and personal interaction with others. This research did not indicate that this was being accomplished. Even though beyond the scope of this research there are several things that can be done in order to improve this situation.

The following recommendations for practice are viable follow-on studies.

1. The research of personality and its effect on the team concepts of CRM would complement FAA AC 120-51C guidance for teambuilding.

2. The identification and use of the various types of assessments tools, such as the Oxford Capacity Analysis or the Keirsey Temperament, could be used to determine an individual's strengths and weaknesses.

People or organizations that are serious about improving their abilities must first know themselves. Integrating a personality assessment tool into any type of training would be a first step.

3. The determination on how to educate CRM course developers and instructors to understand what personality traits and other assessment tools are and how they can be used in CRM training and mission operations.

4.   The identification of an approach to emphasize and integrate the appropriate use of interpersonal skills during all flight training activities and flight evaluations.

This in itself would become a major change in outlook and behavior because as in the past and most likely in the future, technical performance will over shadow the need to expand an individual's ability to interact with others.

5.   Determine the feasibility of constructing a teambuilding-training center sponsored by all the major Air Carriers, where CRM concepts can be developed and used in order to enhance the overall aircrew performance throughout the industry.

When all flight personnel, whether they are in a commuter, regional, national, or major airline know and understand how people are able to effectively work within teams, then human error will be decreased, aircraft will continue to operate safely, and the public will be happy.

Recommendations for a CRM Training Program to

Meet the Requirements of FAA AC 120-51C

FAA AC 120-51C provides guideline topics for use in developing a CRM training program. In all, there are three critical components: initial indoctrination/awareness, recurrent practice and feedback, and continuing reinforcement. This framework is used to structure the curriculum that implements an effective CRM training program. This structure must be stressed and reinforced from the very first initial pilot training class, recurrent or annual training, through upgrade training.

The curriculum topics used in this structure are communications processes and decision behaviors as well as teambuilding and maintenance. In order to properly train in this environment four specific topics must be understood in order to put in place the framework that effectively implements the curriculum topics outlined in FAA AC 120-51C.

1. Use of a personal assessment tool such as the MBTI, Myers-Briggs Type Indicator, provides information concerning an individual's orientation toward the world. MBTI analysis enables an individual to identify their personal strengths and weaknesses in their interaction with others when communicating, during teambuilding, and during the decision making process.

2. Proper understanding of the communication process will help an individual to better understand their place in the sender, receiver and message process. Being aware of how we communicate is essential to interaction with others. Hirsh (1992) points out that the four combinations of perceiving and judging in our personality type provide the functions that we use to communicate. Understanding these individual communication capabilities and weakness will enhance individual and team member interaction between and within groups.

3. Teambuilding is essential in a setting that requires people to work together and flying aircraft is a team effort. Parker (1990) in his teambuilding book stresses that in every team there are four distinct styles of team members: challenger, contributor, communicator, and collaborator. Knowing and

understanding the strengths and weaknesses of these team player characteristics will enhance communication and ultimately team effectiveness.

4.   In most cases, decision-making processes must be taught, relearned, or reinforced. The FAA AC 120-51C (1998) list decision-making as an internal skill. In today's environment however, this internal skill or process must be utilized in a team environment. Parker (1990) contends that work-force changes, the impact of technology and other factors have pushed organizations to stress the concepts of teambuilding and decision-making (p. 1). Certain techniques such as nominal group technique, force field analysis, and multi-voting help individuals or teams identify, prioritize, and make decisions on assigned tasks (Ishikawa, 1990).

Using these four concepts in an understandable and orchestrated effort to implement any process that requires individual interaction will only enhance the abilities of the participants. It will enable participants in any CRM program to effectively understand and utilize any subtopics that are allowed by the FAA. More specifically, "a team that works well together is not a chance event. People concerned about effective teams need to understand themselves first. They also need to know how they function best in a group" (Hirsh, 1992, p.4).

Use of these tools will enhance the identification, understanding, and use of interpersonal strengths and weaknesses therefore effectively complimenting the CRM program outlined in FAA 120-51C.

Impact

Individuality and product identification permeates the entire airline industry. For the majors to agree to sponsor a CRM training center would mean an astronomical leap of cooperation. However, cooperation is exactly what is needed to truly forge relationships between all Part 121 air carriers, whether they are a major, national, regional, or commuter air carrier.

One approach, the FAA notes that there could be many, to this new challenge, optimizing the human/machine interface and accompanying interpersonal activities, may be attainable through the identification and understanding of individual personality traits in the controlled environment of a CRM training center.

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APPENDIXES

APPENDIX A

INTRODUCTION LETTER AND

CONSENT FORM

Research on Personality Trait Integration into CRM Training

10232000-00A

TO:

FROM: Casey Blaine

SUBJECT: CRM Survey

DATE: October, 24 2000

I'm currently working on research as a doctoral candidate at Oklahoma State University in the field of aerospace education. This research is a descriptive study of the use of personality traits in Crew Resource Management (CRM) training. Because of Federal Aviation Administration emphasis, AC 120-51C, and the need to insure the flying public of the safe and efficient operation of aircraft this topic, CRM, is a driving force in today's aircrew training. It is vital that we do all that we can to gain the knowledge that enables us to better understand the intricate dynamics that occur between aircrew members.

The critical premise of this study is to discover the depth and breadth of personality trait integration into today's aircrew training. This concept is significant because personality traits and patterns of behavior are unique to each individual. We all experience these traits and patterns of behavior; others observe them directly or through our communication with them. According to Young, personality includes attitudes, modes of thought, feelings, impulses, strivings, actions, responses to opportunity and stress and everyday modes of interacting with others.

Please don't think, "Oh no another academician trying to figure out what's going on." That's not the case because my aviation background is extensive. I have an ATP and have flown multi-engine aircraft in the military and commercially, Part 121, in the 737-300 and in several DC-9 series aircraft. I understand the evolution of this training and the need for further study. That's precisely why I've chosen specific individuals, like you, who are in positions that provide direction and who make decisions that have a significant impact on products, services, and people. Consequently, you have been selected as a survey candidate for the attached questionnaire.

The number on each questionnaire is coded to organize and maintain the confidentiality of each respondent. Individual questionnaires will not reveal any names, positions, or company identification. Additionally, questionnaire analysis will only reflect aggregate data.

Your response to this questionnaire is very important to the success of this research because of the limited population sample. 13-15 major air carriers. The questionnaire consists of two questions that ask you to select the answer which bests describe your CRM training approach. There are also seven open-ended questions that allow you to describe, in your own words, your CRM training philosophy. It should take you no more than 25 minutes to find data. if needed, and write your answers. Your participation in this research is strictly voluntary; however, if you choose to participate I would appreciate you completing and returning the questionnaire by October 31,2000, in the enclosed, postage paid envelope. If it is more convenient, I've enclosed a disk with the questionnaire in Microsoft Word format that you can use to digitally format and email your response to me at cblaine@mmcable.com. I will also provide you with an executive summary of the results of my research and follow up on questions that you may have based upon your participation.

As required by research guidelines, I must inform you of the following. If you sign and return the attached consent form, page two of this letter, with the questionnaire you signify that you have read this letter and the questionnaire and have freely given your consent to participate in this research and for your data to be used as described above.   Please read, sign and return the attached consent form with your questionnaire responses.

Sincerely yours,

Casey L. Blaine

Attachments

Research on Personality Trait Integration into CRM Training

10232000-00A

CONSENT FORM:

I understand that: participation is voluntary, there is no penalty for refusal to participate, and I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director.

I may contact Dr Steve Marks at telephone number 405-744-7015. I may also contact Sharon Bacher, IRB Executive Secretary, 203 Whitehurst, Oklahoma State University, Stillwater, OK 74078; telephone number 405-744-5700.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____   Time: _____ (a.m./p.m.)

Signed: _____
                        Signature of Subject

APPENDIX B

OPEN-ENDED QUESTIONS

Air Carrier Code	Question #1
	Please explain how you provide *feedback* to your aircrews *during* CRM training.
1	No comment
2	Pilot facilitated discussion on CRM concepts.
3	No comment
4	Technical performance
5	Classroom discussion with feedback or crew "table discussion" CRM recurrent
6	No comment
7	No comment
8	Feedback provided to our aircrews during CRM training is de-identified.
9	Facilitated discussion during initial and recurrent CRM training.
10	No comment
11	No comment
12	Taught six basic CRM skills (Decision Making, Communications, etc.)

Air Carrier Code	Question #2
	Please explain how you provide *feedback* to your aircrews <u>*after*</u> CRM training.
1	No comment
2	Instructor led feedback about technical skills and communication
3	No comment
4	No comment
5	instructor feedback during training about CRM
6	No comment
7	No comment
8	instructor/evaluator facilitated debrief and the VHS video taping of simulator training sessions. In extremely unusual situations (less than 0.1% of the pilot population per year), a 'CRM Intervention Team' is enacted to assist identified individual pilots with correcting specific CRM behavioral problems. boration with the pilot union's Professional Standards division.
9	Aircrew questionnaires to obtain trends.
10	No comment
11	No comment
12	Aircrews encouraged to evaluate and debrief CRM skills, but no formal procedure exists

Air Carrier Code	Question #3
	Please explain what techniques you use to *analyze* the impact of CRM training during aircrew evaluations.
1	No comment
2	Trend analysis of simulator and flight checks. Analyzed by Advanced Qualification Program staff.
3	No comment.
4	CRM tool kit "Can we do it better?"
5	audits have confirmed strengths and weaknesses that we then address in various forms of training data base inputs
6	No comment
7	No comment
8	Data collection is targeted at specific CRM behavioral markers for both qualification and continuing training validations and checking events. CRM training success measures are fed back to instructional systems designers who integrate findings into fleet task analysis, qualification standards, and curriculum revisions/development.
9	Trend analysis ASR (Air Safety Reports)
10	No comment
11	No comment
12	Instructors and evaluators gauge an airman's performance against the observable behaviors

Air Carrier Code	Question #4
	Please describe how you have *integrated* personality trait awareness into your CRM training?
1	
2	Personality traits and their impact are discussed in the new pilot introduction course.
3	Do not use personality in training
4	1st year of training only, no other approach or follow-up
5	limited we discuss (in new hire pilots CRM) different styles of leadership
6	
7	
8	integrates personality trait awareness into the Initial Pilot Indoctrination, Captain Leadership Seminar, and Instructor Qualification Courses.
9	personality trait impact of ops/error mgt but no reference
10	
11	
12	not integrated personality traits into its CRM training

Air Carrier Code	Question #5
	If you use something other than personality trait identification in your CRM training program, please comment on the special process or technique you use.
1	No comments
2	No comments
3	No comments
4	Captain's Advocacy Program
5	we use the term "effective" and ineffective" to describe behaviors in the cockpit emotional IQ
6	No comments
7	No comments
8	NA
9	"best practices" NTSB reports
10	No comments
11	No comments
12	No comments

Air Carrier Code	Question #6
	What *additional comments or observations* of any type would you like to make?
1	No comments
2	No comments
3	No comments
4	In the company's opinion—we do the most!
5	we don't use much "personality" however intrigued by the concept of using in hiring
6	No comments
7	No comments
8	No comments
9	Living changing program
10	No comments
11	No comments
12	availability of a standardized peer evaluation test or battery would be beneficial if it were targeted towards those skills that airmen usually rely on to be proficient

APPENDIX C

SURVEY INSTRUMENT

Personality Trait Integration into CRM Training

PURPOSE:

Current Federal Aviation Administration emphasis, AC 120-51C, on Crew Resource Management (CRM) and the need to insure the flying public of the safe and efficient operation of aircraft is a driving force in today's aircrew training. It is vital that we do all that we can to gain the knowledge that enables us to better understand the intricate dynamics that occur between aircrew members. This research is but one step in that process.

WHO SHOULD COMPLETE THIS SURVEY?

An individual who has first hand knowledge or someone who can affect change or has training program input should complete this survey.

SECTION A:

The Federal Aviation Administration current advisory circular, AC 120-51C, outlines the guidelines for developing, implementing, reinforcing, and assessing Crew Resource Management (CRM) training for flight crewmembers and other personnel essential to flight. CRM training focuses on situation awareness, communication skill, teamwork, task allocation, and decision making.

Based upon your understanding of AC 120-51C, what is the extent of your CRM program development? Please mark an "**X**" in one of the blocks below that best describes your current CRM program.

Our CRM program, as it is currently implemented, incorporates

        [ ]   none

        [ ]   very few

        [ ]   some

        [ ]   most

        [ ]   all

of the components of a CRM program developed in accordance with AC 120-51C.

SECTION B:

As defined by Young in 1978, personality is a word that signifies the personal traits and patterns of behavior that are unique to the individual. You experience these traits and

patterns of behavior as your own; others observe them directly or through your communication with them. Personality includes attitudes, modes of thought, feelings, impulses, strivings, actions, responses to opportunity and stress and everyday modes of interacting with others.

Personality trait identification and awareness is a tool that could be used in CRM training. Based upon Young's statement (above) and your understanding of personality, please circle the answer in this section (B) that best describes your CRM training program's association with personality trait integration.

1. No, we are not aware nor do we use this concept.

2. Yes, we are aware, however, we do not use this concept.

3. Yes, we are aware, and we have integrated its use into our training program.

4. Yes, we are aware and we have integrated its use into our training program and give individual feedback to flight crew participants.

5. Yes, we are aware. We have also integrated its use into our training program, give flight crew participant's individual feedback, and have developed techniques to analyze and determine its impact during aircrew training and evaluation.

SECTION C: Description of your CRM Program

To adequately describe your CRM program, please write a response to each open-ended question. If appropriate, base you comments on your selection from SECTION B. (Use additional paper or space if needed.)

1. Please explain how you provide *feedback* to your aircrews *during* CRM training.

2. Please explain how you provide *feedback* to your aircrews *after* CRM training.

3. Please explain what techniques you use to *analyze* the impact of CRM training during aircrew evaluations.

4. Please describe how you have *integrated* personality trait awareness into your CRM training?

5. If you use something other than personality trait identification in your CRM training program, please comment on the special process or technique you use.

6. What *additional comments or observations* of any type would you like to make?

APPENDIX D

INSTITUTIONAL REVIEW BOARD

APPROVAL FORM

Oklahoma State University
Institutional Review Board

Protocol Expires: 9/11/01

Date : Tuesday, September 12, 2000   IRB Application No   ED0122

Proposal Title: PERSONALITY TRAIT INTEGRATION INTO CRM TRAINING
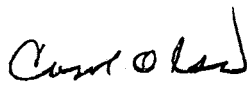
Principal
Investigator(s) :

Casey Blaine   Steven Marks
4008 Sheffield   308 Cordell North
Edmond, OK 73034   Stillwater, OK 74078

Reviewed and
Processed as: Expedited

Approval Status Recommended by Reviewer(s) : Approved

Signature :

Carol Olson, Director of University Research Compliance   Tuesday, September 12, 2000
                                                                 Date

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modifications
to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office
MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited
and exempt projects may be reviewed by the full Institutional Review Board.

APPENDIX E

CRITICAL VALUES OF CHI SQUARE

Critical Values of X²
(Chi-Square)

df\area	.995	.990	.975	.950	.900	.750	.500	.250	.100	.050	.025	.010	.005
1	0.00004	0.00016	0.00098	0.00393	0.01579	0.10153	0.45494	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944
2	0.01003	0.02010	0.05064	0.10259	0.21072	0.57536	1.38629	2.77259	4.60517	5.99146	7.37776	9.21034	10.59663
3	0.07172	0.11483	0.21580	0.35185	0.58437	1.21253	2.36597	4.10834	6.25139	7.81473	9.34840	11.34487	12.83816
4	0.20699	0.29711	0.48442	0.71072	1.06362	1.92256	3.35669	5.38527	7.77944	9.48773	11.14329	13.27670	14.86026
5	0.41174	0.55430	0.83121	1.14548	1.61031	2.67460	4.35146	6.62568	9.23636	11.07050	12.83250	15.08627	16.74960
6	0.67573	0.87209	1.23734	1.63538	2.20413	3.45460	5.34812	7.84080	10.64464	12.59159	14.44938	16.81189	18.54758
7	0.98926	1.23904	1.68987	2.16735	2.83311	4.25485	6.34581	9.03715	12.01704	14.06714	16.01276	18.47531	20.27774
8	1.34441	1.64650	2.17973	2.73264	3.48954	5.07064	7.34412	10.21885	13.36157	15.50731	17.53455	20.09024	21.95495
9	1.73493	2.08790	2.70039	3.32511	4.16816	5.89883	8.34283	11.38875	14.68366	16.91898	19.02277	21.66599	23.58935
10	2.15586	2.55821	3.24697	3.94030	4.86518	6.73720	9.34182	12.54886	15.98718	18.30704	20.48318	23.20925	25.18818
11	2.60322	3.05348	3.81575	4.57481	5.57778	7.58414	10.34100	13.70069	17.27501	19.67514	21.92005	24.72497	26.75685
12	3.07382	3.57057	4.40379	5.22603	6.30380	8.43842	11.34032	14.84540	18.54935	21.02607	23.33666	26.21697	28.29952
13	3.56503	4.10692	5.00875	5.89186	7.04150	9.29907	12.33976	15.98391	19.81193	22.36203	24.73560	27.68825	29.81947
14	4.07467	4.66043	5.62873	6.57063	7.78953	10.16531	13.33927	17.11693	21.06414	23.68479	26.11895	29.14124	31.31935
15	4.60092	5.22935	6.26214	7.26094	8.54676	11.03654	14.33886	18.24509	22.30713	24.99579	27.48839	30.57791	32.80132
16	5.14221	5.81221	6.90766	7.96165	9.31224	11.91222	15.33850	19.36886	23.54183	26.29623	28.84535	31.99993	34.26719
17	5.69722	6.40776	7.56419	8.67176	10.08519	12.79193	16.33818	20.48868	24.76904	27.58711	30.19101	33.40866	35.71847
18	6.26480	7.01491	8.23075	9.39046	10.86494	13.67529	17.33790	21.60489	25.98942	28.86930	31.52638	34.80531	37.15645

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VITA

Casey L. Blaine

Candidate for the Degree of

Doctor of Education

Thesis: MAJOR (PART 121) UNITED STATES AIR CARRIER IMPLEMENTATION OF CREW RESOURCE MANAGEMENT TRAINING CONCEPTS AS OUTLINED IN THE FEDERAL AVIATION ADMINISTRATION'S ADVISORY CIRCULAR 120-51C

Major Field: Applied Educational Studies

Biographical:

    Education: Graduated from Midwest City High School, Midwest City, Oklahoma in May 1969; received Bachelor of Science degree in Business Administration from Oklahoma State University, Stillwater, Oklahoma in May 1973. Received a Master of Arts degree in Counseling Services from Rider University, Lawrenceville, New Jersey in September 1985. Completed the requirements for the Doctor of Education degree with a major in Applied Educational Studies at Oklahoma State University in December 2000.

    Experience: Twenty-fours years as an officer in the United States Air Force with primary duties in aviation, flying six different aircraft; commercial airline pilot with flight experience in the Boeing 737-300, DC-9, and MD-80. Part-time instructor at Oklahoma State University, Department of Aerospace Education. Currently a member of the Business and Industry Services Department Autry Technology Center.