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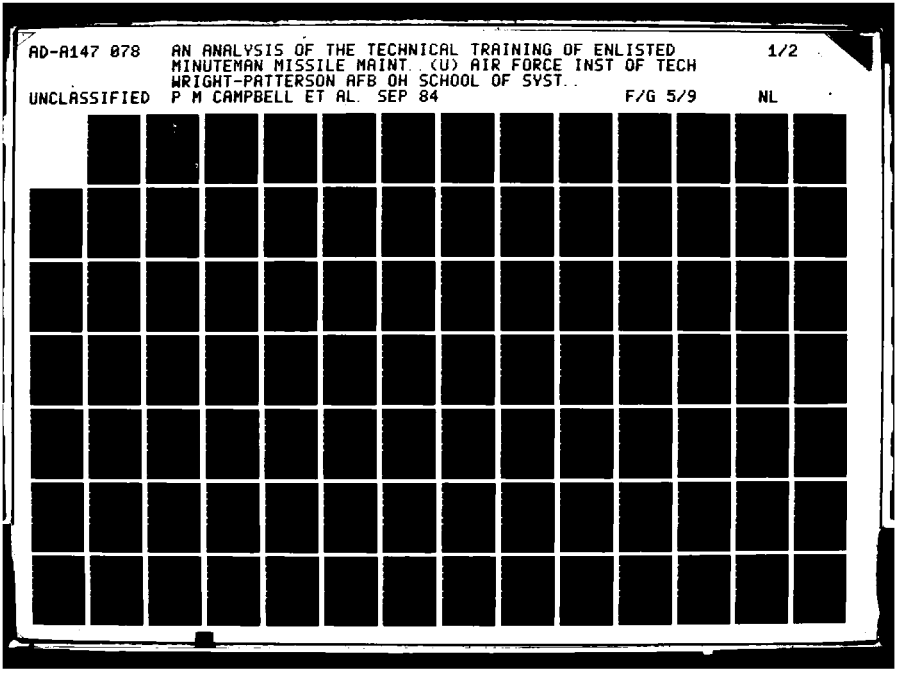

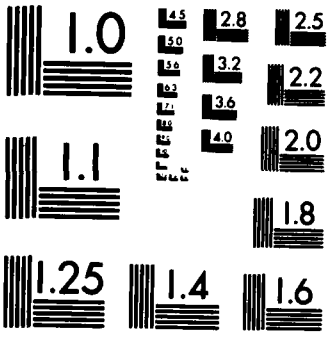

AN ANALYSIS OF THE TECHNICAL TRAINING OF ENLISTED MINUTEMAN MISSILE MAINTENANCE PERSONNEL

THESIS

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AFIT/GLM/LS/84S-8

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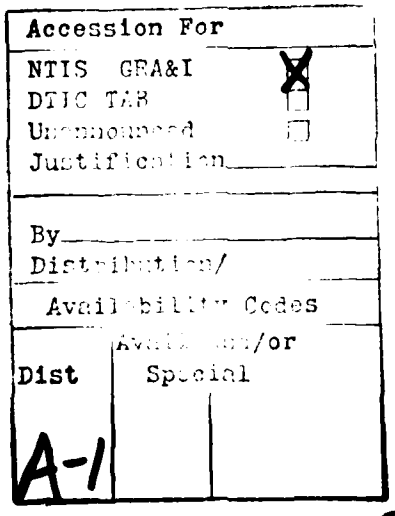

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THESIS

Presented to the Faculty of the School of Systems and Logistics

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

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Abstract

An exploratory study sponsored by the United States Air Force Human Resources Laboratory (AFHRL), Wright-Patterson AFB, Ohio, (Report Number AFHRL TR-83-60) identified possible deficiencies and problem areas in the technical training received by enlisted Minuteman missile maintenance personnel. The authors of this thesis selected several of the topics recommended for further research in the AFHRL study. Results of a review of literature pertaining to the selected topics and of the survey instruments used to gather data from Minuteman missile maintenance personnel are reported in this thesis. The research focused on the formal technical training performed at Chanute AFB, Illinois, and at the Team Training Branch located at each of the six Minuteman missile bases. The research was limited to enlisted Minuteman missile maintenance personnel in Air Force specialties 316x0G, Missile Systems Analyst Specialist; 443x0G, Missile Maintenance Specialist; and 445x0G, Missile Facilities Specialist. Enlisted personnel who were assigned to those Air Force specialties, and who possessed a three or a five skill level rating were surveyed regarding their opinion of the usefulness of their technical training. Data was also collected from the supervisors of the selected enlisted personnel, and from the Team Training Branch at each Minuteman missile wing. Conclusions concerning the selected topics of research were reported and several areas for further research were recommended.

AN ANALYSIS OF THE TECHNICAL TRAINING OF ENLISTED MINUTEMAN MISSILE MAINTENANCE PERSONNEL

I. Introduction

The Minuteman missile weapon system is the primary component of the land-based segment of the strategic triad, our nation's nuclear deterrent force. The Air Force's war readiness and the nation's nuclear deterrent posture depend on the technical capability of the Minuteman missile maintenance force to keep the Minuteman system operating (4:1). Maintenance of a weapon system as complex and important to our nation's security as the Minuteman weapon system requires a stable, weapon system-experienced work force (3:2). The task of training individuals to sustain that work force is shared by the Air Training Command and the Strategic Air Command (1). The Air Training Command (ATC) conducts the initial formal technical training of enlisted Minuteman missile maintenance personnel and the Strategic Air Command (SAC) continues the trianing process using both a modified version of on-the-job training (at the Team Training Branch) and the traditional on-the-job training (in shop) depending on the duty assignment of the personnel.

Background

This research focused on several aspects of the technical training

received by enlisted Minuteman missile maintenance personnel[1] at the 3330th Technical Training Wing, Chanute AFB, Illinois[2], and at the Team Training Branch located at each of the six Minuteman missile wings. A simplified overview of the Minuteman weapon system, how system malfunctions are identified, and the general procedure of how a missile maintenance team is scheduled to respond to system malfunctions is provided in the following paragraphs.

There are 1000 Minuteman missiles distributed among six bases. Two of the bases are responsible for 200 missiles each, the other four bases have responsibility for 150 missiles each. (Table I contains a list of the six Minuteman bases.)

TABLE I

Minuteman Missile Bases

Base	State	Number of Missiles
Ellsworth AFB	South Dakota	150
F.E. Warren AFB	Wyoming	200
Grand Forks AFB	North Dakota	150
Malmstrom AFB	Montana	200
Minot AFB	North Dakota	150
Whiteman AFB	Missouri	150

[1]The phrase "enlisted Minuteman missile maintenance personnel" will be used repeatedly in this thesis. As this phrase is unwieldy and may detract from the readability of this thesis, the phrase will be replaced by EMMMP.

[2]The 3330th Technical Training Wing, Chanute AFB, Illinois is hereafter referred to as Chanute.

The total complement of missiles at each base is referred to as a wing. Each wing is subdivided into squadrons of 50 missiles each; these squadrons, in turn, are subdivided into flights of ten missiles each. There are a number of facilities associated with the Minuteman missile system; several of these facilities are described in the following paragraphs.

The significant facilities cited in this overview are the Strategic Missile Support Base (SMSB), the Launch Facility (LF), and the Launch Control Center (LCC). The SMSB is the central control point for all functions required to operate and maintain the missiles, LFs and LCCs assigned to that SMSB. The administration, command elements, personnel, vehicles, and other supporting activities are maintained at the SMSB. The LFs and LCCs are geographically separated from one another and from the SMSB. The LFs are at least three nautical miles distant from one another and from the LCCs. The distance to an LF or an LCC from the SMSB ranges from only a few miles to over 150 miles. An LCC is assigned responsibility for monitoring the status and controlling entry to ten LFs (an LCC and its ten assigned LFs are designated a flight). The LFs and LCCs are described below.

Minuteman Launch Facilities. Minuteman LFs, also referred to as missile sites, are fenced enclosures covering approximately one acre in area. The Minuteman missiles are housed in hardened underground silos located within the enclosed area. The LFs, which are unmanned, are equipped with radar and motion detection devices which provide electronic security of the site. Also located at the LF is a variety of aerospace ground equipment, operational ground equipment, and real property installed equipment. Some of these equipment items keep the missile in an "on-alert"

condition; that is, maintain the missile ready for immediate launch. Other equipment items monitor the status of the missile and its supporting equipment, while additional equipment items enable communication of equipment status and commands between the LF and its parent LCC. All equipment items are located in either one of two launcher equipment rooms surrounding the silo, or in an underground launch support building, which is separate from the silo but located within the fenced enclosure.

Launch Control Centers. The LCC is manned by two Launch Control Officers. They monitor the status reports of their assigned missile sites. If a malfunction is detected by the monitoring equipment at a missile site, the Launch Control Officers receive an indication on their monitoring equipment. They then report the malfunction to the Job Control Branch located at the SMSB.

A number of organizations, maintenance teams, and maintenance shop personnel are involved in the performance of missile maintenance. The following paragraphs discuss the role of two of the organizations, the teams, and maintenance shops in the performance of missile maintenance.

Job Control Branch. The Job Control Branch controls and directs the daily maintenance effort and maintains the status of all LFs and LCCs assigned to its particular SMSB. When a malfunction report is received from an LCC concerning a discrepancy at the LCC or one of its LFs, Job Control Branch personnel log this information on their status boards and in the computer data base. If the malfunction is a high priority job or constitutes an emergency condition, Job Control personnel either divert a maintenance team from another job at a nearby facility, or schedule a previously unscheduled maintenance team for immediate response to the

malfunction. If the malfunction does not require immediate maintenance action, it becomes the responsibility of the Scheduling Control Branch.

Scheduling Control Branch. Scheduling Control Branch personnel review the outstanding malfunctions requiring maintenance, match the available resources such as maintenance teams, maintenance shop personnel, vehicles, tools, and supplies to known work requirements, and schedule the date and time these resources will be used to correct the malfunction. Before the maintenance scheduled is accomplished, a work package is made up for each job by Scheduling Control personnel. Using this package, the appropriate work center supervisor and Scheduling Control personnel finalize the planning process by ensuring only qualified maintenance personnel are assigned to the job and all the tools and supplies necessary for the job are available (9:2-4).

Teams. The team scheduled to repair a particular malfunction at an LF or LCC must report to the SMSB, gather the necessary equipment, load it into the assigned vehicle, and then travel to the appropriate LF or LCC to perform the required maintenance. There are primarily five types of missile maintenance teams which may be dispatched to LFs or LCCs to perform maintenance; four of these teams will be described in more detail later in this thesis.

Shops. A number of Minuteman missile system components, subcomponents, and equipment items cannot be repaired at the LF or LCC. The missile maintenance teams dispatched to correct malfunctions of these equipment items simply replace the unserviceable item with a serviceable item and return the unserviceable item to the base. Depending on the particular item that is unserviceable, it is scheduled for repair at the appropriate

missile maintenance shop located at the SMSB. The personnel who man the maintenance shops are assigned the same AFSs, and have completed the same technical training courses at Chanute, as personnel assigned to the maintenance teams.

Why Technical Training Is Important

Many of the maintenance teams which are dispatched to LFs or LCCs are composed of EMMMP on their first enlistment. When they dispatch as a team to an LF or LCC, they leave behind the senior enlisted personnel who have extensive technical knowledge of and experience with the weapon system. Once at the LF or LCC, the team members have only their own limited experience and the technical training they have received to rely upon to perform their assigned tasks. Consequently, the quality of the technical training these personnel receive at both Chanute and the Team Training Branch is of paramount importance.

As mentioned above, the EMMMP assigned to the maintenance shops also attend the Chanute formal technical training course for their AFS. However, these personnel do not receive additional training at their unit's Team Training Branch (TTB); instead, they receive additional training through traditional on-the-job training at their duty section. The technical training these EMMMP receive at Chanute establishes the foundation on which their on-the-job training is based. The quality of the technical training these EMMMP received at Chanute is of great importance as it affects the time and effort required of the maintenance shop on-the-job training instructor to accomplish the additional training of the EMMMP. Both the formal technical training and the on-the-job training these

personnel receive affect their ability to perform their jobs effectively and, therefore, are of significant importance. The importance of the technical training EMMMP receive provides the justification for this research effort.

Justification

"Training is essential to the effective operation of the Air Force, but it is expensive and accounts for a multibillion dollar slice of the yearly Air Force budget. A major concern for every manager is whether or not personnel are adequately trained to do the job" (1:3). The ability of EMMMP to effectively and efficiently perform their jobs depends on the quality of the technical training they receive. Any factors interfering with the quality of their technical training must be identified and corrected. The authors researched several of the problems identified in an earlier study which were potentially causing enlisted Minuteman missile maintenance technical training to be less effective than it could have been, in order to more accurately assess the significance and causes of these problems.

Problem Statement

A 1982-1983 Air Force Human Resources Laboratory (AFHRL) study, "Analysis To Improve The Maintenance Environment: A View From Active Duty Missile Maintenance Personnel," was performed to "obtain opinions from active duty missile maintainers about what could be done to improve Air Force missile maintenance and the performance of missile maintenance personnel . . ." (5:1).

The Minuteman missile maintenance personnel interviewed during the AFHRL study identified a number of potential problems impacting the technical training of EMMMP. The AFHRL study was exploratory in nature and "no attempt [was] made . . . to interpret or analyze the significance of the maintenance problems stated by the [missile maintenance personnel interviewed]" (5:1).

The intent of this thesis effort was to research selected problems identified by the personnel interviewed during the AFHRL study, determine the significance of those problems, and identify causes of those problems. The problems identified by the EMMMP interviewed during the AFHRL study which were selected for further research were: EMMMP claims that the formal technical training courses at Chanute included training they did not need, and omitted training they needed; EMMMP claims that they were sent to bases operating a version of the Minuteman system for which they had not received training at Chanute; and claims by EMMMP assigned to maintenance teams that they experienced a delay in beginning training at their unit's TTB. One problem identified by missile maintenance managers and supervisors interviewed during the AFHRL study was selected for further research. Many of the missile maintenance managers and supervisors "said that . . . the tech schools did not teach their young people the right subjects" (5:33).

A topic related to the missile maintenance manager's and supervisor's criticisms of the technical training their subordinates received at Chanute concerned the use of the AF Form 1284, Training Quality Report. If the missile maintenance managers and supervisors felt there were problems with the training their subordinates received at Chanute--either quality or course content deficiencies--this should have been reflected

in their use of the AF Form 1284. An aim of this research effort was to discover if the AF Form 1284 had been used as intended; and if it had not been, why it had not been.

Scope of the Research

This research was limited to two groups of Air Force personnel. One group was EMMMP possessing a three or five skill level in Air Force Specialties (AFS) designated by the following Air Force Specialty Codes (AFSC) and titles: 316x0G, Missile Systems Analyst Specialist; 443x0G, Missile Mechanical Specialist; and 445x0G, Missile Facilities Specialist (NOTE: the concepts of skill level, AFS, and AFSC will be explained later in this thesis). The second group was composed of the officer and enlisted managers and supervisors of the Minuteman missile maintenance organizations at each of the six Minuteman bases. A list of the duty positions of the individuals selected to represent this group is presented in Table II.

TABLE II

List of the Duty Positions of the Minuteman Missile Maintenance Supervisors and Managers Selected for Interview

Field Missile Maintenance Squadron Duty Positions of Personnel Selected for Interview
1. Maintenance Supervisor
2. Maintenance Superintendent
3. Chief Facilities Maintenance Branch
4. Noncommissioned Officer-in-Charge Facilities Maintenance Branch

TABLE II (continued)

Organizational Missile Maintenance Squadron Duty Positions of Personnel Selected for Interview
1. Maintenance Supervisor
2. Maintenance Superintendent
3. Officer-in-Charge Missile Electrical Branch
4. Noncommissioned Officer-in-Charge Missile Electrical Branch
5. Chief Missile Mechanical Branch
6. Noncommissioned Officer-in-Charge Missile Mechanical Branch

Literature Review

A literature search on the topic of technical training of EMMMP was conducted at the Air Force Institute of Technology libraries, various publication and master reference libraries at Wright-Patterson AFB, Ohio, at the Wright State University library in Fairborn, Ohio, and at the Dayton, Ohio, Public Library. In addition, a computer search of the data base of the Defense Technical Information Center (DTIC) was made. As a result of these efforts, the researchers found very little literature was available. As an example, the DTIC search produced only four studies which proved to be of very limited use in this research. Consequently, the literature sources upon which this research relied were limited to the AFHRL study report and the applicable Air Force, ATC, and SAC publications which explain and regulate the technical training of EMMMP. Another valuable source of information regarding the research topic was the personnel responsible for managing, conducting, and/or coordinating the technical

training of EMMMP. These people were located at Chanute, at each of the six Minuteman bases, and at SAC headquarters in the Directorate of Missile Maintenance, Policies and Procedures Division.

The AFHRL Study. Approximately 125 Minuteman missile maintenance personnel--managers, supervisors, and EMMMP in the duty positions and Air Force Specialties cogent to this research effort--were interviewed during the AFHRL study. The interviews were conducted at Grand Forks AFB, North Dakota (Minuteman III); Minot AFB, North Dakota (Minuteman III); and Whiteman AFB, Missouri (Minuteman II) during October and November, 1982 (5:148).

AFHRL Study Objectives. The objectives of the AFHRL study were "(a) to obtain opinions of well informed individuals about what could be done to improve the performance of Air Force maintenance personnel, (b) to provide recommendations for immediate actions to achieve some improvements, and (c) to develop a plan for research and development (R&D) to achieve other improvements" (5:1).

AFHRL Study Assumptions. There were three assumptions of the AFHRL study. "The first is that maintenance organizations have problems . . . . The second is that the people who do maintenance, supervise maintenance, manage, and plan maintenance are the ones who know best the problems in maintenance . . . . The third assumption . . . is that, in studying Air Force maintenance as a whole, problems will surface which can be solved in one of three ways: (a) through policy changes, (b) through the implementation of an existing technology, or (c) through the development and implementation of new technology" (5:2).

AFHRL Study Methodology. The AFHRL study was a qualitative study designed to obtain the "ideas and insights and the careful description of the Air Force maintenance environment from the perspective of those who work there" (5:2). The AFHRL interviewers conducted "private open ended interviews . . . with maintenance personnel, their supervisors, and their managers. Subjects were selected on the basis of their representativeness of the different specialty areas, weapon systems, locations, skill levels, and maintenance environments" (5:3). The Air Force Specialties, and duty positions of the people interviewed during the AFHRL study are presented in Table III.

TABLE III

Specialties and Duty Positions of Personnel Interviewed During The AFHRL Study (5:149)

Air Force Specialty	Duty Position	Number of Personnel Interviewed
A 3116	Missile Maintenance Squadron Commander	7
3116	Missile Maintenance Staff Officer	14
3121 and 3124	Missile Maintenance Officer	23
3196	Missile Maintenance Director	2
31699	Missile Maintenance Superintendent	6
316x0	Missile Systems Analyst Specialist	19
44399	Missile Maintenance Superintendent	4
443x0	Missile Mechanical Specialist	48
44599	Missile Maintenance Superintendent	3
445x0	Missile Facilities Specialist	23

AFHRL Findings. Fifty-eight people interviewed during the AFHRL study made comments concerning the formal technical training they received at Chanute. "People in the . . . [316x0G] career fields had the

most to say about tech schools and how they prepare them for the job. [Many] of the interviewees in the [316x0G] AFSCs said they could not use the things they learned in tech school. Some said the systems they studied were not even present on their base" (5:33). Comments from the personnel assigned to AFSs 443x0G and 445x0G echoed these statements. The TTB received mostly favorable comments from the personnel who commented about it; however, there was one major complaint. The delay experienced before beginning TTB training was cited as a major problem. "Waiting periods, according to some people, range from 30 days to 10 months" (5:41).

Missile Maintenance Defined. The phrase "missile maintenance" has been used repeatedly in this thesis and will continue to be used extensively. Before proceeding any further, the authors want to establish an operational definition of the phrase as it is used in this thesis. The phrase Minuteman missile maintenance is not limited in meaning to only those maintenance tasks performed on the Minuteman missile. As used in this thesis, Minuteman missile maintenance refers to any and all of the tasks performed by Minuteman missile maintenance personnel on the Minuteman missile, the missile subsystems, missile support equipment, etc. This includes those tasks required to maintain any of the equipment at the LF or LCC, or the maintenance performed at the SMSB on equipment intended for an LF or LCC.

Air Force Specialty and Air Force Specialty Code Defined. Also introduced earlier in this thesis were the concepts of an Air Force Specialty (AFS) and Air Force Specialty Code (AFSC). An AFS is ". . . a basic grouping of positions requiring similar skills and qualifications . . . . An AFS may be subdivided by alphabetical shreadouts to identify

specialization in a specific type of equipment or function" (14:3). NOTE: Detailed summaries of the duties and responsibilities of EMMMP assigned AFSs 316x0G, 443x0G, and 445x0G are provided as Appendices B, C, and D, respectively. An AFSC is a five digit number used to identify an AFS. The G "shreadout" of the AFSCs cited in this thesis indicates the personnel assigned those AFSs are specialized in the Minuteman missile system.

Skill Level Defined. Related to the concept of an AFS is the concept of skill level. A skill level is the degree of competence an individual has achieved with respect to the duties and responsibilities associated with an AFS. An individual's skill level in an AFS is indicated by the fourth digit of their AFSC. Table IV indicates the various skill levels and their associated career positions. Advancement through the skill levels is accomplished through formal technical training, on-the-job training (OJT), and completion of the AFS unique Career Development Course (CDC). CDCs are designed for specific skill levels within a career field. They consist of study materials relating to the technical aspects of an individual's functional work area. EMMMP are awarded a three skill level upon graduation from the formal technical training course at Chanute (13:1.1). They earn the five skill level through successful completion of the CDC for their AFS, completion of required OJT, and the recommendation of their supervisor.

TABLE IV

Air Force Skill Levels and Career Positions

Skill Level	Career Position
1	Trainee
3	Apprentice
5	Journeyman
7	Supervisor/Technician
9	Superintendent

Formal Training of EMMMP. Although the EMMMP assigned to the different Minuteman related AFSs were trained to perform different tasks, the general training process they underwent was similarly structured. Because the Minuteman missile maintenance career fields (AFSs) were categorized as training classification A, all personnel entering these career fields had to attend an ATC formal course of instruction at Chanute (2:2-3). A list of the courses corresponding to AFS is presented in Table V. In addition, Table V also lists the missile base(s) for which the versions of a particular course were designed (because of differences in system hardware/equipment, and weapon system variations among the six Minuteman bases, system specific versions of the C3ABR31630G and C3ABR44330G courses were developed).

TABLE V

Formal Technical Training Courses (6)

Formal Technical Training Course	AFS	Base(s) For Which the Course Was Designed
C3ABR31630G 001	316x0G	Ellsworth
C3ABR31630G 002	316x0G	F.E. Warren, Minot, Malmstrom, Whiteman
C3ABR31630G 004	316x0G	Grand Forks and Malmstrom (564th Squadron)
C3ABR44330G 003	443x0G	Ellsworth, Whiteman, Malmstrom
C3ABR44330G 004	443x0G	F.E. Warren, Grand Forks, Minot, Malmstrom (564th Squadron)
C3ABR44530G 000	445x0G	All Minuteman bases

Formal Training of Missile Systems Analyst Specialists. Personnel assigned to AFS 316x0G, Missile Systems Analyst Specialist, attended one of three versions of the C3ABR31630G course after completing a common Electronics Principles Course (6). These versions of the course contained much of the same core subject material. The distinction among them was based on the particular missile base an individual was being trained for.

Formal Training of Missile Mechanical Specialists. Personnel assigned to AFS 443x0G, Missile Mechanical Specialist, attended one of two different versions of the C3ABR44330G course (6). Again the distinction between the versions of the course derived from the different procedures required to perform corresponding tasks on different versions

of the weapon system. The two versions of the C3ABR44330G course contained much of the same core subject material.

Formal Training of Missile Facilities Specialists. Personnel assigned AFS 445x0G, Missiles Facilities Specialist, worked on equipment items not significantly different between the various versions of the Minuteman weapon system. Therefore, there was only one formal course of training these personnel attended, regardless of which base they were to be assigned following completion of training at Chanute (6).

AF Form 1284, Training Quality Report. The AF Form 1284, Training Quality Report (15:2), was developed to provide the organizations to which recent technical school graduates were assigned a means to provide feedback to the appropriate ATC Technical Training Center (in this case, Chanute). It was intended to be used to inform the Technical Training Center about: (1) the ability of recent course graduates to perform tasks at the proficiency level specified in course training standards; (2) the extent to which required skills were used by recent graduates; (3) the extent recent graduates retain the knowledge and skill proficiency acquired as a result of the formal training; (4) the need to revise formal and other courses to improve training; and (5) the need for further evaluation of the education and training problem areas identified by field evaluations. An example of a completed AF Form 1284 is provided as Appendix A.

Initial Duty Assignment. Sometime prior to completion of technical training at Chanute, EMMMP at Chanute were selected for assignment to one of the six Minuteman bases. After completion of formal training at Chanute

and arrival at the assigned Minuteman base, the recent Chanute graduates were assigned among a number of different duty sections, based on their AFS, the base's manning requirements, and managerial decisions.

Maintenance Teams. Among the duty section assignments to which EMMMP were assigned were the five missile maintenance team sections: (1) Electro-Mechanical Team Section (EMT)--AFS 316x0G, (2) Missile Handling Team (MHT) Section and (3) Missile Maintenance Team[3] (MMT) Section--AFS 443x0G, (4) Facilities Maintenance (FMT) Section and (5) Periodic Maintenance Team (PMT) Section--AFS 445x0G. EMMMP who were assigned to one of these team sections, with the exception of MHT, underwent additional training at their respective base's TTB. These five maintenance team sections are described in the following paragraphs.

Electro-Mechanical Teams. EMTs were composed of two or three airmen assigned AFS 316x0G. EMT members "monitored and operated consoles, fault display panels, and checkout equipment, performed malfunction analyses, and assembled, repaired, maintained, modified, inspected, and serviced missile, missile subsystems, missile electronic systems, and aerospace ground equipment to component level" (14:A16-7).

Missile Maintenance Teams. MMTs were composed of five or six airmen assigned AFS 443x0G. As the name implies, MMTs performed maintenance on the missile itself. Personnel assigned to MMTs assembled, repaired, maintained, modified, configured, inspected, and serviced missiles, missile subsystems, and related support equipment (14:A24-7).

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[3]The phrase "missile maintenance team" is used generically to refer to all types of missile maintenance teams, but it also refers to a specific type of team described in this thesis.

Missile Handling Teams. MHTs, similar to MMTs, were composed of five or six airmen assigned AFS 443x0G. MHTs performed removal and emplacement of missiles at LFs, and off-loaded and on-loaded missiles from/into aircraft and rail cars. Of the five types of missile maintenance teams described in this thesis, MHTs were the only maintenance teams that did not undergo additional training at their unit's TTB, instead MHTs accomplished the required additional training through traditional on-the-job training.

Facilities Maintenance Teams. FMTs were composed of two or three airmen assigned AFS 445x0G. FMTs performed tasks associated with the power distribution system at the missile site and worked on the site's environmental control system (13:4.12).

Periodic Maintenance Teams. The teams described above primarily performed corrective maintenance tasks. In contrast, PMTs primarily performed preventive maintenance. PMTs were composed of five or six airmen assigned AFS 445x0G (the same specialty as members of FMTs). Although PMTs worked on many of the same systems as FMTs, their tasks, as previously stated, were primarily preventive maintenance actions. In addition, the personnel making up a PMT were generally qualified in a greater number and variety of tasks than were members of an FMT (13:4.13).

As previously mentioned, the EMMMP assigned to EMTs, MMTs, FMTs, and PMTs attended a modified version of on-the-job training at their respective unit's TTB. The following paragraph presents an explanation of TTB.

Team Training Branch (TTB). In many Air Force specialties, recent technical school graduates received additional

on-the-job technical training (OJT) from their supervisors at the actual work location in order to qualify them to the five skill level. Because of the unique nature of the Minuteman weapon system, this method of OJT was impractical for certain of those personnel whose jobs required them to dispatch as members of a team to LFs and LCCs. To accomplish the necessary OJT of the personnel assigned to the EMT, FMT, PMT, and MMT sections, a TTB was established at each of the six Minuteman bases. The purpose of the TTB was to train "the Missile Maintenance Teams (MMTs), Electro-Mechanical Teams (EMTs), . . . Facility Maintenance Teams (FMTs), and Periodic Maintenance Teams (PMTs), assigned to the missile maintenance squadrons. This is accomplished through the use of instructor teams assigned to the Team Training Branch. The primary function of TTB is to train technicians so they can perform as effective and coordinated teams" (13:4.1).

Non-Maintenance Team Initial Duty Assignments. The vast majority of recent Chanute graduates assigned AFS 316x0G were assigned to the EMT section. However, depending on the base's manning requirements, these EMMMP could have been assigned to any of several wing (staff) level duty positions such as: Briefing/Debriefing, Technical Order Library, and Materiel Control, although assignment of a recent Chanute graduate to these positions was rare.

Recent Chanute graduates assigned AFS 443x0G were assigned among a number of duty assignments in addition to MMTs. In addition to the MHT and MMT sections, these EMMMP were assigned to the Vehicle and Equipment Control Branch, the Mechanical Shop, and the Pneudraulics Shop, which require personnel assigned AFS 443x0G. In addition, they could have been assigned to

any of the wing staff positions mentioned above, although it was rare for a recent Chanute graduate to be assigned to one of these duty positions.

Most of the recent Chanute graduates assigned AFS 445x0G were assigned to the FMT and PMT sections. In addition to these two sections, these EMMMP were also assigned to the Power, Refrigeration and Electric Shop. These personnel could also have been assigned to any of the wing staff positions mentioned above.

The EMMMP assigned to non-maintenance team duty sections and EMMMP assigned to the MHT section completed the additional training required for advancement in skill level through the traditional on-the-job training method.

Research Questions

The preceding paragraphs provided a simplified overview of the operation of a Minuteman base from the maintenance perspective. The technical training process EMMMP undergo was explained and the criticisms of that process by EMMMP cited in the AFHRL study was identified. The following research questions were developed to investigate those criticisms and provide the basis for drawing conclusions and recommendations concerning the technical training of EMMMP.

1. To what degree did enlisted Minuteman missile maintenance personnel perceive the curriculum of their formal technical training course to be relevant to the technical knowledge requirements of their job?

2. Did the formal technical training courses for enlisted Minuteman missile maintenance personnel omit subject matter these personnel needed to know to perform their jobs?

3. Did the formal technical training courses for enlisted Minuteman missile maintenance personnel contain unnecessary subject matter which these personnel did not need to know to do their jobs?

4. Were enlisted Minuteman missile maintenance personnel in AFSs 316x0G, 443x0G, and 445x0G assigned to a Minuteman base which was operating the version of the Minuteman weapon system for which they received formal training? If not, what caused this situation?

5. Did enlisted Minuteman missile maintenance perosnnel in AFSs 316x0G, 443x0G, and 445x0G and assigned to the EMT, FMT, PMT, and MMT sections experience a delay in beginning training at the Team Training Branch? What were the delays at each Minuteman base, by AFS? What were the factors responsible for their delay in entry to training at the Team Training Branch?

6. To what degree did the managers and supervisors of enlisted Minuteman missile maintenance personnel perceive the curriculum of the formal technical training course to be relevant to the technical knowledge requirements of their subordinates' jobs?

7. To what degree did the managers and supervisors of enlisted Minuteman missile maintenance personnel view the AF Form 1284, Training Quality Report, as a useful feedback tool? Did they use it?

II. Research Design and Methodology

Introduction

This chapter presents and explains the methodology employed in this research effort. This research effort investigated several of the potential problems with the technical training received by EMMMP as identified in the AFHRL study and was accomplished by going directly to the personnel most intimately involved with the factors under study. The goal was to obtain facts and personal perceptions of the technical training of EMMMP as accomplished at Chanute and at the six TTBs.

Data Collection Plan

Information was required from the two populations cited in the following paragraphs to answer the research questions. It was necessary to learn how the EMMMP perceived the utility of their technical training with respect to job knowledge requirements in order to answer the first research question. Continuing the AFHRL researcher's philosophy of going directly to the people intimately affected by the research variables, it was decided to ask the EMMMP specific questions to obtain the information required to answer research questions two, three, and five. The researchers also believed it important to obtain the perceptions and opinions of the officer and enlisted managers and supervisors of the EMMMP on many of the same topics. In addition, factual information on a number of topics cogent to this research was requested from the TTB management function.

Defining the Populations

Two populations were identified:

1. All EMMMP possessing a three or a five skill level in AFSs 316x0G, 443x0G, and 445x0G and assigned to one of the six Minuteman bases--Ellsworth, F.E. Warren, Grand Forks, Malmstrom, Minot, and Whiteman Air Force Base. Three subpopulations were identified based on the three different AFSs to which the personnel belonging to this population were assigned. Subpopulation one consisted of personnel assigned AFS 316x0G; subpopulation two--AFS 443x0G; and subpopulation three--AFS 445x0g. When discussing the entire population, it is hereafter referred to as population one; when discussing the subpopulations based on AFS, they are referred to by AFS or by subpopulation.

2. Officer and enlisted managers and supervisors assigned to the missile maintenance organizations at the six Minuteman bases. This population is hereafter referred to as population two.

The Sampling Techniques

A random stratified sampling technique (7:167) was selected to divide population one into three mutually exclusive subpopulations (strada) based on AFS (316x0G, 443x0G, or 445x0G). Purposive judgement (7:178) was the technique employed to establish which elements of population two were to be interviewed. Of all the officer and enlisted managers and supervisors assigned to the missile maintenance organizations at the six Minuteman bases only those who, in the researchers' opinion (based on experience), were in a position to best provide the desired information were selected for interview. Refer to Table II for a list of these personnel by duty position.

Developing the Sampling Plan

After identifying the populations, it was necessary to determine the sample size required to allow statistical inferences at a selected level of confidence. For population one, the enlisted maintenance personnel, an estimate of the size of the subpopulations based on AFS was obtained in a telephone conversation with an official at SAC Headquarters (12). Table VI contains the estimates of the size of the subpopulations.

TABLE VI

Population Size by AFS

AFS	Estimated Population Size
1. 316x0G	650
2. 443x0G	986
3. 445x0G	576

Using the approximate population parameters for each AFS subpopulation in the expression (8:12),

$$n = \frac{N(Z^2) \times p(1-p)}{(N-1)(d^2) + (Z^2) \times p(1-p)}$$

where Z = one-half of the standard deviation associated with the desired level of confidence (alpha),

N = the size of the population being sampled,

n = the sample size required,

p = maximum sample size factor (.50),

and d = desired tolerance (.05),

and solving for n based on a selected confidence level of 95 percent and a percentage error of plus or minus 5 percent, the formula yielded the sample sizes listed in Table VII.

TABLE VII

Population One Sample Sizes Required for a 95 Percent Confidence Level

AFS Subpopulation	Required Sample Size for each AFS Subpopulation
1. 316x0G	242
2. 443x0G	277
3. 445x0G	231

Because of the nonrandom method used to select the sample elements of population two, the officer and enlisted supervisors and managers of the EMMMP, calculation of a sample size would have been meaningless. The researchers' purposive selection of a sample of population two was based on the criteria that the managers and supervisors were closely involved with members of population one, and assigned to an organization level where they had a "managerial" perspective of the technical training process. This resulted in the selection of 10 duty positions for a total of 60 people (10 at each base) to be interviewed.

The Survey Questionnaires

A survey questionnaire was selected as the data gathering instrument. Two different survey questionnaires were developed, one for each

of the populations surveyed. Due to the number of personnel and the geographical separation of the researchers from the potential respondents, the questionnaires were administered and collected by mail. The elements of population one were selected at random from their AFS subpopulation. Those members selected were identified by name only for the purpose of mailing out the survey instrument. Because the members of population two were selected on the basis of their assignment to one of the selected supervisory or management positions, the survey instrument constructed for this group was mailed to the office symbols of the selected positions.

Questionnaires for Population One. A 27 question survey instrument was developed to obtain data from members of population one. Questions 1 through 20 and questions 22 through 27 were common to each questionnaire administered. Question 21, developed to measure the respondents' perceptions of the curriculum of the formal technical training course, was based on the respondents' AFSs and the course of training the respondents attended at Chanute. Six versions of the survey instrument were developed for population one (reflecting the three different courses for AFS 316x0G, the two different courses for AFS 443x0G, and the single course for AFS 445x0G), differing only with respect to the content of question 21. Questions 1 through 20 and 22 through 27 requested that the respondent select from one of the responses provided or to provide the appropriate response as necessary. Question 21 consisted of a number of subquestions corresponding to the areas of instruction identified on the specific course's course chart. A seven-point interval Likert scale was provided for the respondents to use in rating a particular area of instruction in relationship to its usefulness to their jobs. (This was similar to the methodology

used by Bair and Gatewood (3) in their analysis of the Aircraft Maintenance Officer technical training course.) All respondents were requested to complete questions 1 through 21. Only those respondents who were assigned to EMT, FMT, PMT, or MMT were requested to continue with questions 22 through 24; among the respondents who were assigned to EMT, FMT, PMT, or MMT only those who had completed the training at TTB were requested to respond to questions 25, 26, and 27.

Questionnaires for Population Two. A 14 question survey instrument was developed to obtain the managers'/supervisors' opinions on a variety of subjects to complement the information obtained from the members of population one. Question 14 of this survey instrument was patterned after question 21 of the survey instrument designed for population one. In this case, however, the respondents were asked to rate (using a seven-point interval Likert scale) the areas of instruction, not as how they perceived it to be relevant to their subordinates' jobs, but as to the change in emphasis they believed should be made in the instruction of that particular area. Based on the differences in the versions of the formal courses of training at Chanute, six versions of the survey questionnaire for members of population two (differing only with respect to the content of question 14) were developed.

Statistical Analysis of the Data

When the survey instruments were returned, the answers and comments provided were encoded and entered into the data base established. The statistical tests applied to the data are described in the following paragraphs. The Statistical Package for the Social Sciences (SPSS) (11)

was the computer program package used for all statistical analysis performed on the data.

Frequency Distributions. Frequency distributions of the responses, excluding opinion questions, for each of the questions asked of population one members were obtained using the FREQUENCIES program of the SPSS package. This program was used to compute one-way frequency distribution tables for discrete variables (the respondents' answers). This program was also used to calculate the median and mode of the responses to the survey questions.

Cross Tabulation. Two-way contingency analysis of selected pairs of variables was accomplished using the SPSS program CROSSTABS (11:218-247). The CROSSTABS program was used to test the following pairs of hypotheses:

1. H_o: The respondents' answers for a particular question were independent of their duty assignment within their AFS subpopulation.

   H_a: The respondents' answers for a particular question were dependent on their duty assignment within their AFS subpopulation.

2. H_o: The respondents' answers for a particular question were independent of the version of the technical training course for their AFS they had completed.

   H_a: The respondents' answers for a particular question were dependent on the version of the technical training course for their AFS they had completed.

3. H_o: The respondents' answers for a particular question were independent of the time that had elapsed since their graduation from Chanute to the administration of the survey.

   H_a: The respondents' answers for a particular question were dependent on the time that had elapsed since their graduation from Chanute to the administration of the survey.

The variables selected for use in the CROSSTABS contingency table analysis, as stated in the hypotheses above, were: 1--duty assignment (e.g., assignment to EMT, or to another duty section available to personnel assigned AFS 316x0G); 2--version of the AFS technical course completed (e.g., one of the three versions of the C3ABR31630G course); and 3--time elapsed since graduation from Chanute until administration of the survey. These variables were crosstabulated to the respondents' answers to questions 12, 14, and 21.

The chi square statistic was used as the test of significance to determine independence or relatedness between the variables, at the 95 percent level of significance. "By its chi square helps us only to decide whether our variables are independent or related. It does *NOT* tell us how strongly they are related (11:224)." Cramer's V, a modified *phi* statistic was used as a measure of the strength of the relationship indicated by the chi square statistic. Cramer's V can assume a value between zero to one, the higher the value the stronger the relationship. A value of .5 or greater was selected as identifying a significant relationship (11:225).

Other Tests. Other tests were applied to the data as necessary to determine the statistical significance of the data. For instance, one intent of the research was to find out if enlisted personnel were sent to the Minuteman wings possessing the variation of the weapon system for which they were trained. A 25 percent occurrence level of personnel sent to bases possessing versions of the weapon system for which they were not trained was arbitrarily established by the researchers as an indication of a significant problem.

Content Analysis. The open-ended opinion questions generated an unstructured, diverse range of answers which were analyzed through content analysis. This technique of classifying comments into categories, and when useful determining the frequency of answers within a category, was similar to the method used in the AFHRL study (5).

Assumptions

Assumptions and limitations were made for a variety of reasons. The assumptions made by the researchers covered many aspects of the research. EMMMP assigned to AFSs 316x0G, 443x0G, and 445x0G were selected for study because they comprised the only group of perosnnel who attended formal technical training at Chanute and, if assigned to one of the four sections specified earlier (EMT, FMT, MMT, PMT), also attended training at their wing's TTB. Additionally, this population was restricted to only those personnel possessing a three or a five skill level in their AFS. This restriction was made because personnel possessing a one skill level had not completed formal training and therefore would not be able to provide the information desired. Personnel possessing a seven or a nine skill level would most likely have attended technical training at both Chanute and TTB far enough back in time that significant changes to either or both courses of training were likely to have occurred. In addition, personnel in the higher skill levels were more likely to be in the supervisor or manager ranks and thus be potential members of population two. It was assumed, therefore, that the personnel randomly selected to participate in this search met the selection criteria established for population one.

Courses. As alluded to in the discussion about the exclusion of personnel possessing a seven or nine skill level from population one, changes to the Chanute or TTB curriculum may have occurred since the respondents attended either the Chanute or TTB course. Thus, another assumption of this research was that all the members of the population one subpopulations completed essentially the same formal course of instruction (within AFS groupings) and essentially the same TTB training (within AFS groupings) at their particular base of assignment.

Population Size. The researchers assumed the population figures provided for each AFS group comprising population one, provided by SAC Headquarters, were correct.

General Assumptions. The researchers assumed the respondents provided honest and independent answers to all questions. It was also assumed the respondents accurately marked or entered the answers. Finally, it was assumed the statistical results obtained from applying the SPSS programs to the data were correct, insofar as the data entered by the researchers was entered accurately.

III. Results

Introduction

This chapter presents the results of the analysis of the data collected through the various survey instruments used, and the factual data provided by several TTBs. Before presenting the statistical analysis of the data collected, a discussion of the administration and receipt of completed survey instruments is provided.

Administration and Receipt of Surveys - Population One. The random selection of specific members of population one to whom survey questionnaires were mailed was accomplished by means of an Atlas search--a computer search technique which can select individuals meeting specific criteria from the Air Force Military Personnel Center data base. In addition to providing names of potential respondents, the Atlas search was designed to provide the three letter code (PDS code) identifying the particular formal technical training course an individual had attended at Chanute. The Atlas search was also designed to provide a sufficient sample to permit using a desired level of confidence of 95 percent based on an expected response rate of 60 percent of the selected personnel. A 60 percent survey return rate, although in retrospect quite optimistic, was selected by the researchers based on informal conversations with Air Force Institute of Technology personnel experienced with student administered surveys. Table VIII presents the administrative results of the survey instruments mailed to the randomly selected members of the three AFS subpopulations comprising population one.

TABLE VIII

Administrative Results - Population One Surveys

AFSC	Course	Surveys Mailed	Returned Undeliverable	Returned Completed	Return Rate*
316x0G	001	80	0	29	
316x0G	002	240	3	101	
316x0G	004	89	5	33	
	TOTALS:	409	8	163	40.65*
443x0G	003	280	0	110	
443x0G	004	288	5	116	
	TOTALS:	568	5	226	40.14*
445x0G	000	380	5	171	45.33*

*The return rate was computed by dividing the number of returned completed surveys by the number of surveys mailed after adjusting the number of surveys mailed by subtracting the number returned undeliverable.

The return rate for completed surveys from the three AFS subpopulations of population one ranged from 40 to slightly more than 45 percent. It would only be speculation by the researchers to explain why the expected 60 percent return rate was not realized. However, contributing circumstances may have included a breakdown in the mail distribution system as was indicated by several respondents on their returned survey questionnaires. Regardless of the reasons for the less than expected survey response rate, failure to achieve a 60 percent or better return rate decreased the statistical confidence level from the desired 95 percent. The actual confidence level was computed by substituting the actual number

returned surveys as the sample size and solving for Z in the formula described previously in this thesis. The results of those computations are shown in Table IX.

TABLE IX

Actual Confidence Levels for Population One

AFS Subpopulation	Confidence Level Based on Actual Number of Respondents
316x0G	71 percent
443x0G	91 percent
445x0G	87 percent

Analysis of Survey Responses

The following pages present the results of the analysis of the respondents' answers to the survey questions and of data received from four of the TTBs. The results for population one are presented first. These results are presented by AFS subpopulation; subpopulation one--AFS 316x0G, subpopulation two--AFS 443x0G, and subpopulation three--AFS 445x0G. Within an AFS subpopulation, the results of the SPSS FREQUENCIES program analysis and the content analysis is presented. These results are followed by the results of the SPSS CROSSTABS program contingency table analysis of the three selected variables (1--duty assignment; 2--version of AFS course completed at Chanute; and 3--the time elapsed since graduation from Chanute to administration of the survey) and the responses to questions 12, 14, and 21. An explanation, when determined necessary, of the intent of each survey question is provided in the discussion

of the subpopulation one (AFS 316xOG) results; the discussion of population one, subpopulations two and three results are limited to the data analysis.

The results of analysis of population two responses are presented following the population one results. The administration and receipt of surveys for this population are addressed first. Next, a discussion of the results of the SPSS FREQUENCIES and content analysis is presented.

The data received from the responsive TTBs is presented next. Following that discussion are the results of the comparison of the base assignments of the respondents to the version of the course they had completed at Chanute.

Population One Results - Subpopulation One, AFS 316xOG

Introduction. The first three questions of the survey were intended to provide the researchers a means to insure the respondents did indeed meet the selection criteria established for selecting members of population one. This was found to be the case. The results of the SPSS FREQUENCIES program analysis and content analysis are presented first followed by the results of the SPSS CROSSTABS program analysis.

Frequencies and Content Analysis. In this section, the survey question is presented, followed by a discussion of the question (if the question was not self-explanatory) and then the results.

Question 4: How long has it been since you graduated from Chanute?

Discussion: This question was intended to determine the time elapsed since the respondents had graduated from Chanute. The purpose in obtaining this information was to test our assumption that the

personnel (within an AFS subpopulation) selected to participate in this survey had attended essentially the same course of training at Chanute. This will be discussed in greater detail in the discussion of the SPSS CROSSTABS results.

Results: All 161 respondents to the AFS 316x0G survey answered this question. The median time elapsed since graduation from Chanute to the time the survey was administered was approximately two and three-fourths years. The range of time since respondents graduated from Chanute ranged from just over three months to over 10 years.

Question 5: Where were you first assigned after arriving at your present base?

Results: All of the 161 respondents answered this question. One hundred thirty-eight of the respondents were first assigned to EMT when they arrived at their present base, two were assigned to MMT when they first arrived at their present base, and 21 were assigned to a duty section other than EMT or MMT. Of the 21 respondents assigned to duty sections other than EMT or MMT, seven were assigned to the Combat Targeting Teams section when they first arrived at their present base (which was merged into EMT) and 14 were initially assigned to the Site Security Maintenance Teams Section (which also was merged into EMT) after arriving at their present base. The 21 respondents initially assigned to duty sections other than EMT or MMT when they arrived at their present duty station were asked to respond to question 6.

Question 6: How long were you assigned to that area before you were assigned to EMT?

Results: Nineteen of the 21 respondents asked to answer this question replied to this question. One respondent answered he was

assigned to a duty section other than EMT or MMT between 91 to 120 days before being assigned to EMT. Eight of the respondents indicated they had been assigned to duty sections other than EMT or MMT for over 120 days before being assigned to EMT. Of these, the median elapsed time from assignment to a duty section other than EMT to assignment to the EMT work center was 375 days. Ten respondents indicated they were not assigned to the EMT work center.

Question 7: Where did you fill out the paperwork to get your security clearance?

Results: All of the 161 respondents answered this question. One hundred thirty of the respondents completed the paperwork for initiating their security clearances at Lackland AFB, Texas. Nineteen of the respondents had completed their security clearance paperwork at Chanute, and 12 had completed their security clearance paperwork at other Air Force bases or the recruiter's office. The 19 respondents who completed the paperwork at Chanute were asked to answer question 8.

Question 8: If you filled out your paperwork for a security clearance at Chanute, when did you fill it out?

Results: Fifteen of the 19 respondents who were asked to reply to the question responded. Three of the respondents filled out their security clearance paperwork within 30 days after arriving at Chanute. Three of the respondents filled out their security clearance paperwork within 31 to 60 days after arriving at Chanute. Eight of the respondents filled out their security clearance paperwork within 61 to 90 days after arriving at Chanute. One respondent filled out his security clearance paperwork over 90 days after arriving at Chanute. He filled

out his security clearance paperwork 113 days after arriving at Chanute.

Question 9: When did you get your security clearance?

Results: One hundred fifty-nine of 161 respondents replied to this question. One hundred and three of the respondents received their security clearance after arriving at their present base. They were asked to respond to question 10. Fifty-four of the respondents received their security clearance while still assigned to Chanute AFB. Two respondents still had not received their security clearance at the time of the survey, they were asked to answer question 11.

Question 10: If you answered a to question 9 (i.e., you received your security clearance after arriving at your present base), at what time after arriving at your present base did you receive your security clearance?

Discussion: This question was designed to determine how long after arriving on base respondents had to wait for their security clearance. The intent was to use this information in determining if lack of a security clearance was a major factor in delaying respondents in beginning training at TTB.

Results: Of the 103 respondents who answered a to question 9 and therefore were asked to reply to this question, all but one did. Of the 102 respondents who did answer, 29 received their security clearance within 30 days after arrival at their present base; 38 received their security clearance with 31 to 60 days; 21 received their security clearance within 61 to 90 days; eight between 91 to 120 days; and six received their security clearance after more than 120 days. Of the six who answered they had waited over 120 days to receive their security clearance, five indicated the number of days they had waited. The median time these

five respondents waited before receiving their security clearance was 210 days.

Question 11: If you answered b to question 9 (i.e., I do not have my security clearance), how long have you been waiting for your security clearance?

Results: Both of the respondents asked to reply to this question did. One respondent had been waiting 70 days and the other respondent had been waiting 278 days.

Question 12: Did you receive training at Chanute for systems which are not in use at your base?

Discussion: This question was used to determine if the respondents felt the training at Chanute contained material they did not need to know to do their job. The results were used in answering research question 3.

Results: One hundred fifty-seven of the 161 respondents answered this question. Of the 157 who responded, 43 of the respondents indicated they had received training on systems not in use at their base. These respondents were asked to give at least one example of such a system in response to question 13. One hundred and three of the respondents replied they had not received training for systems not in use at their base, and 11 of the respondents indicated they did not know.

Question 13: If you answered yes to question 12, give at least one example of a system you were trained on at Chanute that is not in use at your base.

Content Analysis was used to categorize the open-ended responses to this question.

Results: Forty-three respondents were asked to answer this question (those who had answered no to the previous question).

Twenty-eight of the 43 respondents who had answered no to question 12 provided an example of a system for which they had received trianing at Chanute but which was not in use at their base. The response given most often by the respondents was that they had received training for systems which were used at missile bases other than at their base; other examples provided by the respondents were primarily systems which have undergone modification and/or replacement during the last six years, e.g., the Boeing security system was replaced at some wings by the Sylvania security system, the punched mylar tape transport was replaced at all wings by the magnetic tape unit, and the Automatic Switching Unit was replaced by the Minuteman Power Processor.

Question 14: Are there any systems that you will be/are working on at your base for which you did not receive training on at Chanute?

Discussion: This question was designed to find out if respondents were not taught the information they needed to know to perform their jobs. The results were used in answering research question 2.

Results: One hundred fifty-seven of the 161 respondents who returned completed surveys answered this question. Of these 157 respondents, 71 indicated they had not received training for systems they had or expected to work on. These respondents were asked to provide at least one example of a system they had or expected to work on in response to question 15. Seventy-seven respondents replied that they had not nor did they expect to work on any systems for which they had not received training at Chanute. Nine respondents replied that they did not know if they had not received training at Chanute on systems they had or intended to work on.

Question 15: If you answered yes to question 14, please give at least one example of a system that you will be/are working on at your base for which you did not receive training at Chanute.

Results: Seventy of the 71 who answered yes to question 14 replied to this question. The examples they gave are listed below, the number in parentheses indicates the number of respondents providing that example:

1. Minuteman II weapons system (29)
2. Large equipment (20)
    a. Batteries (2)
    b. Electronic rack (4)
    c. LF motor generator (7)
    d. LCF motor generator (7)
3. Ground maintenance status recorder (14)
4. Sump pumps (12)
5. Minuteman power processor (5)
6. Boeing security system (5)
7. Magnetic tape unit (4)

Question 16: When you were attending Chanute, were you aware that you would have to undergo additional training at your base of assignment--either in shop or at TTB--before you would be qualified to do your job?

Question 17: (Answered if the reply to question 16 was yes) How did you find out that you would have to undergo additional training--in shop or at TTB--before being qualified to do your job?

Results: One hundred fifty-nine of the 161 respondents answered question 16. Of these, 144 respondents indicated they were aware

of the requirement for additional training at their base of assignment. Of these 144 respondents, 129 indicated they learned of this requirement for additional training from Chanute instructors; seven learned of the requirement from other students, and five indicated they learned of the requirement from other sources, i.e., shop supervisors, sponsors, and recruiters. Fifteen respondents indicated they did not know they had to undergo additional training at their base of assignment.

Question 18: What did you expect from Chanute technical training?

Results: One hundred fifty-eight of the total survey of 161 respondents answered this question. Of these, 38 replied that they expected to be fully qualified to do their job (this was unexpected because only 15 respondents indicated they were unaware of the need for additional training at their base of assignment). One hundred and nine respondents replied they expected to be prepared for additional training at TTB, and 11 indicated other expectations such as being familiarized with all possible missile systems, and being initially trained by Chanute with TTB training as a refresher course.

Question 19: Did the technical training you received at Chanute meet your expectations?

Results: One hundred fifty-six of the 161 respondents replied to this question. Of these, 120 respondents indicated their expectations were met by Chanute technical training. Twenty respondents indicated their expectations were not met by Chanute technical training and 16 replied that their expectations were partially met by Chanute. The 36 respondents who answered that their expectations were not met or were only partially met were asked to reply to question 20.

Question 20: If you answered no or somewhat to question 19, explain what you expected from your Chanute technical training, and why the training you received did not meet your expectations.

Results: Thirty-five of the 36 respondents who answered no or somewhat to question 19 answered this question. Of these, 14 respondents thought the training would have more realistically represented the actual work environment at their base of assignment and seven respondents thought the training would involve more hands-on training. Other replies to this question included comments such as: it was too basic; it should have been more indepth; and conversely, it was in too much depth; and that some instructors had not been to an operational base nor had they been experienced, qualified technicians, and therefore did not really know what they were teaching.

Question 21: To what extent are the following subject areas you learned at Chanute relevant to your duties and responsibilities in your present job? You may feel it is relevant to other work, but to what extent do you use it in your job? Next to each subject area, circle the number that most closely corresponds to your answer based on the following 7-point scale.

7	6	5	4	3	2	1	0
Very Useful			Neither Useful nor Useless			Very Useless	Don't Know

Discussion: This question provided the respondents the opportunity to rate the relevance of the major areas of instruction of the technical training course they had attended at Chanute to the needs of their duty assignment. The question was constructed utilizing the course charts provided by officials at Chanute. The course charts described the

training course by block of instruction. The course charts of the versions of the course offered for a particular AFS contained essentially the same material, the difference between the versions of a course occurred in the system specific blocks of instruction (e.g., in the C3ABR31630G course, versions 001, 002, and 004 differed with respect to the subject areas of blocks IV, V, and VI). The analysis of the responses to this question were used to answer research question one.

In the case of the AFS 316x0G survey, question 21 was divided into six blocks, representing the blocks of instruction of the C3ABR31630G course. Each block was further divided into subject areas, based on the course chart. The first three blocks contained the same subject areas regardless of the version of the C3ABR31630G course attended, the next three blocks differed with respect to the version of the C3ABR31630G course attended--i.e., the 001, 002, or 004 version (the reader is referred back to Table V and pages 13 and 14 for a discussion of the need for different versions of the course). This resulted in question 21 containing 21 subquestions (subject areas) for the 001 version of course C3ABR31630G, 26 subquestions for the 002 version of the course, and 16 subquestions for the 004 version of the course.

Results: The results are presented in Table X, the number of respondents rating a particular subject area, the median rating, and the mode--with the number of responses of the modal value indicated in parenthesis--are provided for each subject area rated. A discussion of the results is provided following the table. A median rating greater than 4.5 was interpreted as "useful", a median rating ranging from 3.5 to 4.5 inclusively was interpreted as "neither useful nor useless", and a median rating less than 3.5 was interpreted as "useless".

TABLE X

Population One, Subpopulation One - Frequency Analysis of Ratings of Course Subject Areas

Block/Title Subject Area	Number of Responses	Ratings		
		Median	Mode	(Number of Ratings in Modal Class)
I/Familiarization				
A. Orientation	154	5.188	7	(36)
B. Weapon System Familiarization	157	5.949	7	(56)
C. Tools and Aerospace Hardware	155	4.985	5	(34)
D. Publications	157	5.606	7	(49)
E. Security	153	5.320	5	(43)
F. Maintenance Management	152	4.353	5	(38)
G. Safety	156	6.053	7	(61)
II/Security and Personnel Access Systems				
A. Personnel Access System	155	6.086	7	(63)
B. Security System	152	5.941	7	(57)
III/Power				
A. LCF Power System	153	4.818	5	(33)
B. LF Power System	154	4.875	5	(32)
IV(Version 001)/LCF Command and Control				
A. Command and Control System Operation	27	4.25	4	(10)
B. Command and Control System Maintenance	27	4.6	4	(9)
C. LCF Intrasite Cabling	27	3.778	4	(9)
V(Version 001)/LF Command and Control				
A. OGE/AVE Shutdowns and Startups	28	6.214	7	(12)
B. Command and Control System Operation	27	5.375	7	(8)
C. Command and Control System Maintenance	27	5.583	7	(8)
D. LF Intrasite Cabling	27	4.00	4	(9)

TABLE X (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Mode	(Number of Ratings in Modal Class)
VI(Version 001)/Missile Guidance and Control System				
A. Missile Guidance System (MGS)	28	5.000	4	(7)
B. MGS Cooling System	28	5.5	6	(8)
IV(Version 002)/LCF				
A. Command Control System	93	5.435	7	(25)
B. Operation and Maintenance	93	5.48	5	(25)
C. LCF Fault Analysis	93	5.438	5	(24)
V(Version 002)/LF				
A. Missile and LF Weapon System Description	93	5.619	7	(28)
B. LF Command and Control System	94	5.7	7	(31)
C. LF Startup and Shutdown	93	6.19	7	(40)
D. Tape Loading	92	6.278	7	(42)
E. Code Change	91	6.107	7	(40)
F. Missile Guidance Set Cooling System	93	5.714	7	(30)
G. Programmer Group	93	5.815	7	(28)
H. LF Fault Analysis	92	6.192	7	(37)
VI(Version 002)/Intrasite Cabling				
A. Intrasite Cabling	90	5.1	6	(24)
B. Fault Analysis and UHF Command Radio System	89	4.96	5	(25)
C. Electrical Surge Arrestors, Filters, and Interconnecting Box	90	5.119	6	(22)
IV(Version 004)/Command and Control, LCF				
A. Command and Control, LCF	32	4.875	5	(8)

TABLE X (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Mode	(Number of Ratings in Modal Class)
V(Version 004)/Command and Control, LF				
A. Command and Control, LF	32	5.417	5	(12)
VI(Version 004)/Intrasite Cabling and Fault Analysis				
A. Intrasite Cabling	32	4.6	5	(10)
B. Fault Analysis	33	4.95	5	(10)

Using the median rating as the measure of central tendency (refer) to Table X), 34 of the subject areas were rated as useful (a median rating greater than 4.5). No area was rated as useless (a rating less than 3.5). Four subject areas--Block I, area F; Block IV (001 course), areas A and C; and Block V (001 course), area D--were rated as neither useful nor useless (a median rating between 3.5 and 4.5, inclusive).

Questions 22 Through 27. Questions 22 through 24 of the survey were intended for all respondents who were assigned to EMT regardless if they had or had not completed training at their base's TTB. Questions 25 through 27 were intended to be answered by respondents assigned to EMT who had completed training at their base's TTB.

Question 22: After you were assigned to EMT, how long did you have to wait before starting training at TTB?

Results: One hundred fifty-four of the 161 respondents met the criteria to proceed to this question. One hundred thirty-four respondents of the 154 eligible respondents answered this question. Eight

respondents indicated a wait of less than 30 days from the time they were assigned to EMT until they began TTB training. Thirty-eight respondents said they waited between 31 to 60 days from the time they were assigned to EMT until the time they entered TTB training. Twenty-five respondents said they waited between 61 to 90 days from the time they were assigned to EMT until the time they entered TTB training. Twenty-nine respondents said they waited between 91 to 120 days from the time they were assigned to EMT until the time they entered TTB training. Thirty-four respondents said they waited over 120 days from the time they were assigned to EMT until the time they entered TTB training. Of the 34 respondents who waited over 120 days, 33 indicated the number of days they had waited from the time they were assigned to EMT until the time they entered TTB training. Of these, 21 respondents began TTB training within 180 days after assignment to EMT. Ten respondents began TTB training between 181 to 270 days after assignment to EMT, and one respondent waited between 271 to 365 days before entering TTB training after his assignment to EMT. An "average" wait was computed by taking the larger of each waiting length category (i.e., of the 31 to 60 day category, the 60 day value was assigned to each individual in the category, the 60 day value was assigned to each individual in the category), multiplying by the number of respondents in that category, and then adding the total man-wait days and dividing the total by the number of respondents; this yielded the "worst case" average wait time. The "average" wait time arrived at by this method was approximately 113 days.

Question 23: What did you do during a typical duty week (duty hours 0800-1700, M-F) when you were assigned to EMT and awaiting TTB training?

Results: One hundred and four of the 154 respondents asked to complete this question indicated they spent a median 15 percent of their week performing squadron or base details. Ninety-eight respondents spent a median 20.5 percent of their week performing in-shop details. Seventy-three respondents spent a median 5.5 percent of their week dispatching to LFs or LCCs with supervisors. Seventy-eight respondents spent a median 9.8 percent of their week dispatching to LFs or LCCs with qualified teams. One hundred and ten respondents spent a median 35 percent of their week sitting around the shop--idle. One hundred and nine respondents spent a median 30.5 percent performing other tasks (i.e., attending classes, completing career development courses).

Question 24: What do you think were the reasons you were delayed in beginning TTB training?

Results: One hundred twenty-nine of the 154 respondents asked to answer this question replied to this question. Of these, 120 respondents indicated they were delayed in entering TTB training because the number of personnel awaiting TTB training exceeded the capability of the TTB resources. Other reasons respondents said delayed their entry in TTB training were: waiting for another student (2 respondents); waiting for a security clearance (2 respondents); waiting to take safety classes (2 respondents); driver's training (2 respondents); and finishing CDCs (1 respondent).

Question 25: How long has it been since you graduated from TTB?

Results: There were 123 respondents that answered this question. Of these, 45 respondents said they had graduated from TTB training between one year to 15 months prior to completing the survey.

Ten respondents said they graduated from TTB training between 15 months to 18 months prior to completing the survey. Fifteen respondents said they graduated from TTB training between 18 months to two years prior to completing the survey. Fifty-two respondents said they graduated from TTB training over two years prior to completing the survey. Of these (over two years since graduating from TTB training), the median time was 1017.5 days with a minimum of 771 days and a maximum of 3650 days.

Question 26: Did the technical training you received at Chanute prepare you for TTB?

Results: There were 128 responses to this question. One hundred and fourteen respondents said "yes" (indicating the training they received at Chanute had prepared them for TTB). Fourteen respondents said "no" (indicating the training they received at Chanute had not prepared them for training at TTB). These respondents were asked to answer question 27.

Question 27: If you answered no to question 26, what training was missing from your Chanute training that would have prepared you for TTB?

Results: Only 14 respondents replied no to question 26; however, 15 respondents replied to question 27. The responses included issues such as the Chanute training needed to concentrate on in-depth training on specific systems (e.g., motor generators). Respondents also said that the Chanute training should have been more representative of the manner and conditions under which maintenance was actually performed at the missile bases. They also indicated more hands-on training at Chanute would have prepared them for training at TTB.

Cross Tabulation Analysis. As described previously in the methodology section of this thesis, three variables were selected for cross tabulation to the responses to questions 12 and 14, and to the ratings of the subject areas of question 21. The three variables (hereafter referred to as variable one, variable two, and variable three) selected for the cross tabulation to the responses of the questions identified above were: 1--duty assignment, 2--version of the technical course attended at Chanute, and 3--time elapsed since graduation from Chanute until administration of the survey.

Cross Tabulation Results. There were only ten respondents who were not assigned to EMT; therefore, cross tabulation of variable one to the responses to questions 12, 14, and 21 would have been meaningless; thus, it was not accomplished. Blocks I through III of question 21 were identical for all respondents; however, Blocks IV through VI were different based on the version of the C3ABR31630G course attended. These blocks (IV through VI) were analyzed by course version (001, 002, and 004); therefore, the responses to the subject areas of the blocks of instruction could not meaningfully be cross tabulated against variable two (version of the C3ABR31630G course attended). The criteria used to select associative relationships was a chi square value with a probability equal to or exceeding the 95 percent confidence level, and a Cramer's V value of .500 or greater. The results of the cross tabulation contingency analysis for questions 12 and 14 are discussed below. The results of the cross tabulation contingency table analysis for question 21 are presented in Table XI. If the variable-rating (response) pair met or exceeded the selected chi square statistic criterion value, an "X" was placed at the intersection

TABLE XI

Population One, Subpopulation One - Cross Tabulation Results of Selected Variables and Ratings of Course Subject Areas

Block/Title Subject Area	Variable 2	Variable 3
I/Fundamentals		
A. Orientation		
B. Weapon System Familiarization		
C. Tools and Aerospace Hardware		
D. Publications		
E. Security		
F. Maintenance Management		
G. Safety		
II/Personnel Access and Security Systems		
A. Personnel Access Systems		
B. Security System	X	
III/Power System		
A. LCF/LF Power Systems Description and Diesel Electric Unit		X
B. LCF Power System Maintenance		X
C. LCF Fault Analysis		
IV(Version 001)/LCF Command and Control		
A. Command and Control System Operation		
B. Command and Control System Maintenance		
C. LCF Intrasite Cabling		X (.64316)
V(Version 001)/LF Command and Control		
A. OGE/AVE Shutdowns and Startups		
B. Command and Control System Operation		
C. Command and Control System Maintenance		
D. LF Intrasite Cabling		
VI(Version 001)/Missile Guidance and Control System		
A. Missile Guidance System (MGS)		
B. MGS Cooling System		

TABLE XI (continued)

Block/Title Subject Area	Variable 2	Variable 3
IV(Version 002)/LCF		
A. Command and Control System		X
B. Operation and Maintenance		
C. LCF Fault Analysis		
V(Version 002)/LF		
A. Missile and LF Weapon System Description		
B. LF Command and Control System		
C. LF Startup and Shutdown		
D. Tape Loading		
E. Code Change		
F. Missile Guidance Set Cooling System		
G. Programmer Group		
H. LF Fault Analysis		
VI(Version 002)/Intrasite Cabling		
A. Intrasite Cabling		
B. Fault Analysis and UHF Command Radio System		
C. Electrical Surge Arrestors, Filters, and Interconnecting Box		
IV(Version 004)/Command and Control System, LCC		
A. Command and Control System, LCC		
V(Version 004)/Command and Control System, LF		
A. Command and Control System, LF		X (.61266)
VI(Version 004)/Intrasite Cabling and Fault Analysis		
A. Intrasite Cabling		
B. Fault Analysis		X (.51881)

of the appropriate column and row of Table XI. For variable-rating pairs satisfying the chi square criterion, a Cramer's V value was computed. If the Cramer's V value met or exceeded the selected criterion value, the value was placed in parentheses after or below the "X" in Table XI.

Question 12. Question 12 asked the respondents: Did you receive training at Chanute for systems which are not in use at your base? Cross tabulation of variable two to the responses to question 12 revealed no associative relationship between the course version taken by the respondents and their responses to question 12, based on the established criteria. Cross tabulation of variable three also revealed no associative relationship between the year the respondent graduated from Chanute and their responses to question 12, based on established criteria.

Question 14. Question 14 asked the respondents: Are there any systems that you will be/are working on at your present base for which you did not receive training on at Chanute? Cross tabulation of variable two to the responses to question 14 revealed no associative relationship between the course version taken by the respondents and their responses to question 14 based on the established criteria. Cross tabulation of variable three to the responses to question 14 also revealed no associative relationship between the year the respondent graduated from Chanute and their responses to question 14, based on established criteria.

Question 21. Table XI summarizes the results of the cross tabulations of variable two and three on the subquestions of question 21. As previously stated, if the chi square statistic level of significance selected (.95) was achieved or exceeded, an "X" was placed at the intersection of the appropriate row and columns in Table XI; if the Cramer's V

value also equaled or exceeded the selected level of significance, the Cramer's V value for the variable-rating pair was placed in parentheses adjacent to or below the "X".

There were only three associative relationships indicated based on the established criteria for the chi square statistic and Cramer's V. These relationships were between variable three (time elapsed since graduation from Chanute) and the ratings of the following subject areas: Block IV (001 version), C. LCF Intrasite Cabling; Block V (004 version), A. Command and Control System, LF; and Block VI (004 version), B. Fault Analysis. Cursory examination of the contingency table for these variable-rating pairs appeared to indicate that respondents who had graduated from Chanute more than three and a half years ago rated these areas low (useless) and more recent graduates rated these areas high (useful).

Population One Results - Subpopulation Two, AFS 443x0G

The first 20 questions of the survey instrument administered to personnel assigned AFS 443x0G were identical to the first 20 questions of the survey instrument administered to personnel assigned AFS 316x0G. The reader is referred to the discussion of the survey questions provided in the previous paragraphs. The following paragraphs present the question number, the question, and the results of the data analysis for the population one, subpopulation two (AFS 443x0G) survey responses.

Frequencies and Content Analysis.

Question 4: How long has it been since you graduated from Chanute?

Results: Of the 226 respondents, 224 answered question 4. The elapsed time since respondents attended the formal technical

training at Chanute ranged from less than one-half year to just over five years. The median elapsed time was approximately two and a half to three years.

Question 5: Where were you first assigned after arriving at your present base?

Results: Ninety of the total of 226 respondents were assigned to MMT upon their arrival at their first duty base after completing training at Chanute. The remaining 136 were assigned to other job areas including: Vehicle and Equipment Control, Mechanical Shop, Pneudraulics Shop, and the Technical Order Library. At at least one Minuteman base (Malmstrom AFB, Montana), all incoming AFS 443x0G personnel were assigned to the Vehicle and Equipment Control section. Content analysis revealed six of the respondents indicated they had been assigned to the Mechanical Shop, 99 to VECB, five to the Technical Order Library, five to the Pneudraulics Shop, 15 to MHT and three each to SSMT and Materiel Control, as their first duty assignment after completing training at Chanute.

Question 6: How long were you assigned to that area (an area other than MMT) before you were assigned to MMT?

Results: Only 130 of the respondents answered this question. Of these 130 respondents, 89 were still working in areas other than MMT. Thirteen of the remaining 41 respondents were assigned to MMT within 120 days of their initial duty assignment. The remaining personnel who were eventually assigned to MMT waited from 150 days to three and two-thirds years before assignment to MMT, with a median wait of one and one-third year.

Question 7: Where did you fill out the paperwork to get your security clearance?

Results: Two hundred twenty-three respondents answered this question. One hundred ninety-two of these respondents accomplished the paperwork to obtain their security clearance while at Lackland AFB, Texas (basic training). Twenty of the respondents accomplished this paperwork at Chanute, and the remainder completed the paperwork to obtain their security clearance at another location such as: their present base of assignment, a previous base of assignment, or at an Armed Forces Recruiting and Enlistment Service Center.

Question 8: If you filled out your paperwork for a security clearance at Chanute, when did you fill it out?

Results: Thirty-two respondents replied to this question (based on the respondents who indicated Chanute as their answer for question 7, only 20 respondents were expected to reply to this question). This may indicate a misunderstanding of the question on the part of some of the respondents, or perhaps several individuals completed the required paperwork at both Lackland and Chanute. Of the respondents who answered this question, 11 completed the paperwork within 30 days after arriving at Chanute, 16 respondents indicated they completed the required paperwork between 31 and 60 days after arrival at Chanute, and five respondents said they completed this paperwork between 61 and 90 days after arrival at Chanute.

Question 9: When did you get your security clearance?

Results: Two hundred and eighteen respondents completed this question. One hundred forty-five of these respondents

received their security clearance after they had arrived at their base of assignment. Seventy-two of the respondents had received their security clearance prior to graduating from Chanute. Only one of the respondents had not received his security clearance at the time he completed the survey.

Question 10: If you answered a to question 9 (i.e., you received your security clearance after arriving at your present base), at what time after arriving at your present base did you receive your security clearance?

Results: One hundred forty-five responses were received to this question. Forty-six of the respondents who received their security clearance after having arrived at their initial duty base, received their security clearance with 30 days of their arrival. Fifty-three of the respondents received their security clearance within 30 to 60 days after arrival; 15 within 61 to 90 days; 19 within 91 to 120 days; and 12 waited more than 120 days after arrival at their base before they received their security clearance. Of the 12 respondents who waited more than 120 days before obtaining their security clearance, the minimum wait reported was 190 days, the maximum, 635 days, with a median wait of nearly one year (354 days).

Question 11: If you answered b to question 9 (i.e., have not received your security clearance), how long have you been waiting for your security clearance?

Results: Only one respondent answered b to question 9 and indicated he had been waiting 730 days for his security clearance.

Question 12: Did you receive training at Chanute for systems which are not in use at your base?

Results: Two hundred twenty-one respondents replied to this question. Seventy-three of the respondents indicated they had received training for systems which were not in use at their base. Ninety-nine replied they had not received training for systems which were not in use at their base, and the remaining 49 respondents indicated that they did not know if they had received training for systems which were not in use at their base.

Question 13: If you answered yes to question 12, give at least one example of a system you were trained on at Chanute that was not in use at your base.

Results: Seventy-two respondents, one less than the number who answered yes to question 12, gave at least one example of a system they had received training for at Chanute but which was not in use at their base. These systems included[4]:

Minuteman III Systems (37)
Minuteman II Systems (19)
PT Tractor and/or Trailer (12)
TE Container/Tractor (3)
MK 1 Teststand (1)

Question 14: Are there any systems that you will be/are working on at your base for which you did not receive training on at Chanute?

Results: Two hundred and twenty respondents answered this question. Forty-eight of those respondents indicated that yes, they expected to or were working on systems at their base for which they had not received training at Chanute. One hundred twenty-eight of the respondents said they did not expect to nor were they working on systems for

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[4]Note: the number in parentheses was the number of respondents indicating that particular response.

which they had not received training at Chanute; the remaining 44 respondents indicated they did not know.

Question 15: If you answered yes to question 14, please give at least one example of a system that you will be/are working on at your base for which you did not receive training at Chanute.

Results: Forty-five of the 48 respondents who answered yes to question 14 gave at least one example of a system they expected to or were working on for which they had not received training at Chanute. The examples given included:

VECB Work/Vehicles/Equipment (27)
MHT Tasks (8)
Aircraft/Rail Car Missile Handling/ Unloading (2)
ERCS (2)
Missile R & R (1)
Multiplying Linkage (1)
LC Capsule Chairs (1)
ED/DAS - Computers (1)
Air Paks (1)
Cork and Titanium Inspections (1)

Question 16: When you were attending Chanute, were you aware that you would have to undergo additional training at your base of assignment--either in-shop or at TTB--before you would be qualified to do your job?

Question 17: How did you find out that you would have to undergo additional training at your base of assignment before being qualified to do your job?

Results: Two hundred twenty-four of the 226 respondents answered this question. Of those who responded, 194 indicated yes, they had been aware they would have to undergo additional training at their base of assignment, 30 responded no, they had not been aware additional training was necessary. One hundred ninety-two respondents who

indicated yes to question 16 answered question 17. Four respondents indicated they found out about the additional training from other students, 181 reported they learned of this requirement from Chanute instructors, and seven respondents indicated they learned of this requirement from another source. The other sources included: sponsor at follow-on assignment, friends at technical school, people known prior to attending Chanute.

Question 18: What did you expect from Chanute technical training?

Results: Two hundred twenty-three of the total 226 respondents replied to this question. Sixty-five of the respondents indicated they expected to be fully qualified to do their job, 130 expected to be prepared for additional training and 28 indicated other expectations such as: to be able to do basic maintenance work, and to have had more "hands on" job training.

Question 19: Did the technical training you received at Chanute meet your expectations?

Results: Two hundred twenty-five respondents answered this question. One hundred sixty-five indicated the technical training they received at Chanute had met their expectations. Identical numbers of the respondents (30 each) answered no or somewhat and were requested to explain what their expectations were and why the Chanute training did not meet them (question 20).

Question 20: If you answered no or somewhat to question 19, explain what you expected from your Chanute technical training, and why the training you received did not meet your expectations.

Results: Fifty-six of the sixty respondents who answered no or somewhat to question 19 responded to this question. The

respondents indicated they had expected more indepth--job specific--hands-on training; also more realistic training--they felt the training at Chanute did not represent the "real work" situation very well.

As explained in the AFS 316x0G results section, question 21 was comprised of a number of subquestions based on the course charts provided by Chanute. In the case of version 003 of the C3ABR44330G course, question 21 contained 39 subquestions; for version 004 of the C3ABR44330G course, question 21 contained 38 subquestions. The subquestions were divided into blocks which corresponded to the blocks of instruction of the Chanute formal technical training course as presented in the course chart. Both versions of the C3ABR44330G course (003 and 004) included eight blocks of instruction. The subject areas within each block were labeled alphabetically. The 003 and 004 versions of the C3ABR44330G course differed only in Block VIII of instruction--Blocks I through VII were identical. To review, the respondents were asked to indicate the usefulness or uselessness of each subject area to the requirements of their job using a seven-point interval Likert scale.

Question 21: To what extent are the following subject areas you learned at Chanute relevant to your duties and responsibilities in your present job? You may feel it is relevant for other work, but to what extent do you use it in your job? Next to each subject area, circle the number that most closely corresponds to your answer based on the following 7-point scale.

7	6	5	4	3	2	1	0
Very Useful			Neither Useful nor Useless			Very Useless	Don't Know

Results: The results of the analysis of the respondents' ratings of each major subject area are presented in Table XII.

TABLE XII

Population One, Subpopulation Two - Frequency Analysis of Ratings of Course Subject Areas

Block/Title Subject Area	Number of Responses	Ratings		
		Median	Mode	(Number of Ratings in Modal Class)
I/WS-133 Familiarization				
A. Security	215	5.143	7	(52)
B. Tools and Equipment	220	5.826	7	(79)
C. Weapon System Familiarization	217	5.698	7	(66)
D. Maintenance Management	213	4.342	4	(60)
E. Publications	214	5.289	7	(70)
F. AF Occupational Safety and Health (AFOSH) Program	212	4.779	7	(46)
II/Missile and Electrical Principles				
A. Missile	210	5.316	7	(69)
B. Principles of Electricity	207	4.293	4	(46)
C. Operation and Maintenance of 1 H-1 Ground Heater	204	4.382	1	(44)
III/Hydraulic/Pneumatic Principles and Systems				
A. Hydraulic Principles and Systems	213	4.380	4	(46)
B. Hydraulic Test Stand	195	3.281	1	(71)
C. Operation and Maintenance of Blast Doors	193	3.059	1	(74)
D. Operation and Maintenance of Ventilation Safety System	192	2.875	1	(74)
E. Operation and Maintenance of Hand Lift Trucks	203	3.306	1	(61)

TABLE XII (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Mode	(Number of Ratings in Modal Class)
F. Pneumatic Principles and Systems	206	4.280	1	(43)
G. Corrosion	206	4.206	1	(51)
IV/Missile Handling and Auxiliary Equipment				
A. Missile Handling Vehicles	212	4.742	7	(55)
B. Missile Handling Equipment	212	4.853	7	(61)
C. Missile Removal and Installation	204	4.875	7	(62)
D. Operation and Maintenance of Shock Absorbers, Attenuation System and Isolator System	213	3.432	1	(69)
E. Operation and Maintenance of Elevator Work Cage	211	6.061	7	(91)
V/Vehicles and Proofload Facility				
A. Vehicle and Equipment Control Branch (VECB)	219	4.325	4	(83)
B. Maintenance Data Collection and Forms	219	5.629	6	(89)
C. Operation and Maintenance of Support Trucks	217	6.283	7	(102)
D. Operation and Maintenance of Payload Transporter	210	1.500	1	(105)
E. Operation and Maintenance of Guidance and Control Purging Manifold	216	5.940	7	(94)
F. Operation and Maintenance of a Proofload Test Facility/ Fixture	202	2.114	2	(70)

TABLE XII (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Mode	(Number of Ratings in Modal Class)
G. Operation and Maintenance of Portable Air Conditioner	201	2.113	2	(71)
VI/Launch Facility Maintenance				
A. Personnel Access System Operation	207	4.984	7	(57)
B. Security Pit Vault Door Maintenance	204	3.987	1	(66)
C. Maintenance of Secondary Door	201	3.734	1	(73)
D. Electromechanical Linear Actuator Maintenance	199	3.406	1	(71)
E. Launcher Closure Operation and Maintenance	207	5.114	7	(63)
VII/Missile Umbilicals and Suspension Systems				
A. Missile Suspension System Function and Maintenance	206	4.648	7	(56)
B. Missile Guidance and Control Umbilical Function/Maintenance	207	4.875	1	(53)
C. Skirt Umbilical Function/Maintenance	204	4.611	1	(54)
VIII(Version 003)/Movement of MMII Aerospace Vehicle Equipment				
A. Operation and Maintenance of Reentry Vehicle Equipment	100	5.429	6	(27)
B. Removal and Replacement of Aerospace Vehicle Equipment	98	5.500	6	(29)
C. Launch Facility Shutdown	98	4.981	5	(27)

TABLE XII (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Mode	(Number of Ratings in Modal Class)
VIII(Version 004)/Movement of MMIII Aerospace Vehicle Equipment				
A. Removal and Replacement of Aerospace Vehicle Equipment	106	4.346	1	(31)
B. Launch Facility Shutdown	104	4.500	1	(32)

From Table XII it can be seen that 21 subject areas received a median rating of useful (a median rating of 4.5 or greater), 11 subject areas received a median rating of neither useful nor useless (a median rating between 3.5 and 4.5 inclusive), and nine subject areas received a median rating as useless (a median rating of less than 3.5). The range of ratings for the subject areas was, in each case, one through seven. A possible explanation of this full range of ratings is the members of the sample were assigned to many different duty sections, each of which required the use of different task skills. A possible result of this was a subject area related to a task used by the majority of respondents in their jobs could have received enough higher ratings to completely overshadow the rating of the subject area by personnel in a duty section that did not require the use of that particular task. To examine this situation further, the respondents were separated into two groups--those assigned to the MMT section and those assigned to a duty section other than MMT. In several cases, the median rating of a subject area by one of these two groups was different enough from the median rating computed

on the entire sample to place that subject area in a different category, i.e., from neither useful nor useless to useful. An example was with the subject area designated Block III, A. Hydraulic Principles and Systems. The median rating for this subject based on the total 213 respondents who rated this subject area was 4.380. The median rating for that subject area based on the ratings of respondents assigned to the MMT section was 5.567, the median rating for that subject area based on the ratings of respondents assigned to duty sections other than MMT was 3.900. This indicated that the course material was duty assignment specific in some instances. In other instances, the median rating of a subject area did not significantly differ with respect to the duty assignment of the respondent. This issue was tested further by the use of the SPSS program CROSSTABS and the results are reported later in this thesis.

Questions 22 Through 27. Questions 22 through 27 were to be answered by those respondents assigned to MMT. Respondents who were assigned to MMT but had not completed TTB training were asked to complete only questions 22 through 24. Respondents who were assigned to MMT and who had completed TTB training were asked to answer each question--22 through 27.

Question 22: After you were assigned to MMT, how long did you have to wait before starting training at TTB?

Results: Ninety-one of the 137 total respondents who were assigned to MMT answered this question. Nine of these respondents entered TTB training within 30 days of assignment to MMT, 15 within 31 to 60 days, 16 within 61 to 90 days, 20 within 91 to 120 days, and 31 respondents indicated that after their assignment to MMT, they waited more than

120 days before entering training at TTB. Of the 31 respondents who waited more than 120 days, two indicated they were still awaiting TTB training. The other 29 respondents indicated a wait of from 145 to 474 days, with a median wait time of 250 days.

Question 23: What did you do during a typical duty week (duty hours 0800-1700, M-F) when you were assigned to MMT and waiting to start TTB?

Results: Forty-six of the respondents indicated they performed squadron or base details while awaiting TTB training. The median percentage of time during the duty week they reported being occupied with this activity was 15.5 percent. Fifty-two respondents indicated they performed in-shop details for a median of 25.5 percent of their duty week. Thirty-three respondents indicated dispatching to missile sites with shop supervisors occupied a median 10 percent of their duty week. Twenty-one respondents said at least one of the activities they engaged in while awaiting TTB training was field dispatch with qualified MMTs--the median percentage of the duty week spent involved with this activity was 9.750. Fifty-three of the respondents indicated a median 25.125 percent of their duty week was spent as idle time, i.e., sitting around in the MMT shop area. Eleven respondents reported other activities--primarily career development course self-study, and collateral training classes--occupied a median 48.75 percent of their duty week.

Question 24: What do you think were the reasons you were delayed in beginning TTB training?

Results: Eighty-two of the respondents provided their opinion on the reason(s) they were delayed in beginning training at TTB. Many of the reasons provided were related. For instance, if there were

personnel awaiting training at TTB because prior teams were still being trained, the respondents may have attributed the "delay" to too few instructors, or too many personnel awaiting training, or waiting for the teams in TTB to complete their training. These comments were grouped in the category--personnel exceeded TTB capacity--there were 57 responses in this category. Another grouping of responses included the opposite condition--not enough personnel available for training--comments grouped into this classification were: waiting for team members to arrive from Chanute and awaiting selection/assignment of a team chief. Thirty responses were included in this category. Other reasons had three or fewer number of like responses. They included: awaiting security clearance (3), collateral training requirements (3), Operational Readiness Inspection (1), Minuteman Missile Competition (1), and base in-processing requirements (1).

Question 25: How long has it been since you graduated from TTB?

Results: Seventy-seven respondents answered this question. The median time from respondents' graduation from TTB training to their completion of the survey was slightly over two years (751 days).

Question 26: Did the technical training you received at Chanute prepare you for TTB?

Results: Seventy-six respondents answered this question. Fifty-nine of them said that the technical training they received at Chanute did prepare them for training at TTB. Seventeen respondents said the training they received at Chanute did not prepare them for TTB. They were asked to respond to question 27.

Question 27: If you answered no to question 26, what training was missing from your Chanute training that would have prepared you for TTB?

Results: Sixteen of the 17 respondents asked to respond to this question provided their opinion of the training they felt has been missing at Chanute that would have prepared them for training at TTB. The answers they provided included claims that they had not received instruction on the reentry vehicle, the umbilical, and the missile guidance set; other respondents said they needed more hands-on training while at Chanute, and others commented that the Chanute training was too artificial--it did not prepare them for the way and environment in which missile maintenance was actually performed.

Cross Tabulation Results. The results of the cross tabulation analysis of the selected variables and questions 12 and 14 are discussed below. The cross tabulation analysis results for question 21 are presented in Table XIII.

Question 12. Question 12 asked the respondent--Did you receive training at Chanute for systems which are not in use at your base? Based on the selected levels of significance for the chi square statistic and Cramer's V, no associative relationships between any of the selected variables and the responses to this question were indicated.

Question 14. Question 14 asked the respondent--Are there any systems that you will be/are working on at your base for which you did not receive training on at Chanute? No associative relationships between the selected test variables and the responses to this question were indicated based on the cross tabulation analysis results.

TABLE XIII

Population One, Subpopulation Two - Cross Tabulation Results of Selected Variables and Ratings of Course Subject Areas

Question	Block	Major Area	Duty Assignment Variable 1 (Cramer's V)	Course Version Variable 2 (Cramer's V)	Elapsed Time Variable 3 (Cramer's V)
12	N/A	N/A	X	X	X
14	N/A	N/A			
21	I	WS-133 Familiarization			
		A. Security	X		
		B. Tools and Equipment	X		
		C. Weapon System Familiarization	X		
		D. Maintenance Management			
		E. Publications			
		F. AFOSH	X		
21	II	Missile and Electrical Principles			
		A. Missile	X	X	
		B. Principles of Electricity	X		
		C. Operation and Maintenance of 1-H1 Ground Heater		X	
21	III	Hydraulic/Pneudraulic Principles and Systems			
		A. Hydraulic Principles and Systems			
		B. Hydraulic Test Stand			
		C. Operation and Maintenance of Blast Doors			

TABLE XIII (continued)

Question	Block	Major Area	Duty Assignment Variable 1 (Cramer's V)	Course Version Variable 2 (Cramer's V)	Elapsed Time Variable 3 (Cramer's V)
		D. Operation and Maintenance of Ventilation Safety System			
		E. Operation and Maintenance of Hand Lift Trucks			
		F. Pneumatic Principles and Systems			
		G. Corrosion		X	
21	IV	Missile Handling and Auxiliary Equipment			
		A. Missile Handling Vehicles			
		B. Missile Handling Equipment		x	x
		C. Missile Removal and Installation	X		
		D. Operation and Maintenance of Shock Absorbers, Attenuation System and Isolation System	X		
		E. Operation and Maintenance of Elevator Work Cage	X		
21	V	Vehicles and Proof Load Facility			
		A. Vehicle and Equipment Control Branch	x	x	
		B. Maintenance Data Collection and Forms	x	x	

TABLE XIII (continued)

Question	Block	Major Area	Duty Assignment Variable 1 (Cramer's V)	Course Version Variable 2 (Cramer's V)	Elapsed Time Variable 3 (Cramer's V)
		C. Operation and Maintenance of Support Trucks		X	
		D. Operation and Maintenance of Payload Transporter		X	
		E. Operation and Maintenance of Guidance and Control Purging Manifold	X	X	
		F. Operation and Maintenance of a Proof Load Test Facility/Fixture		X	
		G. Operation and Maintenance of Portable Air Conditioner		X	
21	VI	Launch Facility Maintenance			
		A. Personnel Access System Operation	X		X
		B. Security Pit Vault Door Maintenance	X		
		C. Maintenance of Secondary Door	X		
		D. Electromechanical Linear Actuator Maintenance			
		E. Launcher Closure Operation and Maintenance	X (.57377)	X	

TABLE XIII (continued)

Question	Block	Major Area	Duty Assignment Variable 1 (Cramer's V)	Course Version Variable 2 (Cramer's V)	Elapsed Time Variable 3 (Cramer's V)
21	VII	Missile Umbilicals and Suspension Systems			
		A. Missile Suspension System Function and Maintenance	X		
		B. Missile Guidance and Control Umbilical Function/Maintenance	X (.54287)	X	
		C. Skirt Umbilical Function/Maintenance	X (.53668)	X	
21	VIII (Version 003)	Movement of MMII Aerospace Vehicle Equipment			
		A. O/M of Reentry Vehicle Equipment	X	N/A	
		B. R/R of Aerospace Vehicle Equipment		N/A	
		C. Launch Facility Shutdown	X	N/A	
21	VIII (Version 004)	Movement of MMIII Aerospace Vehicle Equipment			
		A. R/R Aerospace Vehicle Equipment	X (.61207)	N/A	
		B. Launch Facility Shutdown	X (.62055)	N/A	

Question 21. Question 21 was composed of subquestions representing the subject areas, divided into blocks of instruction, of the C3ABR44330G technical training course. The respondents' ratings of each of the subject areas and the three selected variables identified earlier were cross tabulated. The results are presented in Table XIII. If the chi square statistic met or exceeded the selected level of significance (.95) for a variable-response pair, an "X" was placed at the intersection of the respective column and row in Table XIII. For variable-response pairs which met or exceeded the selected level of significance the Cramer's V value was calculated. If the Cramer's V value met or exceeded the selected level of significance, the value was entered into Table XIII in parentheses following the "X".

As can be seen in Table XIII, based on the chi square statistic potential associative relationships between the selected variables and the rating of several subject areas were indicated. It was previously stated that the duty assignment of the respondents may have been associated with their rating of a susbject area. This was found to be the case, the only variable-response pairs that satisfied both the chi square and Cramer's V criteria for acceptance of an associative relationship were between subject area ratings and variable one--the duty assignment of the respondents. Five such associative relationships were found. All five subject areas associated with variable one were related to MMT type tasks. Analysis of the median ratings of these five subject areas by the two groups described earlier (respondents assigned to MMT, and those assigned to duty sections other than MMT) revealed the respondents assigned to MMT rated the five subject areas higher (useful) than the respondents assigned

to duty sections other than MMT, who rated these subject areas as useless. These results are presented in Table XIV.

TABLE XIV

Analysis of MMT vs. Non-MMT Respondents' Ratings of the Subject Areas Demonstrating an Associative Relationship with Variable One

Block	/Subject Area	Median MMT Respondent Rating	Median Non-MMT Respondent Rating
VI	/E. Launcher Closure Operation and Maintenance	6.396	2.786
VII	/B. Missile Guidance and Control Umbilical Function and Maintenance	5.935	2.833
VII	/C. Skirt Umbilical Function and Maintenance	5.611	2.167
VIII(Version 004)	/A. Removal and Replacement of Aerospace Vehicle Equipment	6.250	1.420
VIII(Version 004)	/B. Launch Facility Shutdown	6.500	1.400

Population One Results - Subpopulation Three, AFS 445x0G

All of the questions posed to respondents assigned AFS 445x0G, with the exception of question 21, were the same as those presented to respondents assigned AFSs 316x0G and 443x0G. The reader is again referred to the more complete discussion of each question presented previously. As was the case for the surveys administered to the personnel assigned AFSs 316x0G and 443x0G, question 21 of the survey intended for personnel assigned AFS 445x0G requested the respondents rate the usefulness or uselessness, on a scale of one to seven, of the subject areas of

instruction of the C3ABR44530G formal technical training course. The results of the SPSS FREQUENCIES and content analysis of the responses are presented in the following paragraphs.

Frequencies and Content Analysis.

Question 4: How long has it been since you graduated from Chanute?

Results: One hundred fifty-seven of the 171 respondents answered this question. The median time elapsed since the respondents had graduated from Chanute to the time the survey was administered was approximately one year and nine months. The time elapsed ranged from as little as one month to over five years.

Question 5: Where were you first assigned after arriving at your present base?

Results: Eighty of the respondents were assigned to FMT upon arrival at their present base, 72 were assigned to PMT, the remaining 19 respondents were assigned to duty sections other than FMT or PMT. Of these 19 respondents, 14 indicated they had been assigned to the Power, Refrigeration, and Electric (PREL) Shop (or to the PREL shop's predecessors, the Electric Shop and the Refrigeration Shop). These 19 respondents were asked to answer question 6.

Question 6: How long were you assigned to that area before being assigned to FMT or PMT?

Results: Fifteen of the 19 respondents asked to reply to this question indicated they were not assigned to FMT or PMT. The remaining four respondents indicated they had been assigned to FMT or PMT within three months after initial assignment to the PREL shop, or other non-FMT/PMT duty sections.

Question 7: Where did you fill out the paperwork to get your security clearance?

Results: One hundred and seventy of the respondents answered this question. Of these, 154 (90.6 percent) indicated they had completed the paperwork required to initiate their security clearance while attending basic training at Lackland AFB, Texas. Eight respondents indicated they had accomplished this at Chanute AFB, Illinois, and eight respondents also indicated they completed the required paperwork at an Armed Forces Recruiting and Enlistment Service Center, or at another Air Force Base. The eight respondents who completed the paperwork at Chanute were requested to answer question 8.

Question 8: If you filled out your paperwork for a security clearance at Chanute, when did you fill it out?

Results: Four of the eight respondents asked to answer this question indicated they completed the paperwork for a security clearance within 30 days after arriving at Chanute. The other four respondents accomplished the paperwork between 31 and 60 days after their arrival at Chanute.

Question 9: When did you get your security clearance?

Results: Fifty-six respondents indicated they received their security clearance after arriving at their present base. These 56 respondents were requested to answer question 10. One hundred and six of the respondents received their security clearance while still assigned to Chanute. Two respondents indicated they still had not received their security clearance; they were asked to answer question 11. Seven respondents chose not to answer this question.

Question 10: If you answered a to question 9 (i.e., you received your security clearance after arriving at your present base), at what time after arriving at your present base did you receive your security clearance?

Results: Of the 56 respondents who answered a to question 9 and thus were asked to answer this question, all but one did. Of the 55 respondents who did answer this question, 33 received their security clearance with 30 days after arrival at their present base; 16 received their security clearance within 31 to 60 days; and three each between 61 to 90, and 91 to 120 days, respectively.

Question 11: If you answered b to question 9 (i.e., you have not received your security clearance), how long have you been waiting for your security clearance?

Results: The two respondents asked to complete this question indicated they had been waiting less than 60 days.

Question 12: Did you receive training at Chanute for systems which are not in use at your base?

Results: One hundred sixty-six of the 171 respondents replied to this question. Ninety-eight respondents indicated they had received training for systems which were not in use at the base they were assigned to. These respondents were asked to give at least one example of such a system in response to question 13. Fifty-six of the respondents replied no to this question, 12 indicated they did not know.

Question 13: If you answered yes to question 12, give at least one example of a system you were trained on at Chanute that is not in use at your base.

Results: Ninety-eight respondents were asked to answer this question. One hundred and five respondents, however, provided

an example of a system not in use at their base but for which they received training at Chanute. The response given most often was that the respondents had received training for systems in use at other missile wings, particularly wing VI (44 respondents); other examples provided by the respondents were primarily systems which have undergone modification or replacement during the last six years, i.e., environmental control system brine chillers and automatic switching units (replaced by the Minuteman power processor). Another example of a system for which respondents indicated they received training for but was not used at their base was the nine kilo-watt in the Reentry Vehicle and Guidance and Control van--a system, they said, which has not been in use for the last five years. Other examples reflected the different diesel units in use among the wings.

Question 14: Are there any systems that you will be/are working on at your base for which you did not receive training on at Chanute?

Results: Eighty-four respondents indicated they had not received training at Chanute for systems they had or expected to work on. These respondents were asked to provide at least one example of a system they had or expected to work on in response to question 15. Fifty-nine respondents replied that they were not nor did they expect to work on any systems for which they had not received training at Chanute. Twenty-four respondents said they did not know and four of the 171 respondents did not reply to this question.

Question 15: If you answered yes to question 14, please give at least one example of a system that you will be/are working on at your base for which you did not receive training at Chanute.

Results: Although only 84 of the respondents answered yes to question 14, 95 respondents provided at least one example of a system on which they had or had expected to work on at their base and for which they had not received training at Chanute. The examples they gave are listed below, the number in parentheses indicates the number of respondents providing that example:

1. Minuteman Power Processor (30),
2. Modified Environmental Control System/ Brine Chiller (24),
3. Miscellaneous (e.g., PMT work in general) (17)
4. Diesel Generator (13)
5. Power, Refrigeration and Electric Shop tasks (11)
    a. Guidance and Control Test Bench (4)
    b. Guidance and Control Filters (3)
    c. Maintenance Van Hoists (1)
    d. Portable Air Conditioner (1)
    e. Emergency Storage Batteries (1)
    f. Elevator Work Cages (1)
6. Sump Pumps (2)
7. Nicad Batteries (1)

The examples given by the respondents reflect the wide range of tasks personnel assigned AFS 445x0G perform. Also, various modifications and equipment replacements (e.g., a new Guidance and Control Test Bench was being placed in the Power, Refrigeration and Electric shop at each of the six Minuteman wings) may have resulted in some respondents' examples.

Question 16: When you were attending Chanute, were you aware that you would have to undergo additional training at your base of assignment--either in shop or at TTB--before you would be qualified to do your job?

Question 17: (Answered if the reply to question 16 was no) How did you find out that you would have to undergo additional training at your base of assignment before being qualified to do your job?

Results: One hundred sixty-nine respondents replied to question 16. Of these, 144 indicated they were aware of the requirement for additional training at their base of assignment. Of these 144 respondents, the majority--124 (86.1 percent)--indicated they had learned of this requirement from instructors at Chanute; 12 learned of the requirement from other students; and eight indicated they learned of the requirement from other sources, e.g., friends, sponsors at their follow-on assignment, etc. Twenty-five individuals indicated they had not known they would have to undergo additional training at their base of assignment.

Question 18: What did you expect from Chanute technical training?

Results: Fifty-five individuals replied that they expected to be fully qualified to do their job--an unexpected result because only 25 respondents indicated they were unaware of the requirement to undergo further training at their base of assignment. Ninety-five respondents said they expected to be prepared for additional training at TTB, and 18 indicated other expectations such as being prepared to do the basics of their job, and to have a fundamental knowledge of the systems they would be working with. Three of the 171 respondents who returned the survey chose not to answer this question.

Question 19: Did the technical training you received at Chanute meet your expectations?

Results: One hundred and nine respondents said the training they received at Chanute met their expectations. Thirty-three said no and 29 said somewhat in response to this question. The 62 respondents who replied either no or somewhat were asked to answer question 20.

Question 20: If you answered no or somewhat to question 19, explain what you expected from your Chanute technical training, and why the training yo. received did not meet your expectations.

Results: Fifty-seven of the 62 respondents who answered no or somewhat to question 19 answered this question. The reasons given by the respondents of why the training they received at Chanute did not meet their expectations were diverse. Twenty individuals thought the training was too broad based; they expected to be trained only for the system they would be working on after leaving Chanute. Nineteen respondents indicated they expected to have much more system specific, indepth, hands-on training. Other replies to this question included comments such as: there was too much to learn in too little time; the instructors did not understand Wing VI; some instructors were not qualified and experienced technicians; military training and details interferred with studies; and the training at Chanute was not representative of working in actual field conditions.

As was the case for the AFSs 316x0G and 443x0G surveys, question 21 of the AFS 445x0G survey was developed based on the course chart for the C3ABR44530G technical training course. There were 52 subquestions divided into nine blocks based on the blocks of instruction in the course

chart. All personnel assigned AFS 445x0G attended the same course of instruction at Chanute, unlike the personnel assigned AFSs 316x0G and 443x0G. Again, a 7-point interval Likert scale was used for rating the subject areas.

Question 21: To what extent are the following subject areas you learned at Chanute relevant to your duties and responsibilities in your present job? You may feel it is relevant for other work, but to what extent do you use it in your job? Next to each subject area, circle the number that most closely corresponds to your answer based on the following 7-point scale.

7-----6-----5-----4-----3-----2-----1-----0

Very Useful		Neither Useful nor Useless	Very Useless	Don't Know

Results: The results of the analysis of the respondents' ratings of each major subject area of the course are presented in Table XV.

TABLE XV

Population One, Subpopulation Three - Frequency Analysis of Ratings of Course Subject Areas

Block/Title Subject Area	Number of Responses	Ratings Median	Mode	(Number of Responses in Modal Class)
I /Fundamentals I				
A. Orientation	155	4.729	4	(40)
B. Safety	155	6.061	7	(63)
C. Weapon System Familiarization	158	5.322	5	(45)
D. Corrosion	160	3.864	1	(33)
E. Hazard Reporting	156	4.586	4	(48)
F. Introduction to Electricity	153	6.047	7	(62)

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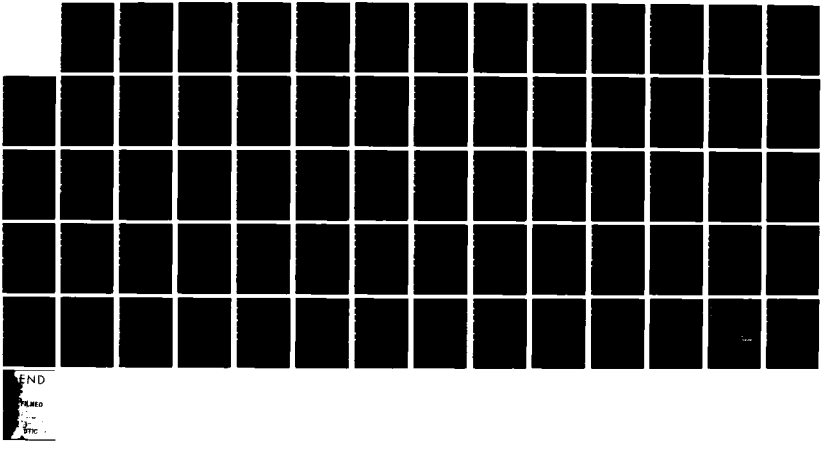

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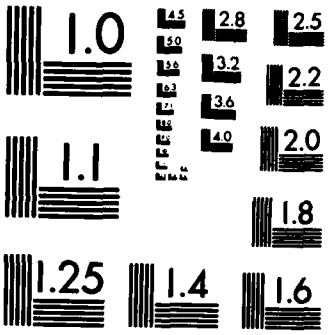

TABLE XV (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Mode	(Number of Responses in Modal Class)
G. Electrical Systems Components	153	6.080	7	(58)
H. Multimeter Usage	151	6.532	7	(78)
I. Hand Tools	152	5.540	7	(52)
J. Electrical Soldering	158	5.064	5	(39)
II /Fundamentals II				
A. Nuclear Surety	158	5.167	5	(39)
B. Electrical Fundamentals	154	5.905	7	(55)
C. Solid State Devices	155	4.712	7	(29)
D. Electrical System Components	154	5.849	7	(49)
III /Power Generation and Distribution I				
A. SAC CEMS	157	5.839	7	(58)
B. Internal Combustion Engine Operation	155	5.431	7	(43)
C. LF Power Distribution	153	5.911	7	(60)
D. Power Generation System	155	6.015	7	(61)
E. LCF Power Distribution	155	5.677	7	(52)
IV /Power Generation and Distribution II				
A. Diesel Electric Unit (DEU) Operation	154	5.957	7	(58)
B. DEU Maintenance	153	5.922	7	(58)
C. Troubleshooting LF Standby Power	152	6.033	7	(62)
V /Air Conditioning Fundamentals				
A. Refrigeration Principles	153	6.363	7	(71)
B. Refrigeration System Components	152	6.364	7	(70)
C. Environmental System Components	152	6.276	7	(65)

TABLE XV (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Mode	(Number of Responses in Modal Class)
D. Environmental Control System (ECS) Operation	152	6.348	7	(69)
E. Adjust ECS Controls	152	6.446	7	(74)
VI /Miscellaneous				
A. Operation of LCF ECS (Wing III-V)	149	5.048	6	(33)
B. Technical Orders	156	5.841	7	(51)
C. Waste Water System	156	4.462	5	(34)
D. Missile Maintenance Management	150	4.188	4	(32)
E. Standard Publications	153	4.453	5	(35)
F. Vehicles	157	4.019	1	(34)
G. Hardness Assurance and Aerospace Hardware	154	4.765	5	(34)
H. Site Penetration	154	5.167	7	(44)
I. Emergency Storage Battery Maintenance	157	4.957	7	(40)
J. Repair Refrigerant Subsystem	154	5.711	7	(47)
K. Tubing Repair	162	5.015	6	(34)
VII /ECS Maintenance				
A. Operation of LF ECS (Wing IV)	142	4.667	1	(34)
B. Security	156	4.667	5	(30)
C. Missile Safety	154	4.867	4	(33)
D. Maintenance Data Collection	153	4.486	4	(37)
E. Portable Air Conditioner	159	3.911	1	(36)
F. Brine System Maintenance	152	5.579	7	(41)
G. Refrigeration System Maintenance	151	5.767		(44)
H. Balance Air Conditioning Subsystem	149	5.224	5	(38)
I. Makeup Air System Maintenance	152	5.068	5	(37)

TABLE XV (continued)

Block/Title Subject Area	Number of Responses	Ratings (Number of Responses in Modal Class)		
		Median	Mode	
VIII/LF Inspection and Maintenance				
A. Periodic Inspection of LF Systems	150	5.150	7	(44)
B. Troubleshoot and Adjust ECS Controls	152	6.143	7	(66)
C. Troubleshoot and Adjust Power Subsystems	148	5.900	7	(59)
IX /Troubleshooting LF Systems				
A. Troubleshooting LF Systems	143	5.482	7	(50)
B. Weapon System Familiarization	143	5.229	7	(39)

Using the median rating, it was observed (refer to Table XV) that the vast majority of subject areas (46) were rated as useful (a rating greater than 4.500). No areas were rated as useless (a rating less than 3.500). Six areas--Block VI, areas C, D, E, and F; and Block VII, areas D and E--were rated as neither useful nor useless (a rating between 3.5 and 4.5).

Questions 22 Through 27. The final five questions were to be answered only by the personnel assigned AFS 445x0G who were assigned to either FMT or PMT--135 of the total 171 respondents met this criteria. All personnel meeting this criteria were asked to complete questions 22, 23, and 24. Only those personnel assigned to FMT or PMT and who had completed TTB training were asked to complete questions 25, 26, and 27.

Question 22: After you were assigned to FMT or PMT, how long did you have to wait before starting training at TTB?

Results: There were one hundred twenty-nine responses to this question--four less than expected based on the number of respondents who were assigned to either FMT or PMT. Four respondents reported they waited less than 30 days after assignment to FMP or PMT; 27 respondents reported they waited between 31 and 60 days; 34 respondents reported they waited between 61 and 90 days; and 27 respondents reported they waited between 91 and 120 days. Thirty-seven respondents indicated they had to wait over 120 days after assignment to FMT or PMT before they began training at TTB. These respondents were requested to indicate the number of days they had to wait. Twenty-three of these 37 respondents indicated they began TTB training within 180 days after assignment to FMT or PMT; 11 respondents within 270 days; one respondent within a year; and two respondents reported they began TTB training within a year and one-half after assignment to FMT or PMT.

An "average" wait was computed by taking the larger of each waiting length category (i.e., of the 31 to 60 day category, the 60 day value was assigned to each individual in the category), then multiplying the number of respondents in that category and adding the category total man-wait days and dividing this total by the number of respondents; this yielded a "worst case" average wait time. The "average" wait time arrived at by this method was approximately 129 days, although nearly 90 percent of the respondents began training at TTB within 120 days of assignment to either the FMT or PMT section.

Question 23: What did you do during a typical duty week (duty hours 0800-1700, M-F) when you were assigned to either the FMT or PMT section and awaiting TTB training?

Results: Eighty-five of the 133 respondents asked to complete this question indicated they spent a median 30 percent of the duty week performing squadron or base details. One hundred and four respondents spent a median 30 percent of the duty week performing in-shop details. A median 24 percent of the duty week of 62 respondents was occupied by dispatching to LFs or LCCs with supervisors. Eighty-two respondents indicated a median 27 percent of their duty week was spent dispatching to LFs or LCCs with either qualified FMTs or PMT. Ninety-six respondents said they were idle a median of 47 percent of their duty week. Thirty respondents indicated they spent a median of 45 percent of their duty week involved in activities such as: . CDC study, assisting teams load vehicles for dispatch, and classes.

Question 24: What do you think were the reasons you were delayed in beginning TTB training?

Results: One hundred twenty-two respondents answered this question. A number of the responses to this question were categorized under the heading: personnel awaiting training exceeded the capacity of TTB resources, i.e., either instructors, vehicles, equipment, or available trainer time was insufficient to meet demand. The responses under this heading were: waiting for other teams to finish (32 responses); not enough TTB instructors (27 responses); the shop was overmanned (16 responses); not enough equipment, vehicles, or trainer time (4 responses). Seventeen respondents indicated they were delayed beginning training at TTB because they had to wait for additional personnel to fill team

positions. A number of other responses were given by five or fewer respondents. Those responses and the number of times they appeared as a response were: training classes, e.g., nuclear surety, missile safety (5); cross trainees and higher ranking incoming personnel were given precedence in entering training at TTB (4); security clearance (2); in-processing to the base (1); holidays (1); weather (1); and poor management of personnel (1).

Question 25: How long has it been since you graduated from TTB?

Results: One hundred twenty-three respondents answered this question. Of those, 10 said they had graduated from TTB training from one year to 15 months prior to completing the survey. One hundred and twelve indicated they had completed TTB training between 15 and 18 months prior to completing the survey, and one respondent replied that he had completed TTB training more than two years prior to completing the survey.

Question 26: Did the technical training you received at Chanute prepare you for TTB?

Results: One hundred and nineteen responses were recorded for question 26. One hundred and seven respondents indicated the training they had received at Chanute had prepared them for training at TTB; 12 said that the training they received at Chanute had not prepared them for training at TTB.

Question 27 was intended for the respondents who felt that the training they received at Chanute had not prepared them for additional training at TTB.

Question 27: If you answered no to question 26, what training was missing from your Chanute training that would have prepared you for TTB?

Results: Only 12 respondents replied no to question 26; however, 15 respondents replied to question 27. The responses were: more hands-on training; not enough training on my wing's system and too much on other wing's systems; the Chanute training needed to be more in-depth; and, too much time elapsed between my graduation from Chanute and training at TTB; therefore, I forgot alot of material.

Cross Tabulation Analysis. To review, three variables: (1) duty assignment; (2) the version of the technical course attended; and (3) the time elapsed since graduation from Chanute to completion of the survey, were selected for cross tabulation to the responses to questions 12 and 14, and to the ratings of the course subject areas listed under question 21. There is only one version of the C3ABR44530G course; therefore, cross tabulation of variable two to the responses to questions 12, 14, and 21 would have been meaningless and thus was not accomplished. In order to be consistent with the previous discussions of the results of the surveys administered to personnel assigned AFSs 316x0G and 443x0G, the variable associated with duty assignment is referred to as variable one and the variable representing the time elapsed between graduation from Chanute and administration of the survey is referred to as variable three (in this case there is no variable two). In addition, the reader is reminded that a relationship between variable one or variable three and the responses to questions 12, 14, or 21 was not indicated unless the following criteria were satisfied: a chi square significance value equal to or greater than .95, and a Cramer's V value of .5000 or greater.

Cross Tabulation Results.

Question 12. Question 12 asked the respondents: Did you receive training at Chanute for systems which are not in use at your base? Cross tabulation of variable one to the responses to question 12 revealed no associative relationship between the duty assignment of the respondents and their responses to question 12, based on the established criteria. Cross tabulation of variable three to question 12 revealed no associative relationship between the time elapsed since the respondents graduated from Chanute and when they completed the survey.

Question 14. Question 14 asked the respondents: Are there any systems that you will be/are working on at your base for which you did not receive training at Chanute? Cross tabulation of variable one to the responses to question 14 did not meet the established criteria; therefore, no associative relationship between the respondents' duty assignment of the respondents and their responses to question 14 were indicated. The cross tabulation of variable three to the responses to question 14 also indicated no associative relationship, at the selected significance levels, between the time elapsed since the respondents had graduated from Chanute to the time they completed the survey and their responses to question 14.

Question 21. As discussed previously, question 21 consisted of 52 subquestions representing the subject areas which were identified on the C3ABR44530G course chart. These subject areas were divided into nine blocks based on the nine blocks of instruction in the course. The following table presents the results of the cross tabulation of variables one and three to the ratings for each of the subject areas

listed under question 21. An "X" indicates the chi square significance value equalled or exceeded the selected criteria. For cross tabulations which met the chi square criterion, the Cramer's V value was calculated; if it met the selected criterion, it was listed in parentheses following the corresponding "X". Thus, any variable-response pair having both an "X" and a Cramer's V entered where their respective column and row intersect were accepted as having exhibited an associative relationship.

TABLE XVI

Population One, Subpopulation Three - Cross Tabulation Results of Selected Variables and Ratings of Course Subject Areas

Block/Title Subject Area	Variable 1	Variable 3
I/Fundamentals I		
A. Orientation	X	
B. Safety		
C. Weapon System Familiarization		
D. Corrosion		
E. Hazard Reporting		
F. Introduction to Electricity		
G. Electrical Systems Components		
H. Multimeter Useage		
I. Hand Tools		
J. Electrical Soldering		
II/Fundamentals II		
A. Nuclear Surety		
B. Electrical Fundamentals		
C. Solid State Devices		
D. Electrical System Components		
III/Power Generation and Distribution I		
A. SAC CEMS		
B. Internal Combustion Engine Operation		
C. LF Power Distribution		
D. Power Generation System		
E. LCF Power Distribution		

TABLE XVI (continued)

Block/Title Subject Area	Variable 1	Variable 3
IV/Power Generation and Distribution II		
A. Diesel Electric Unit (DEU) Operation		
B. DEU Maintenance		
C. Troubleshooting LF Standby Power		
V/Air Conditioning Fundamentals		
A. Refrigeration Principles		
B. Refrigeration System Components		
C. Environmental System Components		
D. Environmental Control System (ECS) Operation		
E. Adjust ECS Controls		
VI/Miscellaneous		
A. Operation of LCF ECS (Wing III-V)	X	
B. Technical Orders		X
C. Waste Water System	X	
D. Missile Maintenance Management		
E. Standard Publications		
F. Vehicles	X	
G. Hardness Assurance and Aerospace Hardware		
H. Site Penetration		X
I. Emergency Storage Battery Maintenance		X
J. Repair Refrigerant Subsystem		X
K. Tubing Repair		X
VII/ECS Maintenance		
A. Operation of LF ECS (Wing IV)		
B. Security		
C. Missile Safety		
D. Maintenance Data Collection		
E. Portable Air Conditioner		
F. Brine System Maintenance		X
G. Refrigeration System Maintenance		X
H. Balance Air Conditioning Subsystem		
I. Makeup Air System Maintenance		
VIII/LF Inspection and Maintenance		
A. Periodic Inspection of LF Systems	X	
B. Troubleshoot and Adjust ECS Controls		
C. Troubleshoot and Adjust Power Subsystems		X

TABLE XVI (continued)

Block/Title Subject Area	Variable 1	Variable 3
IX/Troubleshooting LF Systems		
A. Troubleshooting LF Systems		X
B. Weapon System Familiarization		

An associative relationship, based on the established criterion for the chi square statistic significance value, was indicated between variable one (duty assignment) and four of the C3ABR44530G course subject areas; however, none of these variable-response pairs met the established criterion (.5 or greater) value for Cramer's V; therefore, no associative relationships between the duty assignment of the respondents and their ratings of the C3ABR44530G course subject areas were indicated (in fact, the Cramer's V values for the nine cross tabulation pairs meeting the chi square significance level value criterion were all below .3--well below the .5 level established as the criterion). Nine variable-response (subject area) pairs met the selected level of significance criterion for the chi square statistic computed for variable three-response pairs; however, none of these variable-response pairs met the selected Cramer's V level of significance. Thus, no associative relationships between the time elapsed since the respondent's graduation from Chanute until administration of the survey (variable three) and their ratings of the C3ABR44530G course subject areas were indicated.

Administration and Receipt of Surveys - Population Two

A 14 question survey was sent to each of the 60 personnel in the selected sample of population two (refer to Table II, page 9). Forty-two (70 percent) of these surveys were completed and returned. The surveys administered to the selected members of population two were identical with one another with the exception of question 14. As explained earlier in this thesis, question 14 of the population two survey was patterned after question 21 of the survey administered to members of population one, i.e., question 14 listed the blocks and subject areas of the Chanute formal technical training courses and asked the respondents to provide a rating for each subject area. Unlike the survey administered to population one, however, the respondents in this case were asked to indicate, on a 7-point interval Likert scale, the change in emphasis--eigher less, more, or no change--they felt each subject area within the blocks of instruction should receive; NOT whether they felt the instruction provided was relevant to duty requirements. Respondents were asked to rate only the course(s) their subordinates should have attended--i.e., the Officer-in-Charge of the Missile Electrical Branch was asked to rate the version of the C3ABR31630G course intended for technicians who were subsequently assigned to his particular base; the Officer-in-Charge of the Facilities Maintenance Teams Section was asked to rate only the C3ABR44530G course, etc. Twelve respondents (the maintenance supervisor and superintendent of the Organizational Missile Maintenance Squadron at each of the six Minuteman bases) were asked to rate two courses--the C3ABR31630G and the C3ABR44330G courses. Of those 12 respondents, the maintenance supervisor and maintenance superintendent assigned to Malmstrom AFB were to rate two

versions of the C3ABR31630G course (-002 and -004), and both versions of the C3ABR44330G course (-003 and -004), reflecting the fact that both the Minuteman II and Minuteman III weapon systems were based at Malmstrom AFB.

Population Two Results

Introduction. The first 13 questions of the survey administered to the selected members of population two, as discussed above, were identical among all versions of the population two survey administered. The results obtained from the responses to these questions are addressed first, followed by a discussion and results of the technical training course--wing specific, question 14. The responses to the survey question 14 are presented in the following order: C3ABR31630G-001, -002, -004; C3ABR44330G-003, -004; and C3ABR44530G-000.

Frequencies and Content Analysis. In the following paragraphs, each survey question is presented followed by the results of the frequency and content analysis as appropriate.

Question 1: In a previous study, enlisted Minuteman missile maintenance personnel cited the delay they experienced in beginning TTB training as a problem. Do you agree that the time enlisted Minuteman missile maintenance personnel must wait before beginning TTB training is a problem?

Results: Thirty-three of the respondents answered this question; of those, 26 indicated yes they believed the delay EMMMP experienced in beginning training at their unit's TTB was a problem. The 26 respondents who replied yes to this question were asked to respond to question 2. The seven respondents who answered no, that the delay

experienced by EMMMP in beginning TTB training had not constituted a problem, were instructed to ignore question 2.

Question 2: If you answered a (yes) to the previous question, what are the major factors responsible for this situation? Please be specific.

Results: The 26 respondents asked to answer this question each listed two or three factors they considered responsible for the delay EMMMP experienced in beginning training at their unit's TTB. Their answers to this question echoed many of the answers provided by the EMMMP respondents to a similar question (question 24) on the survey questionnaire administered to members of population one. The responses to this question are listed below, with the number of respondents who made that response indicated in parantheses:

a. The number of recent graduates of Chanute training assigned to a particular base over a relatively short span of time exceeds the number of TTB instructors available to train them in a timely manner (28).

b. EMMMP had to wait for their security clearance (9).

c. Drivers' training/collateral training (7).

d. Lack of TTB resources, other than instructors, i.e., vehicles and equipment (4).

e. The length of time required to train EMMMP once they began training at TTB (3).

f. Shortage of team chiefs (2).

g. Personnel Reliability Program certification (1).

h. Some recent arrivals from Chanute had to complete a remedial reading course (1).

The next four "questions" asked the respondents to rate their degree of agreement or disagreement with each statement presented. A 7-point interval Likert scale was provided. A respondent indicated strong disagreement with a particular statement by a rating of 1; a rating of 2 or 3 indicated disagreement of a less strong nature; a rating of 4 indicated the respondent neither agreed nor disagreed with the statement; ratings of 5 and 6 indicated increased agreement; and the respondent indicated strong agreement with the statement by a rating of 7. In interpreting the responses (ratings) to these statements, a median rating less than 3.5 indicated disagreement with the statement; a median rating between 3.5 and 4.5 inclusively indicated the respondents, as a group, neither disagreed nor agreed with the statement; a median rating greater than 4.5 indicated agreement with the statement. The four statements presented to the respondents were questions 3 through 6 of the population two survey questionnaire and are presented below. The results of the analysis of the responses are presented in Table XVII. The questions/statements were:

Question 3: Three different versions of the C3ABR31630G formal training course are effective for training enlisted Minuteman missile maintenance personnel (AFS 316x0G).

Question 4: Three different versions of the C3ABR31630G formal training course are effective for training enlisted Minuteman missile maintenance personnel (AFS 316x0G).

Question 5: Two different versions of the C3ABR44330G formal training course are necessary for training enlisted Minuteman missile maintenance perosnnel (AFS 443x0G).

Question 6: Two different versions of the C3ABR44330G formal training course are effective for training enlisted Minuteman missile maintenance personnel (AFS 443x0G).

TABLE XVII

Population Two Respondents' Ratings of
Questions 3 through 6

Question	Number of Responses	Ratings		(Number of Responses in Modal Class)	Range	
		Median	Mode		Min	Max
3	32	5.000	2	(7)	1	7
4	30	4.955	5	(11)	1	7
5	30	4.500	5	(6)	1	6
6	32	4.700	5	(10)	1	7

As can be seen from Table XVII, question 5 was the only statement to receive a median rating indicating less than agreement--specifically, neither agreement nor disagreement; however, the median rating for this question--4.5--was at the high (agree side) extreme for the neither agree nor disagree response, indicating the respondents, as a group, tended toward agreement with this statement. From unsolicited comments received from a few of the respondents, it was apparent some of the respondents had not known the C3ABR31630G and C3ABR44330G formal technical training courses existed in different versions based on the different weapon systems--hardware/configurations in use at the different Minuteman bases. This may have affected the ratings accorded each of these statements.

Questions 7 and 8 were concerned with the causes of a backlog of EMMMP awaiting training at the respondents' particular unit's TTB. Question 7 was general--the respondents were asked what they believed to be the cause of a backlog if and/or when their unit experienced one. In

contrast, question 8 was directed at finding out how significant the lack of a valid security clearance was in causing or contributing to a backlog of personnel awaiting training at their unit's TTB.

Question 7: What factor(s) do you believe is (are) the cause for a TTB backlog when you have one?

Results: This question illicited many of the same responses as were received in response to question 2; in fact, a number of respondents referenced their responses to question 2 as their response to this question. There were, however, three responses unique to this question. One respondent indicated a lack of in-shop instructors to supplement TTB instructors in accomplishing recurring training contributed to a backlog of EMMMP awaiting training at their unit's TTB. Another respondent cited an inefficient use of trainer time by the TTB instructors contributed to a backlog of EMMMP awaiting training at his unit's TTB. A third respondent said the TTB instructors at his unit's TTB were relatively deficient in system maintenance experience. He said this resulted in a longer training period, thus resulting in a backlog.

Question 8: How significant is the lack of a security clearance in causing a backlog of EMMMP awaiting training at their unit's TTB?

Results: The responses to this question ranged from very significant to no problem. The units (bases) of the individuals responding to this question were not identified; therefore, it was not possible to determine if the problem, if there was one, was limited to: (1) a particular base, (2) a particular AFS at a particular base, or (3) a particular AFS or a number of AFSs at a particular or at a number of bases. However, the relative numbers of the responses indicated most

respondents did not consider the lack of a security clearance as a significant factor in causing a backlog at their unit's TTB. The responses are presented below, the number in parentheses indicates the number of respondents making that response:

a. No problem, or not very significant (19)

b. Under 25 percent (2)

c. Somewhat (1)

d. Moderate (1)

e. Very (6)

One respondent replied that the problem with security clearances resulting in a backlog of EMMMP awaiting training at TTB was generally experienced by personnel cross-training into the particular career field; not by recent graduates of Chanute.

The next three questions were concerned with the respondents' opinions on the use, and their personal experience with, the AF Form 1284, Training Quality Report.

Question 9: It is generally accepted that the AF Form 1284 (Training Quality Report) has not been used to identify technical training deficiencies of the graduates (or of the courses themselves) to Chanute; why do you think it has not been used?

Results: There was a wide range of responses to this question. Some of the respondents disagreed with the generalization that the AF Form 1284 has not been used--four respondents said they use them regularly. Several of the respondents cited a 45 day limit for using an AF Form 1284 for notifying Chanute of Technical knowledge deficiencies of an individual graduate of a Chanute course--they said this was too short

a period of time to evaluate the individual. Other respondents indicated there was no standardized procedure to check the technical knowledge of recent Chanute graduates. Other respondents said the AF Form 1284 probably was not used because: a lack of understanding of its use on the part of base level personnel (10 respondents); there were other means to accomplish the same ends (5 respondents); supervisors already have too much paper work and would rather just solve the immediate problem--the problem was considered to be the individuals, not a problem with Chanute--(4 respondents); and, no feedback was received if one (an AF Form 1284) was submitted (4 respondents).

Question 10: What feedback have you received concerning deficiencies you identified to Chanute on the AF Form 1284?

Results: The responses to this question, as the case with several other questions, were varied. Several respondents replied they received specific feedback which explained exactly what action Chanute could or could not take and why. The most frequent response (indicated by 12 respondents) to this question, however, was that no feedback had been received. Other replies indicated the respondents were not satisfied with the feedback they received--either it was too general, it did not address the problem, or the information provided was incorrect.

Question 11: How has Chanute resolved any of the problems you have identified through the AF Form 1284? Give at least one example.

Results: Eleven of the respondents indicated either Chanute had not resolved any deficiencies the respondent had identified to Chanute by means of the AF Form 1284, or due to a lack of feedback the respondent was unaware of the actions taken by Chanute to resolve these

deficiencies. Other respondents indicated problems identified by AF Form 1284 had been resolved. A specific example reported by one respondent of Chanute's resolution of a problem identified through the AF Form 1284 was the increased course length for the C3ABR44530G technical training course. Another specific example, reported by two respondents, was the use of the PSM 37 (analog electrical meter) in addition to digital meters in the C3ABR31630G technical training course.

The next survey question dealt with the respondents' perceptions of the preparedness of the graduates of Chanute technical training courses for the additional training those graduates underwent at the unit's TTB. If the respondent felt the Chanute graduates were not as prepared as they thought they should have been, the respondent was asked to explain why.

Question 12: Do you think recent Chanute graduates are as prepared for TTB training as you would like them to be?

Results: Thirty respondents replied to this question. The vast majority--27 respondents--felt the graduates of the Chanute technical training courses were adequately prepared for the additional training they underwent at their unit's TTB. Three respondents indicated they believed the graduates (at least some of the graduates) of the Chanute technical training courses were not adequately prepared for the additional training they had to undergo at their unit's TTB. These three respondents were asked to reply to question 13.

Question 13: Why do you think graduates of the Chanute technical training courses are not as prepared for TTB as you would like them to be?

Results: The three respondents indicated a number of reasons/problems of why they felt graduates of the Chanute courses were

not as prepared for TTB training as they would like them to have been. Some of the responses were incident/individual specific, and not necessarily related to technical knowledge deficiencies. The responses included: some graduates of the Chanute courses cannot read (3 responses); some graduates come to us with medical problems (2 responses); and some graduates cannot meet physical requirements (1 response). Other respondents indicated they believed the technical knowledge of the Chanute graduates was deficient. Specific technical knowledge areas in which the respondents felt Chanute graduates were deficient were: security system troubleshooting/repair for both the inner zone and outer zone security systems (2 responses); meter usage, particularly the PSM 37 (2 responses); and technical order usage (1 response).

As previously mentioned, question 14 was based on the different versions of the Chanute technical training courses. The course and version of the course addressed in a particular survey by question 14 depended upon the base of assignment adn duty position of the respondent. For example, the Officer-in-Charge of the Missile Mechanical Branch at Grand Forks AFB ND received a questionnaire in which question 14 was based on the -004 version of the C3ABR44330G course--the verison of the AFS 443x0G course which his subordinates should have completed; likewise, the Officer-in-Charge of the Missile Electrical Branch at Whiteman AFB MO received a questionnaire in which question 14 was based on the -002 version of the C3ABR31630G course--the version of the AFS 316x0G course which his subordinates should have completed. Because the number of subquestions within question 14 was relatively large and because there were six versions of the question (one each for: the three versions of the

C3ABR44330G course, the two versions of the C3ABR31630G course, and the single version of the C3ABR44530G course), the results are presented in tabular form.

Question 14: Rate each subject area, using the following scale, on how you would like it to be emphasized for the Chanute formal training course.

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7-----6-----5-----4-----3-----2-----1-----0
More              No              Less    No
Emphasis          Change          Emphasis Opinion
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Results: Table XVIII presents the results of the frequency analysis of the respondents' ratings of the subject areas of the C3ABR31630G course.

The criteria employed in interpreting the median ratings was: a median rating less than 3.5 represented "less emphasis", a median rating between 3.5 and 4.5 inclusively represented "no change in emphasis", and a median rating greater than 4.5 represented "more emphasis" of a particular subject area was desired by the respondents. Referring to Table XVIII, it can be seen the respondents did not select any subject areas they felt should receive less emphasis. Of the 35 subject areas rated by the respondents, 24 subject areas were identified by the respondents as needing no change in emphasis. The remaining 11 areas: Block I, subsject areas D. Publications and E. Security; Block II, subject areas A. Personnel Access Systems and B. Security System; Block IV (course version 002), subject area C. LCF Fault Analysis; Block V (course version 002), subject areas C. LF Startup and Shutdown, D. Tape Loading, F. Missile Guidance Set Cooling System, G. Programmer Group, and H. LF Fault Analysis; and Block VI (course version 004), subject area B. Fault Analysis, had a

TABLE XVIII

Population Two Respondents' Ratings of the Subject Areas of Course C3ABR31630G

Block/Title Subject Area	Number of Responses	Ratings Median	Ratings Mode	(Number of Responses in Modal Class)
I/Familiarization				
A. Orientation	16	3.917	4	(12)
B. Weapon System Familiarization	16	4.278	4	(9)
C. Tools and Aerospace Hardware	16	4.300	4	(10)
D. Publications	16	5.100	5	(5)
E. Security	16	4.750	4	(7)
F. Maintenance Management	16	3.750	4	(8)
G. Safety	16	4.500	4	(8)
II/Security and Personnel Access Systems				
A. Personnel Access Systems	16	4.750	4	(6)
B. Security System	15	5.333	6	(5)
III/Power Systems				
A. LCF Power System	16	3.786	4	(7)
B. LF Power System	16	3.500	4	(7)
IV(Version 001)/Launch Control Facility Command and Control				
A. Command and Control System Operation	2	3.500	NA	
B. Command and Control System Maintenance	2	4.000	NA	
C. LCF Intrasite Cabling	2	4.000	NA	
V(Version 001)/Launch Facility Command and Control				
A. OGE/AVE Shutdowns and Startups	2	4.000	NA	
B. Command and Control System Operation	2	4.000	NA	
C. Command and Control System Maintenance	2	4.000	NA	
D. LF Intrasite Cabling	2	3.500	NA	

TABLE XVIII (continued)

Block/Title Subject Area	Number of Responses	Ratings		(Number of Responses in Modal Class)
		Median	Mode	
VI(Version 001)/Missile Guidance and Control System				
A. Missile Guidance System (MGS)	2	4.000	4	(2)
B. MGS Cooling System	2	4.500	NA	
IV(Version 002)/Launch Control Facility				
A. Command and Control System	9	4.000	4	(6)
B. Operation and Maintenance	9	4.000	4	(4)
C. LCF Fault Analysis	9	5.000	5	(4)
V(Version 002)/Launch Facility (LF)				
A. Missile and LF Weapon System Description	9	4.000	4	(4)
B. LF Command and Control System	9	4.000	4	(5)
C. LF Startup and Shutdown	9	5.000	5	(4)
D. Tape Loading	9	5.000	4	(3)
E. Code Change	9	4.000	4	(4)
F. Missile Guidance Set Cooling System	9	5.000	5	(4)
G. Programmer Group	9	5.000	4	(4)
H. LF Fault Analysis	9	5.000	4	(3)
VI(Version 002)/Intrasite Cabling				
A. Intrasite Cabling	9	4.000	4	(5)
B. Fault Analysis and VHF Command Radio System	9	4.000	4	(5)
C. Electrical Surge Arrestors, Filters, and Interconnecting Box	9	4.000	4	(3)
IV(Version 004)/Command and Control Systems, Launch Control Center (LCC)				
A. Command and Control--LCC	No Data Available			
V(Version 004)/Command and Control, Launch Facility (LF)				
A. Command and Control--LF	4	4.000	4	(2)

TABLE XVIII (continued)

Block/Title Subject Area	Number of Responses	Ratings		(Number of Responses in Modal Class)
		Median	Mode	
VI(Version 004)/Intrasite Cabling and Fault Analysis				
A. Intrasite Cabling	3	4.000	4	(3)
B. Fault Analysis	3	5.000	NA	

NOTE: The median rating value for Blocks IV, V, and VI for all three versions of the course were computed by hand due to the small sample sizes. The median of the ratings was computed by the following method from McClave and Benson (10:65): the respondents' ratings were arranged in ascending numerical order, if the number of ratings was odd, the middle number of the set was selected as the median; if the number of ratings was even, the median was computed by taking the mean of the middle two numbers. This method of computing the median is different from the method used in SPSS (11).

median rating greater than 4.5 indicating the respondents felt these areas should receive more emphasis during instruction of the personnel assigned AFS 316x0G.

The next table, Table XIX, presents the median and modal rating of the C3ABR44330G technical training course. All subject areas in Block I through Block VII were identical for both versions of the course (i.e., -003 and -004), Block VIII was the only instruction area for which the subject areas were different.

TABLE XIX

Population Two Respondents' Ratings of the Subject Areas of Course C3ABR44330G

Block/Title Subject Area	Number of Responses	Ratings		(Number of Responses in Modal Class)
		Median	Mode	
I/WS-133 Familiarization				
A. Security	13	4.000	4	(9)
B. Tools and Equipment	13	4.143	4	(7)
C. Weapon System Familiarization	13	4.222	4	(9)
D. Maintenance Management	13	3.714	4	(7)
E. Publications	13	4.250	4	(6)
F. AF Occupational Safety and Health (AFOSH) Programs	13	4.063	4	(8)
II/Missile and Electrical Principles				
A. Missile	13	4.250	4	(6)
B. Principles of Electricity	13	3.333	4	(6)
C. Operation and Maintenance of 1 H-1 Ground Heater	14	3.000	4	(6)
III/Hydraulic/Pneumatic Principles and Systems				
A. Hydraulic Principles and Systems	13	3.857	4	(7)

TABLE XIX (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Ratings Mode	(Number of Responses in Modal Class)
B. Hydraulic Test Stand	12	3.250	3	(4)
C. Operation and Maintenance of Blast Doors	13	2.750	1	(5)
D. Operation and Maintenance of Ventilation Safety System	13	2.667	1	(5)
E. Operation and Maintenance of Hand Lift Trucks	12	2.750	3	(4)
F. Pneumatic Principles and Systems	13	3.250	4	(5)
G. Corrosion	11	2.625	3	(4)
IV/Missile Handling and Auxiliary Equipment				
A. Missile Handling Vehicles	14	4.500	4	(7)
B. Missile Handling Equipment	14	4.500	4	(5)
C. Missile Removal and Installation	14	4.500	4	(7)
D. Operation and Maintenance of Shock Absorbers, Attenuation System, and Isolation System	6	3.833	4	(3)
E. Operation and Maintenance of Elevator Work Cage	7	4.125	4	(4)
V/Vehicles and Proofload Facility				
A. Vehicle and Equipment Control Branch (VECB)	12	4.071	4	(7)
B. Maintenance Data Collection and Forms	12	4.100	4	(5)
C. Operation and Maintenance of Support Trucks	12	4.167	4	(6)
D. Operation and Maintenance of Payload Transporter	11	4.000	4	(5)
E. Operation and Maintenance of Guidance and Control Purging Manifold	11	4.083	4	(6)
F. Operation and Maintenance of a Proofload Test Facility/ Fixture	11	3.333	3	(3)
G. Operation and Maintenance of Portable Air Conditioner	12	2.833	1	(3)

TABLE XIX (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Ratings Mode	(Number of Responses in Modal Class)
VI/Launch Facility Maintenance				
A. Personnel Access System Operation	12	4.125	4	(8)
B. Security Pit Vault Door Maintenance	12	3.700	4	(5)
C. Maintenance of Secondary Door	12	2.833	1	(4)
D. Electromechanical Linear Actuator Maintenance	12	2.833	1	(5)
E. Launcher Closure Operation and Maintenance	13	5.667	7	(4)
VII/Missile Umbilicals and Suspension Systems				
A. Missile Suspension System Function and Maintenance	13	4.417	4	(6)
B. Missile Guidance and Control Umbilical Function/ Maintenance	13	5.000	4	(5)
C. Skirt Umbilical Function/ Maintenance	13	5.000	4	(5)
VIII(Version 003)/Movement of MM II Aerospace Vehicle Equipment				
A. Operation and Maintenance of Reentry Vehicle Guidance Control Van	4	4.500	4	(2)
B. Removal and Replacement of Aerospace Vehicle Equipment (LGM 30F)	4	4.500		
C. Launch Facility Shutdown	4	4.167	4	(3)
VIII(Version 004)/Movement of MM III Aerospace Vehicle Equipment				
A. Removal and Replacement of Aerospace Vehicle Equipment	10	4.214	4	(7)
B. Launch Facility Shutdown	10	4.167	4	(6)

Applying the criteria explained previously, there were 12 subject areas which the respondents felt should receive less emphasis. These 12 subject areas were: Block II, subject areas B. Principles of Electricity and C. Operation and Maintenance of 1 H-1 Ground Heater; Block III, subject areas B. Hydraulic Test Stand, C. Operation and Maintenance of Blast Doors, D. Operation and Maintenance of Ventilation Safety System, E. Operation and Maintenance of Hand Lift Trucks, F. Pneumatic Principles and Systems, and G. Corrosion; Block V, subject areas F. Operation and Maintenance of a Proofload Test Facility/Fixture, and G. Operation and Maintenance of Portable Air Conditioner; and Block VI, subject areas C. Maintenance of SEcondary Door, and D. Electromechanical Linear Actuator Maintenance. Forty-one subject areas had a median rating in the "no change in emphasis" category (3.5 through 4.5). Three subject areas had a median rating greater than 4.5, indicating the respondents felt these areas should receive more emphasis. These three subject areas were: Block VI, subject area E. Launcher Closure Operation and Maintenance, and Block VII, subject areas B. Missile Guidance and Control Umbilical Function/Maintenance, and C. Skirt Umbilical Function and Maintenance. It was interesting to note that the subject areas the respondents felt should receive less emphasis were subject areas related to non-MMT tasks; conversely, those subject areas identified by the respondents for which they felt more emphasis was needed were MMT related tasks. These findings could indicate some bias in the ratings due to the duty positions of the personnel from population two selected for survey--i.e., among the sample selected from population two were managers and supervisors of the MMT duty section; however, there were

no representatives of the other duty sections to which personnel in AFS 443xOG were assigned, e.g., the Missile Handling Teams section.

The results of the rating of the subject areas of the C3ABR44530G technical training course by the managers and supervisors in charge of personnel assigned AFS 445xOG are presented in Table XX. The reader is reminded that there was only one version of this course which EMMMP assigned AFS 445xOG attended regardless of which Minuteman base the individuals eventually were assigned.

TABLE XX

Population Two Respondents' Ratings of the Subject Areas of Course C3ABR44530G

Block/Title Subject Area	Number of Responses	Ratings Median	Ratings Mode	(Number of Responses in Modal Class)
I/Fundamentals I				
A. *Orientation	10	4.214	4	(7)
B. **Safety	10	5.500	6	(4)
C. **Weapon System Familiarization	9	5.333	5	(3)
D. *Corrosion	10	3.833	4	(3)
E. *Hazard Reporting	11	4.167	4	(6)
F. **Introduction to Electricity	10	6.167	7	(4)
G. **Electrical Systems Components	10	6.250	6	(4)
H. **Multimeter Usage	11	6.667	7	(6)
I. **Hand Tools	11	6.000	7	(4)
J. *Electrical Soldering	11	4.500	4	(4)
II/Fundamentals II				
A. *Nuclear Surety	11	4.400	4	(5)
B. **Electrical Fundamentals	11	6.250	7	(5)
C. **Solid State Devices	11	6.000	7	(4)
D. **Electrical System Components	11	6.333	7	(5)

TABLE XX (continued)

Block/Title Subject Area	Number of Responses	Ratings Median	Ratings Mode	(Number of Responses in Modal Class)
III/Power Generation and Distribution I				
A. **SAC CEMS	11	6.714	7	(7)
B. *Internal Combustion Engine Operation	11	4.400	4	(5)
C. **LF Power Distribution	11	6.250	7	(5)
D. **Power Generation System	11	6.000	7	(4)
E. **LCF Power Distribution	11	6.250	7	(5)
IV/Power Generation and Distribution II				
A. **Diesel Electric Unit (DEU) Operation	11	6.583	7	(6)
B. **DEU Maintenance	11	6.714	7	(7)
C. **Troubleshooting LF Standby Power	11	6.714	7	(7)
V/Air Conditioning Fundamentals				
A. **Refrigeration Principles	11	6.583	7	(6)
B. **Refrigeration System Components	11	6.250	7	(5)
C. **Environmental System Controls	11	6.333	7	(5)
D. **Environmental Control System (ECS) Operation	11	6.125	6	(4)
E. **Adjust ECS Controls	11	6.583	7	(6)
VI/Miscellaneous				
A. *Operation of LCF (Wing III-V)	8	4.250	4	(4)
B. **Technical Orders	11	6.000	7	(5)
C. *Waste Water System	11	4.000	4	(5)
D. *Missile Maintenance Management	11	4.083	4	(6)
E. *Standard Publications	11	4.000	4	(5)
F. *Vehicles	11	3.875	4	(4)
G. *Hardness Assurance and Aerospace Hardware	11	4.200	4	(5)
H. **Site Penetration	11	4.800	5	(5)
I. **Emergency Storage Battery Maintenance	11	4.800	5	(5)

TABLE XX (continued)

Block/Title Subject Area	Number of Responses	Ratings		(Number of Responses in Modal Class)
		Median	Mode	
J. **Repair Refrigerant Subsystem	11	5.250	7	(5)
K. **Tubing Repair	11	4.750	4	(3)
VII/ECS Maintenance				
A. *Operation of LF ECS (Wing IV)	7	4.125	4	(4)
B. *Security	10	4.100	4	(5)
C. *Missile Safety	10	4.000	4	(8)
D. *Maintenance Data Collection	10	3.500	3	(3)
E. *Portable Air Conditioner	10	4.000	4	(4)
F. **Brine System Maintenance	10	5.500	4	(4)
G. **Refrigeration System Maintenance	10	4.643	4	(7)
H. *Balance Air Conditioning Subsystem	10	4.500	4	(5)
I. *Makeup Air System Maintenance	10	4.500	4	(5)
VIII/LF Inspection and Maintenance				
A. **Periodic Inspection of LF Systems	11	5.375	5	(4)
B. **Troubleshoot and Adjust ECS Controls	11	6.583	7	(6)
C. **Troubleshoot and Adjust Power Subsystem	11	6.583	7	(6)
IX/Troubleshooting LF Systems				
A. **Troubleshooting LF Systems	11	5.375	5	(4)
B. *Weapon System Familiarization	11	4.400	4	(5)

*Subject areas are those which the respondents felt needed no change in emphasis.

**Subject areas are those which the respondents felt needed more emphasis.

Applying the criteria established earlier, it was found that the respondents had not rated any subject areas less than 3.5, indicating they felt no subject areas should receive less emphasis. The respondents rated 20 of the 52 subject areas of the C3ABR44530G course as subject areas they felt needed no change in emphasis. These 20 subject areas are highlighted by a single asterisk immediately preceding the subject area title in Table XX. The remaining 32 subject areas were rated as requiring more emphasis. These areas are denoted by a double asterisk immediately preceding the subject area title in Table XX. A cursory examination of the respondents' ratings of the subject areas indicated the respondents felt more emphasis was required for subject areas directly related to maintenance tasks and no change in emphasis was needed for subject areas not directly related to task accomplishment, e.g., in Block I, subject area H. Multimeter Usage received a median rating of 6.667, very high in the "more emphasis" range, as opposed to subject area E. Hazard Reporting, which received a median rating of 4.167, near the center of the "no change in emphasis" range. Although there are exceptions to this observation, it appeared to represent the pattern of the respondents' ratings of the subject areas of the C3ABR44530G technical training course.

Supplemental Data Received From Team Training Branches

Introduction. The responses to the questions intended to gather factual information from the six TTBs are presented in this section. The four TTBs that responded represented each type of weapon system (MM II and MM III) and course of instruction. In the following paragraphs, the responses to the requests for data are presented.

Question 1: Is there a backlog of students awaiting TTB training at your base?

Results: Four bases answered this question. Of these, three bases indicated they did have a backlog of students awaiting TTB training. These bases were asked to respond to question 2. One base indicated they were not experiencing a backlog of students awaiting training at TTB.

Question 2: How many EMMMP, assigned to your base, are awaiting TTB training?

Results: The three bases responding to this question were asked to indicate the number of EMMMP awaiting TTB training by AFS, and in the case of AFS 445x0G, by duty section--i.e., FMT or PMT. The data received in response to this question are presented in Table XXI.

TABLE XXI

Backlog of EMMMP Awaiting Training at Their Base's TTB

AFS	Average Number of Students Awaiting TTB	Number of Bases Indicating Backlog
316x0G	2	2
443x0G	8.5	2
445x0G (FMT)	3	3
445x0G (PMT)	2	1

Question 3: What is the average number of AF Forms 1284 (Training Quality Reports) your base sends to Chanute per month?

Results: Four bases responded to this question. All bases indicated they sent between zero to five AF Forms 1284 to Chanute

per month.

Question 4: What are some of the most common subjects of the AF Forms 1284 your base sends to Chanute?

Results: Four bases answered this question. The following responses (with the number of bases indicating that response in parentheses) were the most common subjects of the AF Forms 1284 sent by the bases to Chanute:

1. Lack of general knowledge (2)
2. Familiarization with operational base (2)
3. Reading comprehension (1)
4. Lack of security clearance (1)
5. Emergency shutdown (1)
6. Missile startup (1)
7. Distinguishing between LF/LCF tasks (1)
8. Lack of alignment procedures (1)
9. Lack of hands-on training (1)

Question 5: Who decides what subjects (STS tasks) make up the course of training at TTB?

Results: Four bases responded to this question. Of these, two indicated only the applicable work center supervisors decided what subjects make up the course of training at their bases. At one base, the supervisor in the applicable work center, in conjunction with personnel assigned to Quality Control (QC), and TTB decided what subjects to include in the TTB course of training at their base. One base indicated that TTB, QC, the applicable work center personnel, and personnel from Maintenance Control collectively decide the makeup of the TTB course of training.

Question 6: Does your TTB receive any guidance from off-base sources concerning the subjects (STS tasks) that must be included in the TTB course of training?

Results: Four respondents answered this question. Of these, three bases indicated that off-base sources gave them guidance as to what subjects must be included in the TTB course of training. These respondents were asked to answer question 7. One base indicated they did not receive off-base guidance concerning subjects that must be included in the TTB course of training.

Question 7: If you answered a (TTB receives guidance from off-base sources concerning the subjects that must be included in the TTB course of training) to question 6, please indicate the source or sources providing this guidance.

Results: Four bases replied a to question 6; all four answered this question. All four bases indicated that the 3901st Strategic Missile Evaluation Squadron was an off-base source of guidance concerning the subjects that must be included in the TTB course of training. Two bases indicated Headquarters SAC/LGB (Directorate of Missile Maintenance) was an off-base source of guidance concerning the subjects that must be included in the TTB course of training. One base indicated 15th AF/LGB (Directorate of Missile Maintenance) and the Ogden Air Logistics Center, Depot as off-base sources of providing guidance as to what subjects must be included in the TTB course of training.

Question 8: Are the TTB courses of training at your base coordinated with the TTB courses of training at any other base?

Results: Four bases answered this question. Of these, three bases indicated they did not coordinate their bases' TTB courses of

training with any other base. One base indicated that their TTB courses of training were coordinated with those of another base. This respondent was asked to answer question 9.

Question 9: If you answered a to the previous question, how often are your TTB courses of instruction coordinated with another Minuteman base?

Results: The one respondent who said his base's TTB coordinated their courses of instruction with another base indicated the TTB courses of instruction were coordinated monthly.

Question 10: Are any of your TTB courses of instruction coordinated with Chanute?

Results: Three bases answered this question. Of these, all three bases indicated they did not coordinate their TTB courses of instruction with Chanute.

Question 11: When is a new subsystem or modification (after receipt of technical data) to the system included in the TTB course of instruction?

Results: Four bases responded to this question. Of those, one base indicated that a new subsystem or modification is included in the TTB course of instruction as soon as the subsystem/modification is operational at his base. One respondent indicated the new subsystem/modification is included in the TTB course of instruction before the subsystem/modification is operational at his base. Another base indicated the new subsystem/modification was included in the course of instruction during the time the subsystem/modification is being installed at his base. The fourth base indicated the new subsystem/modification was included in the course of instruction at any one of the three times above (when the subsystem/modification is operational, before the subsystem/

modification is operational, or during the time the subsystem/modification is being installed at the base) depending on the modification.

Comparison of the Version of the Formal Technical Training Course Attended With Base Assignment

It was mentioned earlier in this thesis that the different versions of each of the three technical training courses of concern--C3ABR31630G-001, 002 and 004; C3ABR44330G-003 and 004; and C3ABR445x0G-000--were designed to provide EMMMP with training tailored to the system on which they were to be eventually working. The reader is referred to Table V for a review of the training courses and the bases for which they were designed. An arbitrary rule was established--a 25 percent occurrence rate of personnel sent to bases other than those for which their training had prepared them--which would indicate if a significant problem of misassignment of EMMMP existed. In this section, the results of the comparison of the technical course attended (including course version) by the selected members of population one, to their respective bases of assignment are presented. No comparison of course version attended and base of assignment for personnel assigned AFS 445x0G was necessary as there was only one version of the C3ABR44530G course.

Three hundred sixty-nine members of population one who had attended the C3ABR31630G technical training course (population one, subpopulation one), were selected through the Atlas sampling technique. Sixty-five members of subpopulation one attended the 001 version of the C3ABR31630G course. The EMMMP who had completed this version of the course should have been assigned to Ellsworth AFB. Of the 65 EMMMP personnel in this

group, six were not assigned to Ellsworth AFB--a 9.2 percent occurrence rate of misassignment.

Two hundred twenty-one members of population one, subpopulation one, attended the 002 version of the C3ABR31630G course. EMMMP who completed that version of the course should have been sent to F.E. Warren, Minot, Malmstrom, or Whiteman AFBs. Only five EMMMP in this group were assigned to bases other than those for which they had been trained--a 2.3 percent rate of occurrence of misassignment.

The remaining 83 members of population one, subpopulation one, attended version 004 of the C3ABR31630G course. These EMMMP should have been assigned to either Grand Forks or Malmstrom AFBs. Four members of this group were not assigned to either Grand Forks or Malmstrom AFBs--a misassignment occurrence rate of 4.8 percent.

The Atlas sampling technique selected 661 EMMMP who met the selection criteria and who had attended the C3ABR44330G formal technical training course (population one, subpopulation two). Of the 661 EMMMP selected, 360 had attended the 003 (Minuteman II) version of the C3ABR44330G course. Only five members of that group were not assigned to a base for which they had received training (Ellsworth, Whiteman,and Malmstrom AFBs)--a 1.4 percent rate of occurrence. The remaining 301 EMMMP of subpopulation two had attended the 004 (Minuteman III) version of the C3ABR44330G course. Only one individual in that group was not assigned to a base for which he had been trained (F.E. Warren, Grand Forks, Malmstrom, and Minot AFBs)--an occurrence rate of 0.33 percent.

The above results were aggregated by AFS and in total. These results are presented in Table XXII.

TABLE XXII

Chanute Graduates Not Assigned to Bases
for Which They Were Trained

AFS	Sample Size	Number Misassigned	Percent Misassigned
316x0G	369	15	4.0
443x0G	661	6	0.9
Total:	1030	Total: 21	Overall: 2.0

The occurrence rate of EMMMP not assigned to a base for which they had received training (AFSs 316x0G and 443x0G only) was 2.0 percent. This was significantly less than the selected criteria of 25 percent. A couple of caveats are necessary in interpreting the data. One, the base of assignment of the EMMMP was their assignment location at the time of sample selection--not necessarily their first duty assignment after graduation from Chanute. Two, related to the first caveat, several EMMMP selected may have had a change of duty assignment (PCS) between two Minuteman bases in the time elapsed since their graduation from Chanute and their selection to the sample. These results and caveats are discussed more fully in the next chapter.

IV. General Observations, Conclusions, and Recommendations

Introduction

This chapter first presents general observations concerning the results of this research effort. These are followed by a discussion of the research questions in which conclusions and reocmmendations, based on the data collected, are presented.

General Observations

As discussed previously, the EMMMP sample (selected by the Atlas sampling technique) that represented population one met the criteria established used to define population one. Among the three subpopulations (based on AFS) of population one, the number and variety of possible duty assignments varied wit e AFS. Population one members assigned AFS 316x0G almost exclusively were assigned to the Missile Electrical Branch where they were assigned as members of EMTs. The data from the sample of EMMMP assigned AFS 316x0G supported this observation. Of the 161 EMMMP assigned AFS 316x0G in the sample of population one, only 10 were not assigned to the Missile Electrical Branch as EMT members. Thus, subpopulation one (selected EMMMP assigned AFS 316x0G) of population one was a relatively homogenous group. The members of this subpopulation were involved in the same task environment, and the technical knowledge and skills required for them to perform their jobs were essentially identical for all members of the subpopulation. It was therefore concluded that the responses the members of this subpopulation provided to the survey questions were highly representative of all EMMMP assigned AFS 316x0G and

possessing a three or five skill level.

In contrast to the homogeneity of subpopulation one was the diversity of the selected EMMMP assigned AFS 443x0G (subpopulation two). EMMMP assigned AFS 443x0G were assigned to a number of different duty sections based on the manning requirements at their base of assignment. The duty sections were: the Vehicle and Equipment Control Branch, the Mechanical Shop, the Pneudraulics Shop, the Missile Handling Teams (MHT) Section, and the Missile Maintenance Teams (MMT) Section. Each of these duty positions required technical skills and knowledge unique to that duty position. In the sample drawn from population one, 226 of the respondents were members of subpopulation two (EMMMP assigned AFS 443x0G). Of those 226 members of subpopulation two, the majority--131 (58 percent)--were assigned to MMT. The remaining 95 members, however, were assigned to duty positions for which the technical skills and knowledge required were different from those required by EMMMP assigned to MMT. This diversity in the technical skills and knowledge required of the EMMMP comprising subpopulation two may have resulted in an undesirable masking of the variety of responses to the survey questions, i.e., EMMMP assigned to MMT may have collectively rated a subject area as useful in performing their job, while EMMMP assigned to duty sections other than MMT may have rated the same subject area as neither useful nor useless or as useless in performing their job; in this case, the aggregate rating may not be truly representative of either group. In fact, it was shown previously as a result of the cross tabulation of duty assignment to subject area rating, that in some instances the aggregate rating was in the neither useful nor useless range, while the personnel assigned to MMT rated the subject area

as useful. As also shown, in some instances, the aggregate rating was representative of the ratings of subject areas by both MMT and non-MMT assigned EMMMP. Based on the diversity found in this subpopulation, an analysis based on a division of subpopulation two into groups based on duty assignment may have better represented the perceptions of the EMMMP assigned AFS 443x0G. However, as this was not accomplished in this research effort, the reader is cautioned to consider the nonhomogeneous nature of subpopulation two in interpreting the data and results.

Subpopulation three of population one (EMMMP assigned AFS 445x0G) was similar to subpopulation one in the respect that it represented an essentially homogeneous group (assuming the technical skills and knowledge required of EMMMP assigned to FMT were basically the same as those required of EMMMP assigned to PMT). In addition to FMT and PMT, members of population one who were assigned AFS 445x0G were also assigned to the Power, Refrigeration and Electric (PREL) Shop. EMMMP assigned to the PREL shop required different technical skills and knowledge to perform their jobs than the technical skills and knowledge needed by members assigned to either FMT or PMT. However, the number of respondents assigned AFS 445x0G who were assigned to the PREL shop was small when compared to the number of EMMMP assigned AFS 445x0G who were assigned to FMT and PMT. This was borne out in our results--of the 171 population one, subpopulation three respondents (EMMMP assigned AFS 445x0G), 82 were assigned to FMT, 74 were assigned to PMT, and only 15 (8.7 percent) were assigned to the PREL shop. The responses provided by EMMMP belonging to subpopulation three can be considered representative of the EMMMP assigned AFS 445x0G and assigned to FMT or PMT. However, because of the small number of

respondents assigned to the PREL shop in relation to the number of personnel assigned to either FMT or PMT, their responses may have been masked. Therefore, the subpopulation three results may not have provided a true representation of the responses of the EMMMP assigned AFS 445x0G and assigned to the PREL shop.

The potential bias introduced into the results of the population two responses due to the personnel selected as the sample was discussed previously. This potential bias most likely affected the population two ratings of the C3ABR44330G course the most, because of the number and diversity of the duty sections to which EMMMP assigned AFS 443x0G, and hence their supervisors, were assigned. This coupled with the small number of population two respondents who rated some of the subject areas of a particular course (e.g., only two population two respondents rated the subject areas unique to version -001 of the C3ABR31630G course) should be considered by the reader when interpreting the data.

In addition to the frequency and content analysis applied to the population one survey responses, three selected variables--duty assignment, version of the particular technical course attended at Chanute (within AFS subpopulation), and time elapsed since graduation from Chanute--were cross tabulated to the responses to population one survey questions 12 and 14 and the respondents ratings of the course subject areas in response to population one survey question 21. As was discussed previously, the cross tabulation of the respondents' duty assignment to their answers indicated some associative relationship in several instances. This was especially evident for EMMMP assigned AFS 443x0G (refer to Table XIV).

The cross tabulation results were used to judge the homogeneity of the population subpopulations, which were discussed in the preceding paragraphs. Within an AFS subpopulation, it was assumed that all EMMMP included in population one had completed essentially the same formal technical training course despite the fact that the elapsed time since graduation from Chanute reported by the respondents ranged from several months to over five years, and despite the fact that EMMMP in AFSs 316x0G and 443x0G attended various versions of the basic C3ABR31630G and C3ABR44330G courses respectively. The results of the cross tabulations of the version of the technical course attended, and time elapsed since graduation from Chanute with the responses to the selected population one survey questions appeared to support that assumption. No associative relationships between the version of the course attended and the responses to the selected population one survey questions were evident at the selected level of significance. Associative relationships between time elapsed since graduation from Chanute and the rating of three of the subject areas of the C3ABR31630G (refer to Table XI), indicated there may have been some change in the C3ABR31630G course over the time period represented in the sample. However, because only three of the total 48 subject areas rated by EMMMP personnel assigned AFS 316x0G were found to have an associative relationship with the time elapsed since graduation from Chanute, the authors concluded the assumption that EMMMP assigned AFS 316x0G attended essentially the same formal technical training course was valid.

Despite the potential shortcomings of the data discussed above, the authors believe this research effort has provided valuable insight into the potential problem areas identified in the AFHRL study (5)

which were addressed by the research questions. The following paragraphs address the research questions stated earlier in this thesis.

Research Questions Answered, Conclusions, Recommendations

Research Question One.

> To what degree did enlisted Minuteman missile maintenance personnel perceive the curriculum of their formal technical training course to be relevant to the technical knowledge requirements of their job?

The population one respondents' ratings of the subject areas of the Chanute formal technical training courses provided the data on which the answer to this question was based (refer to question 21 of the surveys administered to selected members of population one). There were a total of 131 different subject areas rated by various subgroups of the respondents (refer to Tables X, XII, and XV). One hundred subject areas (76.3 percent) were rated as useful, 22 subject areas (16.8 percent) were rated as neither useful nor useless, and nine subject areas (6.9 percent) were rated useless. Based on these results, it is concluded that EMMMP perceived the curriculum of their respective formal technical training course to be highly relevant to the technical knowledge requirements of their jobs. The results would have indicated an even greater degree of relevancy of the technical course curriculum to technical knowledge requirements of the job if the subpopulation two (AFS 443x0G) ratings were deleted from consideration. As mentioned previously, the AFS 443x0G (subpopulation two) respondents represented a nonhomogeneous group with respect to technical knowledge and skills requirements. This was evident in the rating of subject areas by those respondents (refer to Table XIV).

The AFS 443x0G subpopulation accounted for all nine of the subject areas rated as useless, and for 11 of the 22 areas rated as neither useful nor useless. The authors feel the results and analysis indicated the C3ABR44330G formal training course was designed to serve too broad a diversity of job knowledge and skills requirements. This resulted in a significant number of personnel undergoing training for which they had no need relevant to the technical knowledge and skills requirements of their jobs.

Research Question Two.

> Did the formal technical training courses for enlisted Minuteman missile maintenance personnel omit subject matter these personnel needed to know to perform their jobs?

The answer to this question was based on the population one respondents' answers to population one survey question 14 as supplemented by the responses to question 15. A total of 417 population one respondents replied to question 14, indicating either they had not, or had worked on systems for which they had not received training at Chanute. The number of respondents indicating they had not, nor had they expected to, work on systems for which they had not received training at Chanute, 214 (51.3 percent), was nearly equal to the number of respondents who indicated they had or had expected to work on systems for which they had not received training at Chanute--203 (48.7 percent). The overall totals were misleading however. In breaking out the ratings by AFS, the results discussed in the following sentences were obtained. Of the EMMMP assigned AFS 316x0G, 71 (72.4 percent) indicated they had worked on (or had expected to work on) systems for which they had not received training at Chanute, 27 (27.6 percent) indicated they had not (nor had they expected to) worked on systems

for which they had not received training at Chanute. The results for EMMMP assigned AFS 443x0G were opposite to those of EMMMP assigned AFS 316x0G; 48 (27.3 percent) of the respondents assigned AFS 443x0G indicated they had worked on (or had expected to work on) systems for which they had not received training at Chanute, 128 (72.7 percent) indicated they had not (nor had they expected to) worked on systems for which they were not trained at Chanute. The results for EMMMP assigned AFS 445x0G were: 84 respondents (58.7 percent) said they had worked on systems for which they had not been trained at Chanute, 59 (41.3 percent) said they had not worked on systems for which they had not received training at Chanute. The answer to research question 2, based on the results explained above, was yes; for a significant percentage of EMMMP assigned AFSs 316x0G and 445x0G (at least 58 percent), and for a smaller percentage of EMMMP assigned AFS 443x0G (27.3 percent), the formal technical training courses for EMMMP did omit subject matter these personnel needed to know to perform their jobs. The omission of training must be examined, however, with respect to the systems (equipment) the EMMMP reported they had worked on but had not received training for at Chanute. The respondents indicated at least some of the systems they had worked on but for which they had not been trained at Chanute in response to population one survey question 15. As mentioned previously, a number of those systems indicated by the respondents in response to question 15 represented systems which had been modified, had been replaced, or were new systems which had been added. However, other systems/equipment items the respondents indicated they had worked on but for which they received no training at Chanute have not, to the authors' knowledge, undergone modification or

replacement. It was beyond the scope of this research effort to determine if the systems/equipment indicated in response to question 15 and which have not undergone modification or replacement were omitted from the Chanute courses by design or by omission. However, it is recommended that the personnel/agencies responsible for establishing the course content of the formal technical training courses review the systems/equipment items indicated by the respondents in response to question 15 of the population one survey (refer to pages 40, 58, and 80) and determine if these systems/equipment items should be incorporated into the Chanute curricula.

Research Question Three.

> Did the formal technical training courses for enlisted Minuteman missile maintenance personnel contain unnecessary subject matter which these personnel did not need to know to do their jobs?

Questions 12 and 13 of the survey administered to the randomly selected EMMMP of population one provided the data used to answer research question three. Overall, 214 of the respondents (45.3 percent of the total number of respondents indicating yes or no to survey question 12) indicated they had received training at Chanute for systems/equipment items which were not in use at their respective bases; therefore, they had no need for the subject matter pertaining to those systems/equipment items. Based on this result, the authors concluded that yes, the formal technical training courses for EMMMP did contain subject matter which nearly one-half of the respondents who responded to question 12 indicated they did not need to know to do their jobs. By AFS, the number of respondents (and percentage) who indicated they had received training for systems/equipment items not in use at their base--indicating the courses contained unnecessary subject

matter--were: for EMMMP assigned AFS 316x0G, 43 (29.5 percent) of the respondents; for EMMMP assigned AFS 443x0G, 73 (42.4 percent) of the respondents; and for EMMMP assigned AFS 445x0G, 98 (63.4 percent) of the respondents. These results must be viewed in conjunction with the respondents' responses to survey question 13, to which the respondents provided examples of systems/equipment items for which they had received training but which were not in use at their base. The vast majority of the responses indicated respondents had received training for versions of the weapon system, or subsystems, which were in use at other bases, but not in use at their base of assignment. This "problem" is a result of several factors including the course curriculum, the modification/replacement of systems/equipment items, and to a small degree, the misassignment of personnel (see the answer to research question 4). For example, the C3ABR44530G course included wing (system) specific subject areas, e.g., Operation of LCF ECS (Wing IV). Based on the responses to question 13, it was concluded that the course curricula at Chanute did include subject matter unnecessary for some of the EMMMP, but the "problem" is not as severe as indicated by the number of affirmative responses to question 12, due to the nature of systems/equipment items reported in response to question 13, as discussed above. The authors recommend that, in the interest of decreasing formal training time and expenditure of funds on subject areas best dealt with at wing level, wing specific training be eliminated from the formal technical training courses at Chanute. This would allow the training at Chanute to concentrate on the common basic knowledge and skills applicable to particular AFS technical knowledge and skill needs.

Research Question Four.

Were enlisted Minuteman missile maintenance personnel in AFSs 316x0g, 443x0G, and 445x0G assigned to a Minuteman base which was operating the version of the Minuteman system for which they received formal training?

The results of the comparison of the formal technical training course attended by each of the randomly selected EMMMP from population one, with their respective bases of assignment provided the answer to this research question (refer to pages 121-123). As mentioned previously, the reader is alerted to the fact that the comparison was made to the EMMMP's base of assignment at the time they were randomly selected from population one. Based on the average time elapsed since the respondents had graduated from Chanute, the authors felt it was safe to assume that for the vast majority of the EMMMP the base of assignment reported by the Atlas selection printout was the same base the EMMMP had been assigned to upon graduation from Chanute. Because all EMMMP assigned AFS 445x0G attended a common course of training at Chanute, designed to provide training for all versions of the Minuteman weapon system, this subpopulation was not considered in determining the answer to this research question. The vast majority (96 percent) of EMMMP in subpopulation one of population one (EMMMP assigned AFS 316x0G) were assigned to a Minuteman base for which they had received training at Chanute. An even greater percentage of EMMMP assigned AFS 443x0G (subpopulation two) were assigned to a Minuteman base for which they had been trained at Chanute; 99.1 percent of the members of subpopulation two were assigned to a base for which they had been trained. Based on those results, the authors concluded that yes, almost without exception, EMMMP were assigned to the Minuteman bases operating the version

of the Minuteman system/subsystems for which they had received training at Chanute.

Research Question Five.

> Did enlisted Minuteman missile maintenance personnel in AFSs 316xoG, 443xOG, and 445xOG, at each of the six Minuteman bases, experience a delay in beginning training at their units' Team Training Branch? What were the factors responsible for the delay in entry to TTB training for each AFS at each base?

All EMMMP experience some delay in beginning training at their unit's TTB. Since there is no standard time to measure if a respondent has been delayed too long before entering TTB training, the researchers were unable to conclude if the delays indicated by the respondents were too much of a delay or represented the "normal" time for the EMMMP to complete the necessary training prerequisites prior to entering TTB training. In the majority of cases (303 of 400 cases), the delay in entering TTB was over 60 days from assignment to EMT, FMT, PMT, or MMT until the respondent entered TTB training. The major factors resulting in EMMMP experiencing a delay in beginning training at their units' TTB were:

1. The number of recent graduates of Chanute assigned to a particular base over a relatively short span of time exceeded the capability of the TTB resources (instructors, equipment, trainers) to train all of them in a timely manner. This problem was common to all AFSs and all Minuteman bases on a cyclical basis.

2. The cyclical nature of assignment of recent Chanute graduates to a particular base was also responsible for the opposite problem. TTB resources for the number of students available for TTB training were abundant, so there were students waiting for more students to come from Chanute to make up a team.

The researchers recommend that a method of smoothing out the flow of personnel from Chanute to the bases and letting the bases know in advance when the personnel will be arriving. This would enable managers to more effectively manage personnel inputs from Chanute.

Research Question Six.

> To what degree did the managers and supervisors of enlisted Minuteman missile maintenance personnel perceive the curriculum of the formal training course to be relevant to the technical knowledge requirements of their subordinates' jobs?

A comparison of the supervisors' perception of the major subject areas emphasis rating and the EMMMP rating of the usefulness of the major subject readings was accomplished. Of 143 major subject areas, the supervisor responses did not match the EMMMP responses in 53 major subject areas. The criteria used were: the supervisors were expected to indicate more emphasis (rating over 4.5) for subject areas that were rated useful (rating over 4.5) by technicians; the supervisors were expected to indicate less emphasis (rating less than 3.5) for subject areas that were rated useless (rating less than 3.5) by technicians; and the supervisors were expected to indicate no change in emphasis (ratings between 3.5 and 4.5) for major subject areas that were rated neither useful nor useless (rating between 3.5 and 4.5) by technicians. Any deviation from these criteria was a mismatch. It is interesting to note that there were 23 mismathces in the C3ABR31630G courses, 21 mismatches in the C3ABR44330G courses and only nine mismatches in the C3ABR44530G courses. This led to the conclusion that although the managers and supervisors of EMMMP know the majority of the tasks that are useful for their personnel to do their job, they may need to get some feedback from their EMMMP about some of the

less obvious, useful, major subject areas so they can restructure the Chanute course, accordingly, to fit the needs of the technicians.

Research Question Seven.

> To what degree did the managers and supervisors of enlisted Minuteman missile maintenance personnel view the AF Form 1284, Training Quality Report, as a useful feedback tool? Did they use it?

In the majority of cases, supervisors and managers of EMMMP viewed the AF Form 1284 as an ineffective feedback tool. The reasons, according to the respondents, for the AF Forms 1284 being viewed as ineffective were: the AF Form 1284 must be submitted within 45 days of the student graduating from Chanute, there are no standard evaluation procedures for Chanute graduates, and there is generally no feedback to the base level managers or supervisors when a problem he identifies is resolved or discussed. The bases had sent an average of zero to five AF Forms 1284 to Chanute per month. The researchers recommend that the AF Form 1284 be eliminated. The informal methods used by base level managers and supervisors of EMMMP and the Chanute technical training course directors is what works best.

Epilogue

The task of providing EMMMP the technical training that will enable them to perform their job of maintaining the Minuteman missile system in the highest state of readiness is very complex. Establishing the goals of the various training processes is complicated enough but finding the most effective and efficient means to accomplish those goals is extremely difficult. The subjects interviewed during the AFHRL study (5) identified a number of areas they perceived to be problems with Minuteman missile maintenance. This research effort attempted to examine several of those problems concerned with the technical training of EMMMP. The authors believe this research effort provides insight into the extent and significance of some of those problem areas.

TRAINING QUALITY REPORT (TQR)

(See Instructions on Reverse)

1. FROM: (Using Activity Address)	2. TO: (Copy 1)	3. TO: (Copy 2) (MAJCOM/DPAT Address)
1961 CG/CCQT APO San Francisco	HQ ATC/TTSE RANDOLPH AFB, TX 78148	HQ AFCC/MPXT

4. NAME OF GRADUATE (Last, First, Middle Initial)	5. SSAN	6. GRADE	7. UNIT OF ASSIGNMENT	8. BASE
Doe, John L.	508-54-3793	SSgt	1961 Comm Gp/FFCZ	Clark AB, RP

COURSE (Not required for BMT)			SPECIALTY OR COURSE TRAINING STANDARD (STS/CTS)		
9. NUMBER	10. TITLE	11. GRADUATION DATE	12. NUMBER	13. TITLE	14. DATE
3ABR27230	Air Traffic Control Operator	June 8X	272X0	Air Traffic Control Oper/Tech	Dec 198X

Provide the required information below when the graduate cannot meet the specialty/course training standard proficiency levels specified for the course. In Block 15 identify the appropriate job areas, i.e., Aircraft General, Elec System, Medical Techniques, etc. In Block 16, match the job areas with specific task and/or knowledge items in the STS/CTS. In Block 17 "Remarks" explain the inadequacy in identifying the specific equipment or procedures involved. Use examples if possible.

15. JOB AREA A	16. STS REFERENCE ITEM NO. B	16. STS REFERENCE PROFICIENCY CODE C	17. REMARKS D
General Control	8f	2b	SSgt Doe was unfamiliar with flight plan and control information; required extensive OJT to meet the "2b" standard.
IFR Operations	9b	2b	Not familiar with clearance limits, airway structures, clearances from center.
Wake Turbulence	12b,c	2b	Not sufficiently trained on applying separation radar or nonradar to progress satisfactorily to higher skill levels. Repeated OJT required to meet minimum requirements.
Precision Radar	15b(1)	2b	Individual could not operate precision radar; totally unfamiliar with procedures. SSgt Doe stated he did not remember covering the subject matter during tech school.

18. DATE	19. GRADE, NAME AND SIGNATURE OF SUPERVISOR	20. AUTOVON NO
19 Feb 8X	SSgt Joe Q. Smith	893-XXXX

AF FORM 1284 FEB 81 PREVIOUS EDITION IS OBSOLETE.

Appendix B. Missile Systems Analyst Specialist Specialty Summary

AFR 39-1(C3) Attachment 16 15 March 1983 Effective 30 April 1983 A16-7
AFSC 31650*
Semiskilled AFSC 31630*
Helper AFSC 31610*

AIRMAN AIR FORCE SPECIALTY

MISSILE SYSTEMS ANALYST SPECIALIST

1. SPECIALTY SUMMARY

Monitors and operates consoles, fault display panels, and checkout equipment, performs malfunction analyses, and assembles, repairs, maintains, modifies, inspects, and services missile, missile subsystems, missile electronic systems, and aerospace ground equipment to component level. Operates checkout and test equipment; and performs adjustment, alignment, and calibration of missile and related missile aerospace ground equipment. *Related DOD Occupational Subgroup:* 122.

2. DUTIES AND RESPONSIBILITIES

a. *Monitors and operates consoles, fault display panels, and checkout equipment.* Monitors weapon system status by observing indications on equipment such as launch vehicle control panels, launch-monitor consoles, flight control consoles, fault display panels, and sequence and monitor panels. Operates related checkout and test equipment to determine weapon system integrity.

b. *Performs malfunction analysis of missile systems, subsystems, and related checkout and aerospace ground equipment.* Troubleshoots malfunctions on missile systems, subsystems, and related electronic checkout and support equipment using system logic, data flow, schematics, diagrams, and weapons system operational characteristics. Detects and localizes malfunctions to component level on systems and equipment, such as launchers, launch vehicles, propellant loading systems, flight control and guidance systems, checkout consoles, environmental controls, electrical cabling, security sensing systems, sequencer and monitor, voice reporting signal assembly systems, and plug-in units.

c. *Performs organizational maintenance on missiles, launchers, and launch vehicles and sites; and coordinates launch vehicle and site maintenance activities.* Performs visual inspection, functional checkout, removal and replacement of faulty components, and other routine maintenance on missile guidance, flight control and electrical equipment, airframe, and other subsystems. Calibrates, aligns, and adjusts missile electronic systems and subsystems. Uses manual and automatic checkout and test equipment, as team member, to perform checkout of integrated missile system subsystems and coordinate missile checkout procedures pertaining to the operations of related systems such as pneudraulic, propulsion, propellant loading, launchers, launch vehicles, electrical, alignment, guidance and control, and security equipment. Performs launch facility emergency procedures.

d. *Performs missile transport, servicing, and inspection functions.* Loads, transports, and unloads missiles into operation or maintenance position. Prepares launch emplacement area for mating with missile. Removes and installs test lines, cables, plates, and fixtures. Performs scheduled preventive maintenance inspections. Services missile with fuels, gases, and lubricants. Services, maintains, inspects, tests, and operates missile support systems and aerospace ground equipment. Performs receipt, servicing, and shipping inspections on air-launched missiles and components. Performs operator inspections and operates special purpose vehicles.

e. *Maintains inspection and maintenance records.* Posts entries on applicable maintenance and inspection records. Records pertinent data in equipment performance logs. Furnishes information for unsatisfactory reports and recommends changes to correct defective equipment or to improve existing procedures.

f. *Performs duty as member of tactical missile launch crew.* Accepts and interprets instructions and codes from missile operations center, combat operations center, or other authorized source, in association with missile launch officer.

g. *Supervises missile systems analyst personnel.* Assigns work, and reviews completed repairs for compliance with prescribed procedures, and evaluates performance. Instructs subordinates in techniques of inspection, maintenance, transportation, servicing, and repair of missile subsystems and associated equipment. Ensures that personnel understand and comply with all aspects of missile safety.

3. SPECIALTY QUALIFICATIONS

a. *Knowledge.* Knowledge of the following is mandatory: missile hydraulic, electrical, electronic, and propulsion systems; electronic theory and circuitry including transistors and solid state devices; circuitry analyses; schematic diagrams; principles of radar or inertial theory; algebraic formulas; associated launch systems and aerospace ground equipment; and blueprint and diagram reading. Possession of mandatory knowledge will be determined according to AFR 35-1.

b. *Education.* Completion of high school with courses in mathematics and physics is desirable.

c. *Experience.* Experience is mandatory in circuitry analyses, troubleshooting, repair, servicing, and inspection of missiles, missile subsystems, and associated aerospace ground equipment at launch sites; missile systems checkout; operation of consoles and electronic test equipment; and alignment and adjustment of missile systems and components.

d. *Training.* Completion of a basic missile analyst specialized course pertaining to the weapons system is desirable.

e. *Other:*

* (1) A minimum physical profile of 222111 with no record of emotional instability is mandatory.

(2) A minimum of Grade 1 color vision as defined in AFM 160-17 is mandatory.

(3) A Secret security clearance is mandatory for award and retention of AFSCs 31650/30, 31650C/30C, 31650G/30G, and 31650T/30T.

(4) A Top Secret security clearance is mandatory for award and retention of AFSCs 31650F/30F.

(5) Physical requirements for missile duty according to AFR 160-43 are mandatory for award of AFSCs 31650F/30F.

4. *SPECIALTY SHREDOUTS

Suffix	*Portion of AFS to Which Related*
C	BGM-109 Ground Launched Cruise Missile
F	LGM-25
G	WS-133AM, WS-133AM/CDB, WS-133B/CDB
T	AGM-69A

Appendix C. Missile Maintenance Specialist Specialty Summary

AFSC 44350*
Semiskilled AFSC 44330*
Helper AFSC 44310*

AIRMAN AIR FORCE SPECIALTY

MISSILE MAINTENANCE SPECIALIST

1. SPECIALTY SUMMARY

Assembles, repairs, maintains, modifies, configures, inspects, and services missiles, missile subsystems, and related support equipment. *Related DOD Occupational Subgroup:* 632.

2. DUTIES AND RESPONSIBILITIES

a. *Performs missile transport, assembly, and inspection functions.* Loads, transports by special vehicle, unloads, and hoists missile into operation or maintenance position. Prepares launch emplacement area for mating with missile. Uncrates, inspects, and assembles missile and missile subsystems at launch emplacement or storage areas. Removes or applies preservatives, desiccants, and covers. Removes and installs test lines, cables, plates, and fixtures. Joins missile sections and joins missile to launch pad. Mechanically and electrically mates and demates reentry vehicles and reentry systems containing nuclear warheads and guidance systems to missiles. Performs scheduled preventive maintenance inspections. Performs electrical test of reentry vehicles and reentry systems containing nuclear warheads and guidance systems. Services, maintains, checks, adjusts, and operates missile emplacement support systems such as water, pneumatic, security, and fire extinguisher. Inspects, repairs, maintains, checks, and controls related support equipment. Performs operator inspections, operates special purpose vehicles, and configures vehicles with required support equipment.

b. *Services missiles with fuels, gases, and lubricants.* Ensures adequate supply of fuels, gases, and lubricants is available at launch emplacement area. Monitors servicing and checkout of missile subsystems. Monitors and evaluates instruments and gauges during fueling and countdown operations. Monitors and interprets mechanical console panels to locate and isolate malfunctions. Determines scope and complexity of malfunctions by consulting technical publications, mechanical drawings, or engineering instructions. Removes, tests, and replaces mechanical console components. Performs launch facility emergency procedures.

c. *Records and maintains missile, missile components, and related support equipment historical data.* Maintains accurate historical records of inspections, repairs, replacements, tests, malfunctions, and servicing of missile, missile components, and related ground equipment, using prescribed forms and methods of recording. Requisitions and records deliveries of gases, fuels, and lubricants.

d. *Supervises missile maintenance personnel.* Assigns maintenance, repair, and replacement functions to subordinates. Observes subordinates' performance to ensure compliance with standard operating procedures or technical publications. Instructs subordinates in techniques of vehicle configuration and assembly, repair, inspection, test, checkout, use and replacement of missile, missile subsystems, and support equipment and components using diagrams and technical directives.

3. SPECIALTY QUALIFICATIONS

a. *Knowledge:*

(1) Knowledge is mandatory of hydraulics, electricity, and principles of propulsion and mechanics that apply to missiles; and use of blueprints, diagrams, and technical publications. Possession of mandatory knowledge will be determined according to AFR 35-1.

(2) Knowledge of inspection techniques and supply procedures is desirable.

b. *Education.* Completion of high school with courses in mathematics and physics is desirable.

c. *Experience.* Experience is mandatory in functions such as assembly, repair, servicing, checkout, and inspection of missiles, missile subsystems, and related support equipment.

d. *Training.* Completion of a basic missile maintenance course is desirable.

e. *Other:*

(1) A minimum of Grade I color vision as defined by AFM 160-17 is mandatory.

*(2) A minimum physical profile of 222111 with no record of emotional instability is mandatory.

(3) A Secret security clearance is mandatory for award and retention of this AFSC.

4. *SPECIALTY SHREDOUTS

Suffix	*Portion of AFS to Which Related*
C	BMG-109 Ground Launched Cruise Missile
E	LGM-25
G	WS-133A/M, WS-133B
P	Drone/RPV

Appendix D. Missile Facilities Specialist Specialty Summary

AFR 39-1(C3) Attachment 24 15 March 1983 Effective 30 April 1983 A24-17

AFSC 44550*
Semiskilled AFSC 44530*
Helper AFSC 44510*

AIRMAN AIR FORCE SPECIALTY

MISSILE FACILITIES SPECIALIST

1. SPECIALTY SUMMARY

Inspects, monitors, troubleshoots, operates, maintains, and repairs missile weapons systems support facilities and equipment. *Related DOD Occupational Subgroup:* 633.

2. DUTIES AND RESPONSIBILITIES

a. *Performs preventive and operator maintenance of missile weapons systems support facilities and equipment.* Inspects, services, troubleshoots, repairs, removes, and replaces electrical, pneudraulic, and mechanical components of missile weapons systems real-property-installed-equipment, facilities, and ground support equipment such as missile pedestals, crib suspensions, pendulum links, shock mounts, maintenance work platforms, erection booms, umbilical brackets, and suspension devices; trusses, beams, counter-weights, gears, shafts, cams, cables, slings, cranes, seals, actuators, air locks and latches, switches, pulleys, and cylinders associated with launcher and antenna elevating devices, missile moving, erecting, and aligning equipment, and launch facility doors; flame shields; security, fire, shock, and gas detection systems; compressed systems; and environmental control, refrigeration, and equipment temperature control systems, diesel electric generators, electrical or pneumatic switching units, electrical distribution systems, and control and monitoring systems, waste disposal systems, primary access systems, and heating and ventilation systems. Troubleshoots, inspects, and repairs auxiliary power units, hoists, and environmental control systems on support vehicles. Services support equipment with fuel, lubricants, hydraulic fluid, and air. Isolates major malfunctions in support facilities and equipment and arranges for repair by proper specialist. Maintains maintenance records and logs on missile weapons systems support equipment. Performs launch facility emergency procedures.

b. *Monitors and operates missile weapons systems support equipment.* Monitors and operates fault display and check panels and test stands to detect systems and component malfunctions and determine operational readiness of support equipment including testing of electrical circuits for continuity, voltage, and load; security, gas detection, and fire warning systems for proper operation; and readiness of auxiliary power equipment. Isolates malfunctions in nonelectronic equipment from fault display panels or from individual systems and component operational checks. Performs operator inspections, operates special purpose vehicles, operates auxiliary motor generators, battery systems, and portable self-powered handling equipment.

c. *Supervises missile facilities personnel.* Instructs subordinates in techniques of inspection, operation, and operator maintenance and repair of weapons systems support facilities and equipment. Assigns work and examines completed repairs to ensure compliance with local procedures and applicable technical orders.

3. SPECIALTY QUALIFICATIONS

a. *Knowledge.* Knowledge is mandatory of electrical, mechanical, and pneudraulic principles that apply to missile weapons systems support facilities and equipment; and use and interpretation of wiring diagrams, blueprints, and applicable technical publications. Possession of mandatory knowledge will be determined according to AFR 35-1.

b. *Education.* Completion of high school with courses in physics and mathematics is desirable.

c. *Experience.* Experience is mandatory in functions such as troubleshooting, repairing, and maintaining missile weapons systems support facilities and equipment.

d. *Training.* Completion of a basic missile facilities maintenance course is desirable.

e. *Other:*

(1) A minimum of Grade 1 color vision, as defined in AFM 160-17, is mandatory.

(2) A Top Secret security clearance is mandatory for award and retention of suffix E.

* (3) A minimum physical profile of 222111 with no record of emotional instability is mandatory.

(4) Physical requirement for missile launch crew duty according to AFR 160-43 is mandatory for the award of suffix E.

(5) A Secret security clearance is mandatory for award and retention of suffix F or G.

4. *SPECIALTY SHREDOUTS

Suffix	*Portion of AFS to Which Related*
E	LGM-25 (Operations)
F	LGM-25 (Maintenance)
G	WS-133B, WS-133A/M

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VITA

Captain Robert M. Gallagher was born 23 November 1953 in Hazelton, Pennsylvania. He graduated from Woodrow Wilson High School in Levittown, Pennsylvania, in 1971. He attended The Pennsylvania State University at University Park, Pennsylvania, from which he graduated with a Bachelor of Science in Biology in June 1975. In August 1977 he entered the United States Air Force Officer Training School from which he received his commission on 9 November 1977. He was assigned to Malmstrom AFB, Montana, as a Minuteman Missile maintenance officer. His duties while assigned to Malmstrom AFB included: Combat Targeting Officer, Site Maintenance Officer, Assistant Officer-in-Charge Vehicle and Equipment Branch, Chief Shop Maintenance Branch, Officer-in-Charge Missile Mechanical Teams Section, Officer-in-Charge Materiel Control Branch and Officer-in-Charge Scheduling Control Branch. Captain Gallagher completed Squadron Officer School through correspondence in 1978 and attended the resident course at Maxwell AFB, Alabama, in 1982. He entered the School of Systems and Logistics, Air Force Institute of Technology in May 1983. Following graduation from the Air Force Institute of Technology in September 1984, Captain Gallagher will be assigned to the Ground Launch Cruise Missile Test Center at Davis Monthan AFB, Tucson, Arizona.

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VITA

Captain Parnell M. Campbell is a 1973 graduate of Dowling College located in Oakdale, Long Island, New York. He received his commission as a Second Lieutenant in the United States Air Force upon completion of Officers Training School at Medina AFB, Texas, in September 1977. His first duty assignment was to Malmstrom AFB, Montana, as a Minuteman Missile maintenance officer. He held numerous positions during his six year assignment to Malmstrom AFB. He entered the School of Systems and Logistics, Air Force Institute of Technology, in May 1983. Following graduation from the Air Force Institute of Technology, Captain Campbell will be assigned to the United States Air Force Tactical Air War Center, Eglin AFB, Florida, as the Ground Launch Cruise Missile Test and Evaluation Program Manager.

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An exploratory study sponsored by the U.S. Air Force Human Resources Laboratory (AFHRL), Wright-Patterson AFB OH (report number AFHRL TR-83-60)[2] identified possible deficiencies and problem areas in the technical training received by enlisted Minuteman missile maintenance personnel. The authors of this thesis selected several of the topics recommended for further research in the AFHRL study. Results of a review of literature pertaining to the selected topics and of the survey instruments used to gather data from Minuteman missile maintenance personnel are reported in this thesis. The research focused on the formal technical training performed at Chanute AFB, Illinois, and at the Team Training Branch located at each of the six Minuteman missile bases. The research was limited to enlisted Minuteman missile maintenance personnel in Air Force specialties 316x0G, Missile Systems Analyst Specialist; 443x0G, Missile Maintenance Specialist; and 445x0G, Missile Facilities Specialist. Enlisted personnel who were assigned to those Air Force specialties, and who possessed a three or a five skill level rating were surveyed regarding their opinion of the usefulness of their technical training. Data was also collected from the supervisors of the selected enlisted personnel, and from the Team Training Branch at each Minuteman missile wing. Conclusions concerning the selected topics of research were reported and several areas for further research were recommended.

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