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MINUTEMAN COMBAT CREW INTEGRITY: ITS EFFECT ON JOB SATISFACTION AND JOB PERFORMANCE

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Air Force Institute of Technology
Wright-Patterson Air Force Base, Ohio

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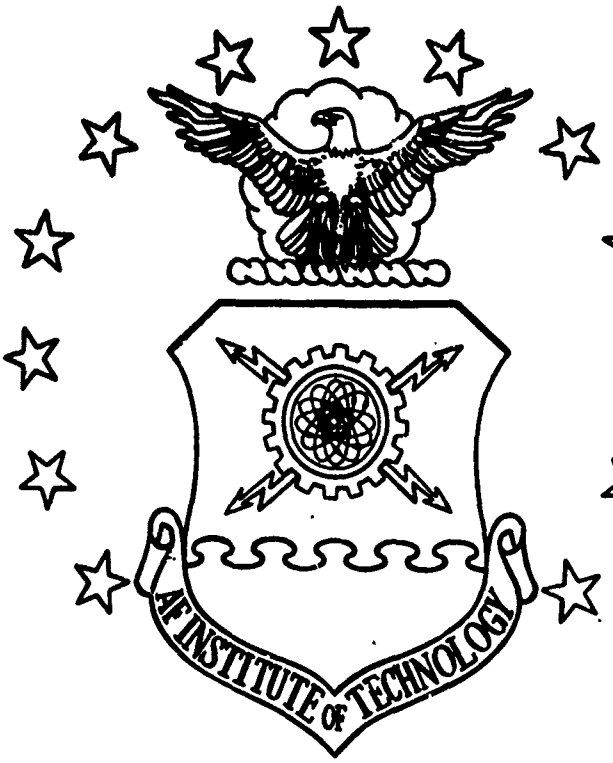

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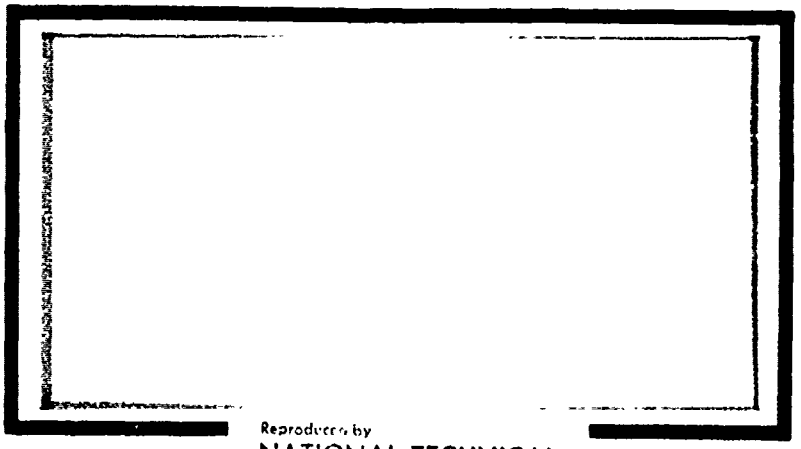

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13. ABSTRACT

The Strategic Air Command's policy of maintaining integral missile crews was evaluated. The specific purpose of the research was to determine the impact of this policy on job satisfaction and job performance in the Minuteman combat crew environment. Research data was collected via job attitude questionnaires, a crew performance records review and missile management interviews. Data analysis primarily involved the application of various statistical techniques. The authors concluded that the policy of crew integrity was a source of job dissatisfaction and had no significant effect on job performance. Further, it was recommended that the current policy be modified.

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of the Air Force Institute of Technology

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In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

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Chapter I

INTRODUCTION

The Problem

Missile combat crew duty has been characterized as boring, trivial, miserable, unrewarding, and dehumanizing.[1] To improve this situation the Air Force has expended considerable resources to identify and eliminate irritants in the missile work environment.[2] One aspect of crew duty which had not been subjected to any type of detailed analysis was the policy of maintaining integral crews--commonly known as crew integrity.[3] Specifically, insufficient information existed as to the effect of crew integrity on job satisfaction and job performance.

The Background

The Minuteman weapon system is one of two Air Force operational intercontinental ballistic missile systems. Along

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[1]Robert L. Petersen, "Results of a Survey of SAC Missile Combat Crews," (Unpublished Report, Offutt AFB, Neb.: SAC/DA, May 1971), pp. 71-85.

[2]"Second Update, Fifteenth Air Force Missile Improvement Symposium, 8-12 March 1971," (Unpublished report on the Symposium Recommendations, March AFB, Calif.: 15AF/CS Oct. 1, 1971).

[3]David A. Wilkerson, Capt., USAF, Chairman, SAC Missile Management Working Group, HQ SAC, (DPXPS), Offutt AFB, Neb. (Telephone interview, Jan. 10, 1972.)

with the Titan missile system, it represents one portion of the United States' nuclear deterrent triad. The other two elements include the strategic bombers and the Navy's nuclear-armed submarine fleet. Approximately 1,000 Minuteman missiles are kept "on alert" throughout the continental United States. They are concentrated around six support bases: Ellsworth AFB, South Dakota; F. E. Warren AFB, Wyoming; Grand Forks AFB, North Dakota; Malstrom AFB, Montana; Minot AFB, North Dakota; and Whiteman AFB, Missouri. The Minuteman missile is an effective deterrent to general war, and the relative simplicity of the weapon has resulted in a highly reliable system requiring minimum personnel support.[1] Paradoxically, the Minuteman weapon system has, however, experienced some unique human problems.

The officers who monitor and control the Minuteman system are assigned to the missile operations career field. They are called missile combat crew members and are awarded an Air Force Specialty Code designated by the number 1825. There are 1,724 crew member authorizations allocated to the Minuteman force and ninety-eight per cent of that force is comprised of captains and lieutenants.[2]

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[1]Salvador E. Felices, Major General, USAF, Deputy Chief of Staff for Logistics, Strategic Air Command, "Logistics In SAC" (lecture presented to the AFIT Graduate Logistics Management School, Wright-Patterson AFB, Ohio, Jan. 31, 1972).

[2]Warren D. Johnson, Major General, USAF, "Missile Management Working Group News" (letter to all missile officers, Offutt AFB, Neb., Mar. 13, 1972).

The duties of a missile combat crew member can best be described under two conditions. During peacetime, the job basically involves electronically monitoring missiles to detect system irregularities for maintenance action. In war, the crew member's chief function is to launch the Minuteman within predesignated time constraints. Each crew, consisting of two officers, has primary responsibility for ten missiles. To assist them in their duties, a comprehensive technical order--procedures guide--is furnished. The crew performs their job at a remote site in an underground capsule. A tour of duty is normally forty hours long with three eight-hour shifts actually spent in the capsule. In addition to the work itself, there is considerable social and psychological stress on a crew member. Because he works with nuclear weapons, the crew member is continually evaluated to guarantee his job proficiency. Further, he has the added responsibility of controlling top secret documents, and finally he is cognizant of the awesome destructive potential he may someday be ordered to release.

A major aspect of missile combat crew duty is the policy of maintaining integral crews. An integral crew is composed of a commander and a deputy who constitute a single work team to carry out their assigned duties. Once a crew has been formed, this pairing is maintained to the maximum extent possible.[1] Like many other missile procedures, the

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[1]U.S. Department of the Air Force, Strategic Air Command, ICBM Operations, SACM 55-66, Vol. I, Offutt AFB, Neb.: 8 Feb. 1972, p. 22.

integral crew is a carry-over from a similar concept employed in aircraft operations.[1] Though it has proven to be a "workable" procedure in missile operations, crew integrity has never been validated as an optimum policy for the missile work environment. More precisely, the authors were unable to find any research which had adequately demonstrated the relationship of missile combat crew integrity to job satisfaction and job performance.

The Purpose and Hypotheses of the Study

This research effort investigated the Strategic Air Command's policy of maintaining integral crews and the impact of that policy on Minuteman crew personnel. The study was undertaken to provide information on the subject for subsequent review by Air Force management. To achieve this purpose, hypotheses were formulated to test two different dimensions of the problem.

Hypothesis 1: Crew integrity functions as a factor of job dissatisfaction.

Hypothesis 2: Crew integrity has no significant effect on job performance.

The subject of crew integrity was chosen because of its apparent influence on numerous sociological and administrative aspects of the job. While there was an abundance of written material--both official and unofficial--on various

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[1] Sheldon A. Goldberg, GS-12, Archivist, Strategic Air Command Historian, HQ SAC, (HO), Offutt AFB, Neb. (Telephone interview, Mar. 14, 1972).

human problems within the Minuteman weapon system, this literature was predominantly qualitative in nature and most often, consisted of unsubstantiated personal opinions. Therefore, the aim of this thesis was to produce a fairly rigorous quantitative as well as qualitative analysis in testing the two hypotheses.

An Organization and Preview of the Study

The following chapters include the background investigation, research design, analysis, and conclusions. Chapter II offers a review of the pertinent literature. Chapter III describes the design of the research and data collection techniques. Chapter IV gives an analysis of the data and hypotheses tests while Chapter V presents a summary and conclusions.

Chapter II

REVIEW OF THE LITERATURE

Preview

The purpose of this chapter is twofold: first, to provide a brief discussion on the theoretical aspects of job satisfaction and job performance and second, to review existing literature on these two topics pertaining to the Minuteman combat crew environment.

Job Satisfaction

When anyone talks about job satisfaction they are generally referring to an aspect of job attitude. An attitude has been defined as ". . . the intensity of positive or negative affect for or against a psychological object."[1] So in this instance, the psychological object is the job. More simply stated, job attitude is the term used to denote how an individual feels toward his job. Conceptually, a positive attitude toward the job is equivalent to job satisfaction and a negative attitude is equivalent to job dissatisfaction.[2]

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[1]Charles A. Kiesler, Barry E. Collins, and Norman Miller, Attitude Change (New York: Wiley, 1969), p. 2.

[2]Victor H. Vroom, Work and Motivation (New York: Wiley, 1964), p. 99.

Over the years many psychologists and management theorists have attempted to define those factors which determine job attitudes. While no one theory has been able to fully describe this complex psychological phenomenon, several theories have been used quite effectively by managers to implement policies which have improved the work environment. One of the best known yet controversial theories is that of Frederick Herzberg.[1] His original research was designed to test the concept that man had two sets of needs.

> One set of needs can be thought of as stemming from his animal nature--the built-in drive to avoid pain from the environment, plus all the learned drives which become conditioned to basic biological needs. . . . The other set of needs relate to that unique human characteristic, the ability to achieve and, through achievement, to experience psychological growth.[2]

As a result of Herzberg's extensive research, he came to the following conclusions:

> Feelings of strong job satisfaction come principally from the job itself and the opportunities for Achievement, the Recognition for the achievement, Work Itself, Responsibility, and professional Advancement and Growth. These factors . . . /produce/ . . . not only job satisfaction, but increased productivity and retention. Feelings of dissatisfaction are more likely to be attached to the environment in which one does his job, from such factors as Company Policies and Administration, Supervision, Working Conditions, Salary, Personal Life, and Interpersonal Relations. These factors are . . . the source of job

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[1] John P. Campbell, Marvin D. Dunnette, Edward E. Lawler III, and Karl E. Weick, Jr., Managerial Behavior, Performance, and Effectiveness (New York: McGraw-Hill, 1970).

[2] Frederick Herzberg, "One More Time: How Do You Motivate Employees?" Harvard Business Review, Vol. 46 No. 1, (Jan.-Feb., 1968), pp. 53-62.

> dissatisfaction that results in decreased productivity and retention.[1]

In other words, the factors that cause job satisfaction--the job satisfiers--are different from the factors that cause job dissatisfaction--the job dissatisfiers. Therefore, the opposite of job satisfaction is not job dissatisfaction, but instead, no job satisfaction. Similarly, the opposite of job dissatisfaction is not job satisfaction, but no job dissatisfaction.[2]

Robert J. House and Lawrence A. Wigdor are, perhaps, Herzberg's severest critics.[3] After a comprehensive review of the research conducted by Herzberg and others, they concluded that his basic theory was an oversimplification of the relationships between motivation and satisfaction, and the sources of job satisfaction and dissatisfaction. Even so, the authors of this research paper decided the Herzberg model would prove to be useful in identifying factors that affect overall job attitudes in the Minuteman crew environment.

The Department of the Air Force in 1966 conducted a study on junior officer retention called "New View" which

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[1]Clifford E. Smith, "The Implications of 'New View' for Motivating Officer Behavior," Air University Review, XX No. 3 (March-April 1969), pp. 57-62.

[2]Herzberg, "One More Time: How Do You Motivate Employees?", pp. 53-62.

[3]Robert J. House and Lawrence A. Wigdor, "Herzberg's Dual Factor Theory of Job Satisfaction and Motivation: A Review of the Evidence and a Criticism," Personnel Psychology, XX (1967), pp. 369-389.

used the techniques and concepts of Frederick Herzberg.[1] The findings demonstrated that the job attitudes of junior officers, like their civilian contemporaries, were determined by those factors described in the Herzberg model--with one notable exception. Interpersonal relationships were found to be associated with job satisfaction rather than job dissatisfaction.

In 1972 identical research was accomplished on Minuteman crew members. These results indicated that the determinants of job satisfaction and job dissatisfaction among missile personnel also conformed to Herzberg's theory. The only difference was that crew members were considerably less satisfied with their jobs than other career groups surveyed in previous studies.[2]

Colonel Donovan K. Bowe prepared a report in which he concluded that the job of a missile combat crew member did not readily lend itself to job enrichment. By necessity the job was subject to "tight" managerial control due to its association with nuclear weapons. Consequently, this extensive control created an environment which severely limited the possibilities for individual achievement and psychological

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[1]U.S. Department of the Air Force, Assistant Chief of Staff, Studies and Analysis, "Officer Motivation Study (New View)," (Washington, D.C.: Government Printing Office, April 1967), pp. 73-79.

[2]Thomas J. Gosling, "Job Motivation Among Line Missile Combat Crew Members" (unpublished Master's thesis, South Dakota State University, 1972), p. 24.

growth. Therefore, he proposed that programs be instituted to eliminate the job dissatisfiers, especially in areas of policy and supervision.[1]

Another study was completed involving crew personnel stationed at Malstrom AFB, Montana.[2] The findings of this study showed that interpersonal relationships and Air Force policy and administration were the most frequent causes of job dissatisfaction. The author recommended that management take a greater interest in these aspects of the crew environment. He further stated the opinion that the improvement of interpersonal relationships offered the best opportunity for diminishing job dissatisfaction among Minuteman crew members.

Part of this paper has delved into the question of interpersonal relationships among crew members, particularly relationships between members of the same crew. The social or interpersonal factors permeate every dimension of the job and are extremely hard to delineate. Social interaction itself does not produce job satisfaction. Rather, satisfaction results from specific kinds of socially derived outcomes: being responsible to and for other people; being recognized for achievement by other people; being liked by other people; to name a few. The significance of social interaction in

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[1]Donovan K. Bowe, "Retention of Junior Officers in the Minuteman Crew Force" (research report, Maxwell AFB, Ala., April 1969), p. 36.

[2]Alan C. Schlukbien, "Job Attitudes of Missile Officers" (unpublished Master's thesis, University of Montana, 1971), pp. 43-49.

the formation of job attitudes has clearly been established in numerous studies.

> Herzberg, Mauser, Petersen, and Capwell (1957) have compiled data from 15 studies of over 28,000 employees which point to the importance of social satisfactions derived from the work. In each of the studies, employees were asked what gave them satisfaction from their jobs. The most frequently mentioned sources of satisfaction were the "social aspects of the job," a term which the authors used to refer to all "on the job" contacts made by the worker with other workers, especially those at the same or nearly the same level within the organization. The second most frequently mentioned factor was the worker's relationship with his immediate supervisor.[1]

Job Performance

To measure job performance, appropriate criteria must first be established and then a comparison made between the criteria and employee behavior. There are numerous types of criteria available to the manager for the measurement of job performance. He can measure the quantity of work, the quality of work, or he may choose to use a subjective rating system. No matter what the standard, the important consideration is whether the criteria chosen is relevant to the job.

> The relevance of a criterion refers to the extent to which criterion measures of different individuals are meaningful in terms of the objectives for which such measures are derived. This concept is probably most meaningful in the case of criteria of job performance. Every job exists for some purpose, or complex of purposes. . . . Relevance, then, relates to the adequacy of criterion measures as indices of the relative abilities of individuals in fulfilling such purposes.[2]

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[1] Vroom, Work and Motivation, p. 40.

[2] Joseph Tiffin and Ernest J. McCormick, Industrial Psychology (Englewood Cliffs, N.J.: Prentice-Hall, 1965), p. 44.

Disregarding organizational and interpersonal determinants, Sutermeister suggests there are basically two factors which determine a worker's level of performance--his ability and his motivation.[1] The extent to which each of these factors affect performance has been the subject of considerable research. Given that ability can be measured and controlled through various personnel selection processes, the critical variable becomes motivation, or specifically, the worker's job attitude. It is interesting to note". . . that there is little evidence . . . that employee attitudes of the type measured in morale surveys bear any simple, or for that matter, appreciable relationship to performance on the job."[2]

Yet, Lyman W. Porter and Edward E. Lawler state that while it is true that very few well controlled investigations found highly positive relationships between satisfaction and performance, the trend of the relationship, nevertheless, seems to be in that direction. They go on to say:

> Its role [job satisfaction] is not to serve as a stimulus to employee's job performance but rather as a gauge of how good a job the organization itself is doing in rewarding employees in proportion to the quality and quantity of their work. . . . Evidence that satisfaction is not related to performance should be regarded as a signal for

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[1]Robert A. Sutermeister, People and Productivity (New York: McGraw-Hill, 1969), p. 7.

[2]Arthur H. Brafield and Walter H. Crockett, "Employee Attitudes and Employee Performance," Psychological Bulletin, Vol. 52 No. 5 (1955), pp. 415-422.

management to investigate effort-reward expectations /of their employees/.[1]

The authors failed to find any literature concerning the effect of crew integrity on job performance with respect to missile combat crew personnel. However, they were able to find several studies on the subject relating to aircrew members. One such study on crew performance in the B-29 aircraft concluded that a need existed for "careful" re-evaluation of crew integrity policies. Results had ". . . indicated that crews with medium number of /crew/ membership changes during the 10-month period had better combat performance scores, in general than high--or low--change crews."[2]

A Naval investigation of various antisubmarine aircraft--particularly, the P3A--revealed that ". . . under conditions of aircrew instability, the operational performance of the aircrew is significantly impaired, and that aircrew instability produces . . . greater operator error, than occurs under conditions of enforced crew stability."[3]

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[1]Lyman W. Porter and Edward E. Lawler, "What Job Attitudes Tell About Motivation," Harvard Business Review, Vol. 46 No. 1 (January-February, 1968), pp. 118-126.

[2]Donald G. Forgays and Bernard I. Levy, "Combat Performance Characteristics With Changes in the Membership of Medium-Bomber Crews" (unpublished report, Air Force Personnel and Training Research Center, Randolph AFB, Texas, December 1957), pp. 1-18.

[3]James E. Wise, "Developmental Paper 101311.100, 'Individual and Crew Performance In ASW Platforms'" (presentation to Symposium of the Naval Material Command and National Academy of Engineering, Washington, D.C., January 17, 1967), p. 13.

Yet in still another study of crew performance among B-52 aircrews, Lt. Colonel Herman L. Gilster stated, "Contrary to the belief that substitutes adversely affect crew coordination, I found no significant difference in /bomb/ scores between crews with and without substitute members."[1]

The aforementioned studies were representative of research that had been accomplished to discover the relationship between crew integrity and aircrew performance. Since the findings were varied, any conclusions would be speculative, especially as they might pertain to missile crew performance.

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[1]Herman L. Gilster, "Technical Report 69-1, 'A Combat Crew Production Function SAC ORI - Personnel Study'" (USAF Academy, Colorado, September, 1969), p. 7.

Chapter III

RESEARCH DESIGN AND DATA COLLECTION

The Approach

Since the deployment of the Minuteman, no operational wing has operated without maintaining crew integrity among its missile crew personnel. It seemed the policy of crew integrity simply had been accepted as a requirement by Air Force management.[1] Therefore, this research paper was oriented toward determining the effect of this policy on the combat crew environment as well as making inferences about how the Minuteman system might operate in the absence of such a policy. This chapter was organized according to the type of data collection techniques employed in the study: a job attitude questionnaire, a crew performance records review, and a missile management interview.

Job Attitude Questionnaire

The primary method used to gather data on the Minuteman combat crew environment was a job attitude questionnaire. This questionnaire was based primarily upon the research of

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[1]Sheldon A. Goldberg, GS-12, Archivist, Strategic Air Command Historian, HQ SAC, (HO), Offutt AFB, Neb. (Telephone interview, Mar. 14, 1972).

Frederick Herzberg. In The Motivation to Work, Herzberg listed three ways of identifying factors that determine job attitude.

> (1) An a priori list of factors can be presented to workers, who are then asked to rank or rate these factors as to desirability. Examples are wages, supervision, company and management policies, and communication. (2) Workers can be asked to indicate spontaneously what they like or dislike about their jobs. An analysis of these comments would reveal the existence of some of the factors listed. Their relative importance can be deduced either from the frequency with which they are given by the workers or by some method of weighting the vigor of the like or dislike. (3) Multi-item inventories or questionnaires may be administered. These make it possible to apply statistical techniques of analysis. From such an analysis it is possible to derive factors whose content can be deduced from a study of interrelationships among the items.[1]

Hypothesis 1 states: Crew integrity functions as a factor of job dissatisfaction. To test this hypothesis, Herzberg's third suggested methodology was chosen as it was readily adaptable to statistical analysis techniques and provided a systematic means of gathering data from a geographically dispersed population. The test instrument (or questionnaire) was designed to acquire information in three areas--those factors which are related to job attitude, the relationship between these factors and crew integrity, and finally, the relationship between crew integrity and job attitude. A reproduction of the questionnaire is presented in Appendix A.

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[1]Frederick Herzberg, Bernard Mauser, and Barbara Bloch Snyderman, The Motivation To Work (New York: Wiley, 1967), pp. 6-7.

A synopsis of the questionnaire is shown in Table 1. The questionnaire was divided into four parts--questions concerning biographical data, job attitude, interpersonal relationships and crew integrity. The biographical information was gathered in an effort to identify any differences that might exist between various categories of respondents, for instance, between commanders and deputies. The questions used to acquire information about job attitude included those factors delineated in the Herzberg model discussed in Chapter II. These factors represented both job satisfiers and job dissatisfiers. The questions on interpersonal relationships were constructed to determine variables that best described a crew member's attitude toward his partner. The last section of the questionnaire was designed to gain some insight into crew personnel attitudes toward the policy of maintaining integral crews.

In distributing the questionnaire, the names and organizational addresses of the entire Minuteman crew force--1,784 crew members--were extracted from a collection of weekly operations plans published during the month of May 1972 (one plan from each of the six operational wings). Questionnaires were mailed to a random sample of 500 crew members chosen from the original 1,784 names. The large sample size was used to establish a sound basis for statistical inference. Chapter IV presents the specific quantitative analyses.

TABLE 1

QUESTIONNAIRE SYNOPSIS

Question	Question Factor	Question Category
A.	Current Crew Position	Biographical
B.	Length of Time on Crew	" "
C.	Length of Time with Crew Partner	" "
D.	Volunteer Status for Crew Duty	" "
E.	Type of Crew	" "
F.	Number of Crew Partners	" "
G.	Experience in other Career Fields	" "
1.	Attitude Toward Job	Overall Attitude
2.	Sense of Personal Accomplishment	Satisfier
3.	Opportunity for Recognition	" "
4.	Enjoyment from the Work Itself	" "
5.	Adequacy of Responsibility	" "
6.	Opportunity for Advancement	" "
7.	Attitude toward Work Schedule	Dissatisfier
8.	Opportunity for Social Interaction	" "
9.	Attitude toward Work Environment	" "
10.	Adequacy of Salary	" "
11.	Effect on Personal Life	" "
12.	Attitude toward Supervision	" "
13.	Attitude Toward Crew Partner	Overall Attitude
14.	Shared Job Attitude with Partner	Interpersonal
15.	Competence of Partner	" "
16.	Compatibility during Evaluation	" "
17.	Compatibility on the Job	" "
18.	Enjoyment from Talking with Partner	" "
19.	Personality Assessment of Partner	" "
20.	Partner Attitude toward Respondent	" "
21.	Preference for Partner Variety	Crew Integrity
22.	Impact on Unit Effectiveness	" "
23.	Ease of Working with Same Partner	" "
24.	Effect on Individual Performance	" "
25.	Restriction of Social Interaction	" "
26.	Attitude Toward Crew Integrity	Overall Attitude
27.	Effect on Job Attitude by Partner	Interpersonal
28.	Career Intentions	Biographical

Crew Performance Records Review

The 321st Strategic Missile Wing at Grand Forks Air Force Base, North Dakota, was visited in June 1972 to collect data on the performance of missile combat crews. This data was necessary to test the second hypothesis of this thesis: Crew integrity has no significant effect on job performance. The missile organization at Grand Forks AFB was chosen as, in the judgment of the authors, it represented a "typical" Minuteman wing. The 321st Strategic Missile Wing supported the two most current intercontinental ballistic missile systems in the Air Force inventory--the Minuteman II and Minuteman III. Additionally, this unit had the "normal" number of crew members assigned and had not experienced any unusual rotation of crew personnel in recent months.[1]

Individual standardization (standboard) evaluation records were determined to be the best measurement of job performance. It was recognized that these evaluations are accomplished in a simulated environment and may not be a comprehensive means of testing a crew member's ability to perform in the actual work environment. However, these standardization evaluation results were the only available means of determining crew member performance.

A crew standboard evaluation takes place in a computerized trainer which is a replica of the actual crew work

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[1]David A. Wilkerson, Capt., USAF, Chairman, SAC Missile Management Working Group, HQ SAC, (DPXPS), Offutt AFB, Neb. (Telephone interview, Jan. 10, 1972.)

environment. Standardization crew members evaluate crew performance by observing crew behavior to see if crew actions conform to prescribed procedures in solving simulated problems. These problems are oriented around various system malfunctions, security violations, and launch activities. Each crew member receives a numerical score based on the number of errors he commits during an evaluation. These errors are classified as to their criticality and weighted accordingly--the more serious the error, the more points deducted.

Numerical scores range from a high of 5.0 to a low of 0.0.[1] If a crew member receives a score between 4.6 and 5.0, he is considered "Highly Qualified." A score between 3.0 and 4.5 constitutes a "Qualified" rating. When a crew member is judged "Unqualified," he automatically receives a numerical score of 0.0. While it is theoretically possible to become "Marginally Qualified" with a score between 3.0 and 2.0, this rarely occurs. Thus, there are generally only three designated categories of individual job performance--"HQ," "Q," and "UQ."

The sample of standardization records reviewed for this research included 224 individual crew member scores from every evaluation administered by wing personnel between January 1, 1972 and June 12, 1972, with the exception of scores

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[1]U.S. Department of the Air Force, Strategic Air Command, ICBM Combat Crew Standardization and Evaluation Manual, SACM 55-66, Vol. II, Offutt AFB, Neb., 16 June 1972, p. 3-3.

resulting from re-evaluations. A re-evaluation is conducted when a crew member has received an "Unqualified" score. The re-evaluation scores were excluded because the "Unqualified" scores were already incorporated in the sample.

These individual performance scores were then organized to simulate conditions as if some crews had operated under a policy of crew integrity and others had not. To achieve this result, crew member scores were divided into three groups. These groups were constructed by comparing standboard evaluation dates with "change of crew" documents and were verified by knowledgeable wing staff personnel. The first group--designated as integral crews--was composed of crews whose members had previously been evaluated together. The second group--simulating crews not under a policy of crew integrity--represented crews whose members were being evaluated together for the first time, but were neither new to the crew force nor their respective crew positions. The third group--identified as upgrade crews--included all crews where one or more of its members had recently completed upgrade training and were receiving their initial standboard evaluation either as a new crew member or as a new crew commander. These standboard scores were then analyzed to see if there were any significant differences in performance between the groups. Chapter IV contains the results of the statistical computations.

Missile Management Interview

In addition to the data accumulated through the questionnaire and the crew standardization records, information was also acquired by the use of a structured interview, administered by the authors to fourteen missile operations officers at the wing and higher headquarters level. This interview contained questions which attempted to define management's attitude toward the policy of maintaining crew integrity. A copy of the interview guide is presented in Appendix B.

The interview guide was designed to elicit definitive responses from those individuals being interviewed. This result was accomplished by having the interviewer state an opinion before asking each question. For example:

> Several management theorists have stated that job satisfaction is primarily derived from the various social aspects of the job. By social aspects, they mean "on the job" contacts made by the worker with other workers, especially those at the same or nearly the same level within the organization. Do you think that crew integrity allows adequate social contact on the job?

This procedure encouraged the respondent to address the interviewer's statement in his response. The respondent was also asked to substantiate his answer for each question. Moreover, the structured guide insured that each individual was exposed to the same question phraseology in an effort to provide some uniformity in the overall response stimulus. The particular aspects of crew integrity covered in the interview included: the purpose, the effect on performance, the adequacy of social interaction, the perceived attitudes of crew members, the

impact if eliminated, the relationship to crew standardization, and lastly, the influence on informal information flow. The findings are reported in Chapter IV.

Chapter IV

DATA ANALYSIS

Introduction

This chapter describes the quantitative and qualitative analyses that were applied to the data collected in this research. All of the statistical tests used in this paper are presented here. The chapter has three sections dealing separately with each type of data: questionnaire data, performance data, and interview data.

Questionnaire Data

In analyzing the data from the questionnaire, the authors' first task was to tabulate the responses and produce descriptive statistics on the combat crew member sample. A total of 390 questionnaires were returned. Of these, three crew members failed to properly complete the questionnaire and were excluded from the sample. Therefore, a total of 387 crew members constituted the sample upon which the tests and analyses were performed. The actual numbers and percentages of response for each question are given in Appendix A.

The respondents to the questionnaire were about evenly divided between the number of commanders and deputies;

volunteers and nonvolunteers; and those who had been in other career fields and those who had not. Seventy-one per cent were assigned to line crews; 18 per cent were members of instructor crews; and 11 per cent were members of standboard crews. Instructor and standboard crew members have the additional responsibility of crew personnel training and evaluation, respectively, and normally do not "pull alert" as often as line crew members. Thirty-four per cent of the sample had been combat ready less than a year; 30 per cent, over one year but under two years; 21 per cent, over two years but under three years; and 15 per cent had been combat crew members for over three years. Fifty-eight per cent planned to make a career in the Air Force while 23 per cent were definite about their intention to return to civilian life.

As for the question on overall job attitude, 51 per cent of the crew members indicated they liked their jobs. The largest number of negative responses among the job satisfiers concerned a crew member's sense of personal accomplishment in his job. Forty-four per cent responded with a "qualified" or "definite" no. The job satisfier with the least number of positive responses--40 per cent--was related to the work itself. Less than 46 per cent thought their job offered them a reasonable opportunity for individual recognition, while approximately half of the respondents felt they were given adequate individual responsibility. However, 67 per cent of the crew members considered the possibilities for

advancement at least as good in missile operations as in other Air Force career fields.

Among Herzberg's job dissatisfiers, salary represented the least amount of dissatisfaction. Eleven per cent were displeased with their salary. Fifty-five per cent were dissatisfied with the physical working environment of the capsule, while more than 50 per cent thought their jobs had an unfavorable effect on their personal lives. One-third of the crew members were not satisfied with their work schedule. Approximately one-fourth of the respondents did not think there was ample opportunity to form personal friendships. Yet, 65 per cent indicated they were satisfied with their immediate supervisor.

The questions regarding interpersonal relationships represented the least divergence of opinion. Eighty-seven per cent liked their partner. Over 80 per cent indicated that their partners were competent, that the crew worked well together on alert and during an evaluation, and that they enjoyed talking to their partners. Lastly, 48 per cent of the respondents thought their crew partners had influenced their job attitude.

The questions which dealt specifically with the policy of crew integrity produced the following statistics. Seventeen per cent of the sample wanted to see crew integrity eliminated and 19 per cent would prefer pulling alert with a variety of partners. Sixty per cent felt the elimination of

crew integrity would degrade overall crew performance. Eighty-seven per cent concluded they would be unable to perform as well on a standboard evaluation with other than their regular partner. Twenty-five per cent of the crew members thought crew integrity restricted the opportunity to develop personal friendships. Finally, 85 per cent felt crew integrity made their job "easier."

Descriptive statistics, at best, can only reveal how crew members responded to specific questions. Statistical inferences are required to provide an explanation for a particular response. Numerous quantitative tests have been developed which make these inferences possible. Yet whenever statistical tests are performed, certain assumptions have to be made.

In this research, parametric statistics were used to make statistical inferences. Generally, parametric statistical tests are considered stronger than nonparametric methods; however, they also demand more stringent assumptions. Even so, Fred N. Kerlinger has given this advice: "Use parametric statistics, as well as the analysis of variance, routinely, but keep a sharp eye on data for gross departures from normality, homogeneity of variance, and equality of intervals."[1]

Simple correlation analysis was the first parametric

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[1]Fred N. Kerlinger, Foundations of Behavior Research (New York: Holt, Rinehart, and Winston, Inc., 1964), p. 260.

technique applied to the data.[1] Basically, simple correlation was used to compare two factors to discover whether or not a relationship existed between them. Each question on the questionnaire represented a single factor. A coefficient of correlation was the statistic used in this study to describe the relationship. A simple correlation was performed on every pair of questions; however, the authors were primarily interested in those relationships where one of the questions measured a crew member's overall attitude. Table 2 lists the factors that best explained a crew member's attitude toward his job, his crew partner, and crew integrity.

As illustrated in Table 2, job attitude seemed to be strongly related to specific job satisfiers described in the Herzberg model. The first three factors were job satisfiers followed by the question on career intentions and then the question on personal life. The question on career intentions was not defined by Herzberg.

Table 2 also depicts the simple relationships that exist concerning a crew member's attitude toward his crew partner. It would appear this attitude is primarily related to the enjoyment he receives from talking with his partner, his partner's competence, and their compatibility on the job. More interesting, perhaps, were the relationships between the questions on crew integrity and the attitude toward one's

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[1] Morris Hamburg, Statistical Analysis for Decision Making (New York: Harcourt, Brace, and World, 1970), pp. 433-507.

TABLE 2

SIMPLE CORRELATION ANALYSIS

Question	Question Factor	Correlation* Coefficient	Question Category
1.	Overall Attitude Toward Job		
4.	Enjoyment from the Work Itself	.81	Satisfier
2.	Sense of Personal Accomplishment	.77	"
3.	Opportunity for Recognition	.59	"
28.	Career Intentions	.55	Biographical
11.	Effect on Personal Life	.53	Dissatisfier
5.	Adequacy of Responsibility	.49	Satisfier
9.	Attitude Toward Work Environment	.43	Dissatisfier
7.	Attitude Toward Work Schedule	.43	Dissatisfier
6.	Opportunity for Advancement	.38	Satisfier
8.	Opportunity for Social Interaction	.26	Dissatisfier
13.	Overall Attitude Toward Crew Partner		
18.	Enjoyment from Talking with Partner	.72	Interpersonal
15.	Competence of Partner	.65	"
17.	Compatibility on the Job	.59	"
16.	Compatibility during Evaluation	.52	"
20.	Partner Attitude Toward Respondent	.51	"
19.	Personality Assessment of Partner	.47	"
14.	Shared Job Attitude with Partner	.40	"
12.	Attitude Toward Supervision	.33	Satisfier
21.	Preference for Partner Variety	-.32	Crew Integrity
23.	Ease of Working with Same Partner	.27	"
26.	Attitude Toward Crew Integrity	-.24	Overall Attitude
26.	Overall Attitude Toward Crew Integrity		
21.	Preference for Partner Variety	.73	Crew Integrity
22.	Impact on Unit Effectiveness	.73	"
23.	Ease of Working With Same Partner	-.55	"
25.	Restriction of Social Interaction	.52	"
24.	Effect on Individual Performance	.42	"
28.	Career Intentions	-.25	Biographical
18.	Enjoyment from Talking with Partner	-.24	Interpersonal
13.	Attitude toward Crew Partner	-.24	Overall Attitude
15.	Competence of Partner	-.23	Interpersonal
17.	Compatibility on the Job	-.22	"

*All correlation coefficients are statistically significant (df = 385, alpha = .10).

crew partner. Two of these correlation coefficients had an inverse relationship.

The last hierarchy of factors in Table 2 pertained to crew member attitudes toward crew integrity. This particular attitude was related first, to the respondent's preference for a variety of partners and second, to his opinion concerning this policy's impact on unit effectiveness. The questions measuring interpersonal relationships all had negative coefficients, demonstrating again the inverse relationship between a crew member's attitude toward his partner and his attitude toward crew integrity. The question on career intentions also had a negative coefficient.

A form of regression analysis was also applied to the questionnaire data--multiple regression analysis.[1] Unlike simple regression where two factors are compared in a "vacuum," multiple regression accounts for the simultaneous effect of several factors. In performing a multiple regression analysis, the possibility of multicollinearity must be considered in interpreting the results. Multicollinearity occurs when two "independent" factors are highly intercorrelated.[2]

As with the simple correlation, the three questions that measured overall attitudes were designated as the

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[1]William A. Spurr and Charles P. Bonini, Statistical Analysis for Business Decisions (Homewood, Ill.: Irwin, 1967), pp. 589-630.

[2]Dennis J. Palumbo, Statistics in Political and Behavioral Science (New York: Appleton-Century-Crofts, 1969), p. 215.

dependent factors. The independent factors were those questions chosen by the authors to explain these attitudes. The selection of the independent factors was chiefly based on the results of the simple correlation. Other independent factors included questions which depicted specific categories of respondents.

Some of the questions, like question A, had only two possible responses. A crew member was either a commander or he was a deputy. From this question the authors were able to determine if commanders and deputies had a significantly different attitude about their job, their crew partner, or crew integrity. Still other questions were constructed with more than two answers. These questions had to be altered. For instance, in the regression on the attitude toward crew integrity, crew members were divided into two groups depending on how they responded to question 7--respondents that were not satisfied with their work schedule and respondents that were satisfied (or neutral). By placing crew members into two categories according to their responses on a specific question, the authors attempted to discover whether these groups had significantly different attitudes toward crew integrity. In summary, the independent factors used in the multiple regression analyses represented two types of questions, those measuring specific crew member attitudes and those identifying certain categories of respondents.

Stepwise multiple regression analyses were accomplished through the use of one of the Biomedical Computer Programs--specifically, the BMD02R Stepwise Regression.[1] The BMD02R program first computes the simple regression between the dependent factor and the independent factor that explains the greatest part of variation of the dependent factor. At the next step of the program, a second independent factor is included in the regression. The question selected is the one that makes the greatest additional contribution to explained variance. This process continues until all the questions which contributed to the explanation of the dependent factor are incorporated in the regression equation. The questions in Table 3 are listed in the order they entered the stepwise regression process.

All the factors chosen to describe a crew member's job attitude are shown in Table 3. The coefficient of multiple determination attained a value of .77. This coefficient represented the percentage of explained variance. The computed F-statistic for the overall regression equation was 68.25. The critical value of the t-statistic was 1.65 (df = 369, two tailed alpha = .10). Six of the twenty questions were significant and they included both job satisfiers and dissatisfiers. A crew member's attitude toward his job was primarily a function of the work itself, his sense of personal

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[1] Wilford J. Dixon, ed., Biomedical Computer Programs (Berkeley: University of California Press, 1970), pp. 233-247.

TABLE 3

STEPWISE MULTIPLE REGRESSION ANALYSIS

Question	Question Factor	Regression Coefficient	Computed t-Statistic	Question Category
1.	Overall Attitude Toward Job			
4.	Enjoyment from the Work Itself	.40198	9.67*	Satisfier
2.	Sense of Personal Accomplishment	.25151	5.91*	" "
11.	Effect on Personal Life	.10594	2.76*	Dissatisfier
28.	Career Intentions	.14266	4.62*	Biographical
7.	Attitude Toward Work Schedule	.09236	2.74*	Dissatisfier
D.	Respondent (Nonvolunteer)	.16374	2.23*	Biographical
G.	Respondent (Only Missile Duty)	-.10600	-1.27	" "
3.	Opportunity for Recognition	.04815	1.30	Satisfier
A.	Respondent (Deputy)	-.14696	-1.58	Biographical
8.	Opportunity for Social Interaction	.03006	0.96	Dissatisfier
12.	Attitude toward Supervision	-.04539	-1.45	" "
13.	Attitude toward Crew Partner	.04484	1.14	Interpersonal
E.	Respondent (Standboard)	-.13090	-1.10	Biographical
5.	Adequacy of Responsibility	.02525	0.80	Satisfier
E.	Respondent (Instructor)	-.08138	-0.83	Biographical
9.	Attitude toward Work Environment	.02453	0.77	Dissatisfier
26.	Attitude toward Crew Integrity	.02069	0.72	Crew Integrity
B.	Respondent (Over 3 Years Crew Duty)	.02049	0.19	Biographical
6.	Opportunity for Advancement	(Factor not included in regression)		
10.	Adequacy of Salary	(Factor not included in regression)		
13.	Overall Attitude Toward Crew Partner			
18.	Enjoyment from Talking with Partner	.41010	9.21*	Interpersonal
15.	Competence of Partner	.36901	7.56*	" "
17.	Compatibility on the Job	.18276	3.56*	" "
19.	Personality Assessment of Partner	.06730	2.30*	" "
14.	Shared Job Attitude with Partner	.04866	1.83*	" "
20.	Partner Attitude toward Respondent	.07222	1.47	" "
B.	Respondent (Over 1 Year Crew Duty)	.05381	0.83	Biographical
A.	Respondent (Deputy)	-.03705	-0.60	" "
26.	Attitude toward Crew Integrity	-.00783	-0.33	Crew Integrity
C.	Length of Time with Partner	-.00513	-0.24	Biographical
1.	Attitude toward Job	.00357	0.16	Overall Attitude
16.	Compatibility during Evaluation	-.00729	-0.16	Interpersonal
26.	Overall Attitude Toward Crew Integrity			
21.	Preference for Partner Variety	.35443	7.58*	Crew Integrity
22.	Impact on Unit Effectiveness	.31772	8.21*	" "
25.	Restriction of Social Interaction	.09907	2.73*	" "
23.	Ease of Working with Same Partner	-.11858	-2.33*	" "
24.	Effect on Individual Performance	.10545	2.22*	" "
28.	Career Intentions	-.06138	-1.89*	Dissatisfier
7.	Respondent (Negative toward Schedule)	-.12039	-1.42	" "
F.	Respondent (With Over 3 Partners)	.13874	1.37	Biographical
A.	Respondent (Deputy)	.14823	1.52	" "
13.	Respondent (Negative toward Partner)	.08218	0.52	Overall Attitude
C.	Respondent (Over 6 mos. with Partner)	-.05750	-0.65	Biographical
B.	Respondent (Over 1 Year Crew Duty)	.05251	0.49	" "
1.	Respondent (Negative toward Job)	.03043	0.31	Overall Attitude
E.	Respondent (Standboard)	-.02603	-0.19	Biographical
E.	Respondent (Instructor)	-.01506	-0.13	" "

*Indicates regression coefficient is statistically significant.

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accomplishment, his personal life, his work schedule, his career intentions, and his volunteer status. Volunteers liked their jobs better than nonvolunteers. Among deputies, standboard members, instructors, and those with only missile experience, a trend was indicated which suggested they liked their jobs better than their counterparts; however, the regression coefficients for these factors were not significant. The question regarding a crew member's overall attitude toward crew integrity was also insignificant. The questions on salary and advancement were entered in the analysis but were not included in the final regression equation.

Based on the analysis of job attitude, the first hypothesis cannot be rejected. Crew integrity apparently functions as a factor of job dissatisfaction. In other words, a crew member's attitude toward crew integrity does not significantly affect his job attitude. Yet, it is a source of job dissatisfaction--17 per cent of the crew member sample would like to see the policy eliminated.

The stepwise multiple regression performed on the question concerning a crew member's attitude toward his crew partner revealed the following statistics. The coefficient of determination was .69. The computer F-statistic was 62.73 for the regression equation and the critical value of the t-statistic was 1.65 (df = 375, two tailed alpha = .10). The pertinent factors are presented in Table 3. Five out of a total of twelve questions were significant. It would appear

this overall attitude was essentially a function of a crew member's enjoyment in talking to his partner, of his partner's competence and personality, of the degree to which they worked well together on alert, and finally, of the degree to which they shared similar job attitudes. No biographical factors were significant.

Questions considered relevant by the authors in determining the attitude toward crew integrity are also enumerated in Table 3. For this regression analysis a coefficient of multiple determination of .67 was achieved. The final regression equation had a computed F-statistic of 49.78. The critical t-statistic was 1.65 (df = 374, two tailed alpha = .10). All five of the questions that addressed the specific topic of crew integrity had a significant coefficient. A respondent's attitude toward crew integrity was primarily dependent upon his preference for a variety of partners, his opinion relative to the impact on unit effectiveness, and his belief concerning the social restrictions imposed by the policy. One other factor was significant which did not deal directly with an aspect of crew integrity. The question was on career intentions and it had a negative regression coefficient. Also, a trend was indicated which showed that crew members who were dissatisfied with the work schedule wanted crew integrity eliminated. Yet, the coefficient was not significant.

Performance Data

As stated in Chapter III, crew standboard records were reviewed. Individual crew member scores were placed into three groups--crews designated as integral crews, crews simulating nonintegral crews, and crews identified as upgrade crews. The entire sample included 224 crew members, 112 commanders, and 112 deputies. The actual standardization evaluation scores are presented in Appendix C.

To determine if there were any differences in performance among the groups, a Chi-Square test for proportions was used.[1] Each of the three groups were divided into three categories--"Highly Qualified" (HQ), "Qualified" (Q), and "Unqualified" (UQ). Table 4 gives the numerical tabulations by group for commanders and deputies.

TABLE 4

STANDBOARD EVALUATION SCORE GROUPS

Commanders			
Score Groups	"HQ"	"Q"	"UQ"
Integral Crews	26	8	7
Nonintegral Crews	11	7	8
Upgrade Crews	28	12	5
Deputies			
Score Groups	"HQ"	"Q"	"UQ"
Integral Crews	24	10	7
Nonintegral Crews	10	9	7
Upgrade Crews	29	12	4

[1] Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill, 1956), pp. 104-110.

First, a test was run simultaneously on all three groups. The critical value of Chi-Square was 7.79 (df = 4, alpha = .10). The computed value of Chi-Square was 5.60 for commanders and 6.03 for deputies. Next a comparison was made between the groups--two at a time. In these computations the critical Chi-Square value was 4.61 (df = 2, alpha = .10). The computed Chi-Square values are presented in Table 5.

TABLE 5

TWO-GROUP COMPARISONS

Commanders	
Crew Score Groups	Chi-Square
Integral vs. Nonintegral	3.02
Integral vs. Upgrade	1.02
Nonintegral vs. Upgrade	4.67*
Deputies	
Crew Score Groups	Chi-Square
Integral vs. Nonintegral	2.60
Integral vs. Upgrade	1.29
Nonintegral vs. Upgrade	5.83*

*Indicates significant differences between groups.

One further test was performed involving a comparison between those crews designated as integral crews and those simulating nonintegral crews. Each of these two groups was reduced to two nominal categories--"Qualified" and "Unqualified." Then a t-test for the difference between two means was calculated.[1] The critical value of the t-statistic was

[1]Hamburg, Statistical Analysis for Decision Making, pp. 330-334.

1.67 (df = 66, two-tailed alpha = .10). The computed t-statistic was 1.65 for commanders and 1.24 for deputies.

On the basis of these analyses the second hypothesis of this study cannot be rejected. It would appear crew integrity has no significant effect on job performance. However, there is an indication that upgrade crews do perform better than crews who have not undergone recent upgrade training.

Interview Data

In this section the authors have analyzed the opinions expressed in fourteen separate interviews, primarily with missile staff officers. In Appendix B, the authors identified each officer by his grade and missile experience followed by a paraphrase of each individual's answer to every interview question.

The majority of those interviewed concluded the purpose of crew integrity was to provide predictability among crew partners. By working together regularly, partners learned each other's behavior patterns, which developed coordination and built confidence in the other partner. Some staff officers also felt crew integrity facilitated crew personnel training. If crew integrity were eliminated, the consensus was that crew performance would be degraded, but not to the extent that crew members could not perform their jobs or pass a standboard evaluation. Several officers thought the elimination of crew integrity would allow more scheduling

flexibility.

Considering factors other than crew performance, about half of the officers felt crew integrity restricted social interaction, while all but three individuals considered crew integrity an impediment to informal information flow. There was no consensus of opinion on whether crew integrity promoted complacency or enhanced standardization. Finally, most of the staff interviewed thought the vast majority of crew members liked crew integrity as this policy fostered a sense of security. This observation seemed to have been demonstrated by the crew member questionnaire data.

In general, the authors concluded that management's attitude toward crew integrity was favorable. The authors attributed this attitude to the missile officers' mission orientation. Even though many of those interviewed recognized the social limitations of crew integrity, they felt its elimination would have an adverse effect on performance. Performance considerations seemed to override other considerations in arriving at an opinion on crew integrity. This conclusion was also supported by the questionnaire data.

Chapter V

SUMMARY AND CONCLUSIONS

Problem Review

Numerous Air Force personnel familiar with the missile operations career field have characterized missile combat crew duty as an undesirable assignment. To change this prevailing attitude, the Air Force has attempted to identify and eliminate irritants in this career field.[1] In this paper the authors confined their research to the policy of maintaining crew integrity because of its apparent influence on numerous sociological and administrative aspects in the Minuteman combat crew environment. The principle objective of this thesis was to discover if crew integrity contributed to job dissatisfaction among missile combat crew members. Additionally, the authors wanted to determine if crew integrity had a significant effect on job performance, since mission impact would be the primary consideration in any decision to alter the current policy.

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[1] Second Update,"Fifteenth Air Force Missile Improvement Symposium, 8-12 March 1971" (Unpublished report on the Symposium Recommendations, March AFB, Calif.: SAF/CS Oct. 1, 1971).

Findings

Though the Herzberg model proved to be useful in analyzing crew member attitudes, the theory did not provide a complete explanation of job attitudes among crew personnel. According to Herzberg, such factors as personal life and the work schedule would not affect job satisfaction. However, these two factors were related to job satisfaction in the missile crew environment. On the other hand, the policy of crew integrity did not directly affect job attitudes. Yet, this policy was a source of job dissatisfaction. One-fourth of the crew members felt crew integrity restricted social interaction; one out of every five would prefer to pull alert with a variety of partners; and one-sixth of the sample would like to see crew integrity eliminated.

The majority of the crew members did not want to see the policy eliminated. Apparently, this consensus of opinion can be attributed to two causes. First, most crew members--approximately ninety per cent--liked their partner. Second, a majority of missile officers thought individual and unit performance would be degraded if crew integrity were eliminated. (Over thirty per cent did not think overall crew effectiveness would be degraded.)

As the missile management interviews suggested, crew members develop a sense of security by working with the same partner. In the Minuteman combat crew environment where a crew member is frequently evaluated, security becomes an

important consideration for many officers. However, as the analyses demonstrated, those crew members who did not like their partner were more apt to want crew integrity eliminated.

Another conclusion based upon the analyses was that scheduling does have an effect on overall job attitudes. Further, one-third of the crew personnel were dissatisfied with their work schedule. While this research could not ascertain the relationship between crew integrity and scheduling, the policy of maintaining crew integrity does place a constraint on scheduling flexibility. Also, a relationship was discovered between a crew member's career intentions and his attitude toward crew integrity. Again, the causal relationship is unclear, but those planning to leave the Air Force are the ones most dissatisfied with crew integrity.

Despite the prevalent attitude that the elimination of crew integrity would degrade individual performance, the authors found no evidence to support this opinion. None of the statistical tests applied to the crew member standboard scores demonstrated that the policy of crew integrity has a significant effect on job performance. However, it did appear that crews perform better on a standardization evaluation after having recently completed an upgrade training program.

Recommendations

From the questionnaire data, the authors found that only half of the crew members sampled liked their job. Therefore, job satisfaction seems to be a problem in the

Minuteman combat crew environment. The authors consider the lack of job satisfaction to be a major problem among Minuteman crew personnel. Moreover, Air Force management should be concerned over this apparent deficiency and actively support programs to reduce, or eliminate, job irritants in the missile operations career field.

The policy of crew integrity appears to be a significant job irritant to a sizable number of crew members. Further, the elimination of crew integrity would seem to have no effect on crew performance. Therefore, the authors recommend: The Strategic Air Command's current policy of maintaining crew integrity among Minuteman crew personnel should be modified. Instead of maintaining this policy ". . . to the maximum extent possible," crew integrity should be maintained to the maximum extent desirable. More precisely, crew members who desire to work with a variety of crew partners should be allowed that opportunity and crew members who would prefer to work and be evaluated with the same crew partner should be permitted to do so.

Appendix A

THE QUESTIONNAIRE

The questionnaire is reproduced in this appendix. The format is the same as the original except more spacing has been provided to allow for the insertion of the response tabulations. There are two numbers given for every response choice. The top number represents the absolute number of responses and the bottom number, the percentage. There were 387 respondents to this questionnaire.

COMBAT CREW INTEGRITY QUESTIONNAIRE

Please read: In this questionnaire the term crew integrity refers to the policy of pairing missile officers--a commander and a deputy--so as to form a single crew. These same officers pull alert together and are evaluated together. This pairing is maintained to the maximum extent possible. (Reference: SACM 55-66, Vol. I)

SECTION I Questions About You

A) What is your present crew position? (circle one)

Commander	Deputy
189 (48.8)	198 (51.2)

B) How long have you been combat ready? (circle one)

0-6 months	13-24 months	37-42 months
78 (20.2)	115 (29.7)	30 (7.7)
7-12 months	**25-36 months**	**over 42 months**
57 (14.7)	80 (20.7)	27 (7.0)

C) How long have you and your current partner been crewed together? (circle one)

0-3 months	7-9 months	13-15 months
157 (40.6)	48 (12.4)	17 (4.4)
4-6 months	**10-12 months**	**over 15 months**
119 (30.7)	24 (6.2)	22 (5.7)

D) Did you volunteer for missile crew duty? (circle one)

Yes	No
196 (50.6)	191 (49.4)

E) What type of crew are you on? (circle one)

Line	Instructor	Standboard
276 (71.3)	68 (17.6)	43 (11.1)

F) How many crew partners have you been assigned with since you were combat ready? (circle one)

1	2	3	4	5	6	7	over 7
124 (32.1)	65 (16.8)	64 (16.5)	49 (12.7)	33 (8.5)	24 (6.2)	12 (3.1)	16 (4.1)

G) Were you in a different Air Force career field prior to your current missile assignment? (circle one)

Yes	No
198 (51.2)	189 (48.8)

SECTION II Questions About Missile Crew Duty

Directions: The following questions are designed to get your attitude on certain aspects of your job. Each question has five possible answers ranging from a definite YES to a definite NO. Please circle one of the five responses which best describes your attitude. Remember the only correct response is your frank opinion.

1) Do you like your job?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
49 (12.7)	150 (38.7)	44 (11.4)	68 (17.6)	76 (19.6)

2) Do you feel a sense of personal accomplishment when performing your job?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
47 (12.2)	129 (33.3)	42 (10.9)	86 (22.2)	83 (21.4)

3) Does your job offer you a reasonable opportunity for individual recognition?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
50 (12.9)	127 (32.8)	56 (14.5)	95 (24.5)	59 (15.3)

4) Do you enjoy doing the actual work involved in accomplishing your job?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
48 (12.4)	108 (27.9)	71 (18.3)	70 (18.1)	90 (23.3)

5) Do you feel that you are given adequate individual responsibility in your job?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
80 (20.7)	121 (31.3)	54 (13.9)	75 (19.4)	57 (14.7)

6) Do you think the opportunity for advancement in the missile operations career field is <u>at least</u> as good as other Air Force career fields?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
126 (32.5)	134 (34.8)	74 (19.1)	29 (7.4)	24 (6.2)

7) Are you satisfied with your work schedule?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
41 (10.6)	153 (39.5)	64 (16.5)	71 (18.4)	58 (15.0)

8) Does your job provide you ample opportunity to develop personal friendships with other officers in your unit?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
121 (31.3)	134 (34.6)	43 (11.1)	67 (17.3)	22 (5.7)

9) Do you consider the physical working environment of the capsule (LCC) to be satisfactory?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
15 (3.9)	113 (29.2)	46 (11.9)	104 (26.9)	109 (28.1)

10) Are you paid a reasonable salary?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
120 (31.0)	183 (47.3)	36 (9.3)	34 (8.8)	14 (3.6)

11) Does your job have a favorable effect on your personal life?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
18 (4.7)	78 (20.2)	87 (22.5)	115 (29.7)	89 (22.9)

12) Are you supervised by your immediate supervisor in a manner which is satisfactory to you?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
122 (31.5)	131 (33.[illegible])	52 (13.4)	52 (13.4)	30 (7.8)

13) Do you like your current crew partner?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
214 (55.3)	121 (31.3)	25 (6.4)	17 (4.4)	10 (2.6)

14) Do you think you and your current crew partner share the same attitude about missile duty?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
89 (23.0)	166 (42.9)	36 (9.3)	60 (15.5)	36 (9.3)

15) Do you think your current crew partner is competent at his job?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
252 (65.1)	101 (26.1)	22 (5.7)	7 (1.8)	5 (1.3)

16) Do you think you and your current crew partner work well together during an evaluation?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
212 (54.8)	115 (29.7)	45 (11.6)	12 (3.1)	3 (0.8)

17) Do you think you and your current crew partner work well together while on alert?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
254 (65.6)	97 (25.1)	25 (6.5)	7 (1.8)	4 (1.0)

18) Do you enjoy talking with your current crew partner while on alert?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
201 (51.9)	122 (31.5)	43 (11.1)	13 (3.4)	8 (2.1)

19) Do you think you and your current crew partner have similar personalities?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
31 (8.0)	121 (31.3)	84 (21.7)	99 (25.6)	52 (13.4)

20) Do you think your current crew partner likes you?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
121 (31.3)	196 (50.7)	64 (16.4)	5 (1.3)	1 (0.3)

21) Would you prefer to pull alerts with different crew partners as opposed to the current policy of maintaining crew integrity where you pull alert with the same partner all the time?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
24 (6.2)	49 (12.6)	39 (10.1)	99 (25.6)	176 (45.5)

22) Do you think the policy of maintaining crew integrity could be eliminated without degrading the overall effectiveness of the crew force?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
48 (12.4)	71 (18.3)	36 (9.3)	95 (24.6)	137 (35.4)

23) Do you think pulling alert with the same crew partner all the time makes the job <u>easier</u> than it would be if you had to pull alerts with different crew partners?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
193 (49.9)	134 (34.6)	29 (7.5)	21 (5.4)	10 (2.6)

24) Do you think you could perform <u>as well</u> (or better) on an evaluation if you were being tested with different partners each time instead of with the same partner each time?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
5 (1.3)	22 (5.7)	24 (6.2)	107 (27.6)	229 (59.2)

25) Do you think the policy of maintaining crew integrity restricts your opportunity to develop personal friendships with other officers in your unit?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
29 (7.5)	70 (18.1)	39 (10.1)	115 (29.7)	134 (34.6)

26) Would you like to see the policy of maintaining crew integrity discontinued as an operating procedure?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
27 (7.0)	39 (10.1)	45 (11.6)	86 (22.2)	190 (49.1)

27) Do you think your attitude toward your job has been influenced by your current and/or past crew partners?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
83 (21.4)	103 (26.6)	54 (14.0)	79 (20.4)	68 (17.6)

28) Do you plan to make a career in the Air Force?

A Definite Yes	A Qualified Yes	Neutral	A Qualified No	A Definite No
144 (37.2)	80 (20.7)	54 (14.0)	19 (4.9)	90 (23.2)

Appendix B

THE INTERVIEW GUIDE

This appendix has two parts. Part One gives biographical data and assigns a number to each respondent.

Part Two presents the interview guide used by the authors. The questions are identical to the original guide. The response sections have been enlarged in order to accommodate a synopsis of each respondent's answer. All answers are numbered to identify the respondents listed in Part One.

Part One

RESPONDENT IDENTIFICATION

Respondent No.	Biographical Data
1	Colonel; eight years experience in missile operations and administration; present assignment at Higher Headquarters level.
2	Colonel; four years combat crew experience and six years experience in missile operations and administration; present assignment at Wing level.
3	Colonel; five years experience in missile operations and administration; present assignment at Higher Headquarters level.
4	Lt. Colonel; no combat crew experience; Squadron Commander; present assignment at Wing level.
5	Major; five years combat crew experience; training and standardization background; present assignment at Higher Headquarters level.
6	Major; eight years experience in missile operations and administration; training and standardization background; present assignment at Higher Headquarters level.
7	Captain; four years combat crew experience; training and standardization background; Olympic Arena participant; present assignment at Higher Headquarters level.
8	Captain; five years combat crew experience; training and standardization background; Olympic Arena participant; present assignment at Higher Headquarters level.
9	Captain; four years combat crew experience; standardization background; present assignment at Wing level.
10	Captain; two and one-half years combat crew experience; standardization background; present assignment at Wing level.

Respondent No.	Biographical Data
11	Captain; three years combat crew experience; training background; Olympic Arena participant; present assignment at Wing level.
12	Captain; three years combat crew experience; training background; present assignment at Wing level.
13	Captain; three years combat crew experience; standardization background; Olympic Arena participant; present assignment at Wing level.
14	First Lieutenant; one and one-half years combat crew experience; standardization background; present assignment at Wing level.

Part Two

THE INTERVIEW GUIDE AND RESPONSES

COMBAT CREW INTEGRITY INTERVIEW GUIDE

Date_____

I. Introduction

A. Introduce yourself.

1. Name
2. Background
3. Current status

B. Briefly explain the purpose and nature of the research.

1. Inadequate information on effect of crew integrity on job satisfaction and job performance.

2. Coordination with SAC Missile Management Working Group.

C. Request permission to transcribe and use the information from the interview.

D. Specifically request to use the interviewee's name and assure him it will not be used if he so desires.

II. Biographical Data

A. Full name:_____

B. Grade:_____

C. Job title:_____

D. Crew experience:_____

III. Define Combat Crew Integrity

It says in the SAC Manual 55-66 Vol. I that combat crew integrity will be maintained to the maximum extent possible. In that manual the term combat crew integrity refers to the policy of pairing missile officers--a commander and a deputy--so as to form a single crew. These same officers pull alert together and are evaluated together. (Make sure the interviewee agrees with this definition of crew integrity.)

IV. Discussion Questions

A. What do you think is the purpose of maintaining combat crew integrity?

1. Concept allows predictability of partner's actions and facilitates the training program.

2. Crew integrity instills confidence between crew members and facilitates crew training.

3. Crew integrity insures predictable response of the team and promotes efficient crew effort. This allows management to "manage" its resource of people.

4. Optimizes efficiency and proficiency, and promotes pride and esprit among the crew force.

5. Crew integrity enhances predictability of actions. Facilitates crew training.

6. Concept fosters training, provides a confidence factor for the crew, and results in more efficient and effective crew performance.

7. Provides confidence in and knowledge of crew partner's actions.

8. Crew integrity provides "partner confidence" and promotes efficiency.

9. Provides a confidence factor and increases crew performance. Makes scheduling easier.

10. Crew integrity increases crew proficiency by fostering a higher degree of crew coordination.

11. It allows the integration of a crew partner's weak and strong skills within the crew.

12. Crew integrity increases overall unit standardization. Hold over from the aircraft days.

13. Nothing more than a carry-over from the aircrew era.

14. A better functioning team results when partners know each other and each other's techniques.

B. The Military Airlift Command does not maintain crew integrity among the majority of their aircrews and claims that this policy improves their operation. What effect do you think the elimination of crew integrity would have on missile crews?

1. People would enjoy the change and the overall performance would be improved.

2. Crew coordination and efficiency would be degraded.

3. It would simplify scheduling and provide flexibility for the crews.

4. Crew integrity provides a check and balance between skill levels. Professional compatibility is important.

5. Elimination would adversely affect performance.

6. Elimination would provide scheduling flexibility. Adversely impact efficiency more than effectiveness.

7. Crews could not, confidently, perform required quick reactions. From personal experience the longer a crew has been together the better they perform.

8. This would degrade the overall effectiveness of the crew force. Combat crews couldn't perform as well.

9. A scheduling problem would be created. Performance would be degraded due to lack of confidence in partner.

10. Would provide scheduling flexibility, but would adversely effect crew performance in a time constrained structure.

11. Performance would be degraded.

12. Would upgrade quality of individual skills. The short run would be terrible but long run would result in overall improvement in performance.

13. Elimination would have a very bad effect, that is, crew members would feel no obligation to each other, which would reduce coordination.

14. Improve morale by offering a greater variety of partners. Improve social aspects. Improve personal proficiency.

C. Several management theorists have stated that job satisfaction is primarily derived from the various social aspects of the job. By social aspects, they mean "on the job" contacts made by the worker with other workers, especially those at the same or nearly the same level within the organization. Do you think that crew integrity allows adequate social contact on the job?

Yes_____ No_____

Why/Why not?

1. As a combat crew member, one's exposure to other people is too small. There is not enough interplay and interaction between individuals.

2. No, but crew integrity is not at fault. The environment and nature of the job is to blame for lack of social contact.

3. Doesn't even begin to approach it. Too small a group to allow adequate contact. Presently the crew's only contact is with Air Police, Food Services personnel, etc., without direct control. Even the crew doesn't have too much in common and it's kind of lonely.

4. Crew integrity has no effect.

5. This aspect is not relevant to duty performance.

6. More social contact is needed to improve work environment.

7. Intermittent exposure has some benefits because it is the best that you have. Too much social contact can stifle as well as help.

8. Has no bearing. Even though direct contact is limited, much communication is performed over the telephone, at predeparture briefings, Commander's Calls, social functions, etc.

9. The concept definitely restricts because you don't get to meet as many people.

10. May be restrictive, but it is no big thing.

11. Crew integrity is not a factor as far as social contact is concerned.

12. The present atmosphere is more constructive because one is able to interact with the same partner in a freer manner.

13. Crew integrity does not restrict making friends.

14. Multicontact is not necessary, you can interact with only one individual.

D. If it is true that the average worker enjoys his job more when he has adequate social contact, do you think most crew members would prefer pulling alert with different officers as opposed to pulling alert with the same officer all the time as is currently the policy?

Yes_____ No_____

Why/Why not?

1. Crew members would enjoy it more.

2. Yes, for the social aspects, but no for performance aspects.

3. Job satisfaction is very difficult to obtain among combat crew members. They can't see what they created during their tour. Satisfaction has to be gained by

saying that you and your partner helped maintain the peace.

4. No. There are a lot of unknowns, that is personality factors, job competence factors, and many questions need to be asked.

5. Most crew members would prefer having the same partner because confidence in your partner is more important that social aspects.

6. Yes.

7. No. At most places there is some effort made to provide for compatibility of crew member selections to begin with. Most people are crewed together because they want to be.

8. No. Crew member would rather be confident that he knows what he is doing with his partner than be social with him.

9. He would rather be crewed with the same person all the time because of the feeling of security you have from being with the same person.

10. May be even, 50% yes, 50% no.

11. No. Applicable in larger groups, but not with just two people.

12. No. Uncertainty about partner and how to treat him leaves a bad, uneasy feeling with the commander.

13. No. Feeling of greater security results when you know your partner. There is greater freedom of action, that is, known versus the unknown.

14. The Officer Effectiveness Report must be written by one person.

E. It has been said that without crew integrity, crew coordination is more difficult to maintain. Do you think the elimination of crew integrity would degrade crew coordination to the extent a crew could not perform its job?

Yes_____ No_____

Why/Why not?

1. The overall general skill level of crews would be decreased but not to the extent that they could not do their job.

2. No. Most crews, given sufficient time, could perform the job. However, most of the decisions need not be made within a split second and I think the job could still be accomplished.

3. No, it would not degrade actual integrity or the performance aspect.

4. No, performance would be degraded but the crew would not be unable to perform their j- Have witnessed the effect of the l . of crew coordination in the trainer and they passed.

5. Yes. If you have a bad crew.

6. No, they will get the job done, but not as fast.

7. Yes, without question. Based on experience of observation those crews would either bust or minimally pass. Split second decisions can't be made because the assumption that your crew partner has done a job doesn't exist. Must know what small areas the other is weak in and strong in.

8. No. They could eventually get the job done, but not as quickly or as well.

9. Yes. Depending on the quality of the crew members involved, however the median, average crew member's ability is directly related to this factor.

10. No, but don't know to what extent. There would be degradation. New people require more coordination than old crew members.

11. No, this would degrade performance but they could still launch. Elimination would hamper trust between crew partners.

12. Yes, especially during transition period, more T.O. orientation is required.

13. No. Crew coordination is important to getting job done right but it is imperative in emergency situations.

14. No. Standardization would be improved. It would eliminate crew idiosyncracies.

F. It also has been said that familiarity among crew partners can produce complacency. That when crew members have been crewed together for an extended period of time, there is a tendency to deviate from prescribed procedures and these deviations increase the chances of human error. Do you think the elimination of crew integrity would improve unit crew standardization?

Yes_____ No_____

Why/Why not?

1. One cannot predict this without a trial. Good points for each side. However, there is a chance that overall each crew member's performance would be improved because they have been exposed to many different good methods.

2. No. Crews that work together perform better together. Always going out with a different partner would not provide an incentive for developing skills as a crew or as an individual.

3. Unobserved work habits cause complacency. Split scheduling provides better visibility and lets better ideas in.

4. No. There may be many tradeoffs, but crew integrity promotes overall standardization.

5. No. One would be more complacent with other crew members. He would be more particular with the same partner because he would know they would be checked together.

6. Unit standardization would not be as good. This is based on observations. Crews that have not been together do not do as well as crews that have. Something always falls through that goes unnoticed by the crew.

7. Potentially true, but not a valid reason for arguing for elimination of crew integrity.

8. The amount of deviation depends upon the commander. He either will allow or not allow it, regardless of whether he is on a split or integral crew.

9. No. This is a function of the commander. He'll run the crew the way he wants to.

10. No.

11. No. Crews do get lax but would do so with or without crew integrity.

12. No. In the long run complacency happens independent of crew integrity.

13. Yes. Standardization can be significantly improved. Elimination of crew integrity would allow no deviations from the "book."

14. Yes, this takes away the opportunity to develop crew idiosyncracies.

G. Several studies on human behavior have shown that workers tend to identify with their immediate working group rather than the larger organization. It is within these smaller groups that the worker receives information upon which he eventually forms attitudes about his job and his organization. Do you think crew integrity provides an environment for adequate information flow within the Wing organization?

Yes_____ No_____

Why/Why not?

1. No. The informal flow of information is too restricted. A man's attitudes are influenced by his partner and one poor crew member can ruin several partners. However, if these partners had the chance to see other crew's attitudes they would have had a better perspective.

2. No. Obviously the smaller the group, the smaller the span of communication.

3. No. Think that most crew members would prefer pulling alert with others. Can't ever remember having a complaint about having a split crew.

4. No, but not a factor of crew integrity.

5. No. Contact with more people would give you a better perspective. Knowledge should come more directly from the squadron rather than scuttlebutt.

6. Too small. The more exposure you have, the more information you have and the better conclusions you can draw.

7. Yes. In most cases people are more open in their job if they are exposed to one person with whom they have become friends.

8. Yes. Telephone talk, predeparture briefings, social gatherings, etc., provide this.

9. Informal lines of communication are not as good. This has a bearing on job attitude. One's partner definitely affects his attitudes toward his job.

10. Maybe not.

11. No. Yes for instructors and standboard crews, but not for line crews.

12. No. But crew integrity has nothing to do with it. An upgrade class sticks together.

13. Yes. But crew integrity has no effect on this aspect.

14. No. An active interest is the only way for line crews to know what is going on.

H. Do you have any additional comments?

1. No comment.

2. No comment.

3. Urgency of time and the resolution of problems is a factor in missile duty. Sometimes you have hours to work out a problem. With air crews you don't see some of the other members so you must be able to predict how the crew might react. SAC makes too big a thing out of crew integrity. If you send out a Commander with different people he really doesn't have any one to command. One guy to boss is better than no one to boss.

4. No comment.

5. No comment.

6. No comment.

7. No comment.

8. No comment.

9. Should have a test program to see what effects the elimination of crew integrity would have on morale, performance, scheduling, etc. Don't just talk about it but do it. Success I have had was due to my being crewed with good partners.

10. Crew integrity requirements are unrealistic. Question: What effect does crew integrity have on performance?

11. Job satisfaction could improve job performance.

12. In favor of crew integrity because the commander can train his deputy which gives the commander greater job satisfaction.

13. No comment.

14. Eliminate standboard integrity.

V. Conclusions

Express appreciation for interviewee's time and information.

Appendix C

STANDARDIZATION EVALUATION SCORES

Individual standardization evaluation scores are listed in this appendix along with the evaluation dates.

INTEGRAL CREWS*

Crew Number	Evaluation Date	Commander's Score	Deputy's Score
1	7 Jan 72	0.0	0.0
2	16 Jan 72	0.0	0.0
3	17 Jan 72	0.0	0.0
4	17 Jan 72	0.0	0.0
5	20 Jan 72	5.0	4.5
6	23 Jan 72	5.0	5.0
7	28 Jan 72	5.0	5.0
8	28 Jan 72	5.0	5.0
9	3 Feb 72	5.0	5.0
10	8 Feb 72	4.8	4.9
11	10 Feb 72	4.9	4.9
12	10 Feb 72	5.0	5.0
13	11 Feb 72	5.0	4.5
14	11 Feb 72	4.9	4.9
15	13 Feb 72	4.9	4.9
16	14 Feb 72	4.4	3.8
17	22 Feb 72	5.0	5.0
18	22 Feb 72	5.0	5.0
19	24 Feb 72	5.0	4.9
20	19 Mar 72	5.0	4.5
21	23 Mar 72	5.0	5.0
22	24 Mar 72	5.0	5.0
23	8 Apr 72	5.0	5.0
24	10 Apr 72	4.5	4.4
25	10 Apr 72	5.0	5.0
26	11 Apr 72	4.5	4.4
27	11 Apr 72	4.9	4.9
28	21 Apr 72	4.5	4.5
29	23 Apr 72	4.8	4.9
30	24 Apr 72	4.3	4.9
31	26 Apr 72	0.0	0.0
32	27 Apr 72	4.0	4.0
33	1 May 72	0.0	0.0
34	7 May 72	5.0	5.0
35	12 May 72	5.0	5.0
36	14 May 72	4.4	4.9
37	24 May 72	5.0	5.0
38	27 May 72	4.9	4.9
39	30 May 72	0.0	0.0
40	31 May 72	4.4	4.4
41	6 Jun 72	4.4	4.4

*Crews whose members had previously been evaluated together.

NONINTEGRAL CREWS*

Crew Number	Evaluation Date	Commander's Score	Deputy's Score
42	8 Jan 72	0.0	0.0
43	29 Jan 72	3.9	4.5
44	14 Feb 72	4.4	3.9
45	20 Feb 72	0.0	0.0
46	10 Mar 72	4.5	4.5
47	24 Mar 72	0.0	0.0
48	29 Mar 72	5.0	5.0
49	31 Mar 72	0.0	4.4
50	10 Apr 72	0.0	0.0
51	17 Apr 72	4.9	4.9
52	27 Apr 72	5.0	5.0
53	28 Apr 72	4.4	4.3
54	29 Apr 72	5.0	5.0
55	6 May 72	0.0	0.0
56	11 May 72	5.0	5.0
57	15 May 72	4.9	4.3
58	17 May 72	4.9	4.9
59	26 May 72	0.0	0.0
60	26 May 72	4.5	4.5
61	1 Jun 72	4.8	4.9
62	4 Jun 72	0.0	0.0
63	4 Jun 72	4.5	4.5
64	7 Jun 72	5.0	5.0
65	8 Jun 72	4.8	4.8
66	10 Jun 72	5.0	5.0
67	12 Jun 72	4.5	4.5

*Crews whose members were being evaluated together for the first time but were neither new to the crew force nor their respective crew positions.

UPGRADE CREWS*

Crew Number	Evaluation Date	Commander's Score	Deputy's Score
68	14 Jan 72	4.9	4.9
69	14 Jan 72	4.9	4.9
70	14 Jan 72	0.0	0.0
71	15 Jan 72	5.0	5.0
72	15 Jan 72	5.0	5.0
73	18 Jan 72	4.9	4.9
74	18 Jan 72	4.9	4.9
75	19 Jan 72	4.5	4.5
76	31 Jan 72	5.0	4.9
77	1 Feb 72	4.9	4.9
78	2 Feb 72	4.0	4.5
79	3 Feb 72	4.8	4.4
80	4 Feb 72	0.0	0.0
81	4 Feb 72	4.8	4.7
82	5 Feb 72	0.0	0.0
83	6 Feb 72	5.0	5.0
84	6 Feb 72	4.9	4.9
85	6 Feb 72	3.9	3.8
86	16 Feb 72	4.4	5.0
87	19 Feb 72	5.0	5.0
88	15 Mar 72	4.9	4.9
89	16 Mar 72	4.5	4.5
90	5 Apr 72	4.5	5.0
91	5 Apr 72	4.5	4.9
92	5 Apr 72	4.9	5.0
93	5 Apr 72	4.5	4.5
94	7 Apr 72	4.0	4.0
95	7 Apr 72	5.0	5.0
96	13 Apr 72	5.0	5.0
97	14 Apr 72	4.4	4.2
98	20 Apr 72	5.0	5.0
99	20 Apr 72	5.0	5.0
100	25 Apr 72	5.0	5.0
101	3 May 72	4.0	4.0
102	3 May 72	4.8	4.9
103	3 May 72	4.8	4.7
104	4 May 72	0.0	0.0
105	4 May 72	0.0	4.0
106	4 May 72	5.0	5.0
107	5 May 72	5.0	4.3
108	5 May 72	5.0	5.0
109	20 May 72	5.0	5.0
110	20 May 72	5.0	4.9
111	21 May 72	4.4	4.3
1.2	22 May 72	4.9	4.9

*Crews where one or more of its members had recently completed upgrade training and were receiving their initial standboard evaluation either as a new crew member or as a new crew commander.

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