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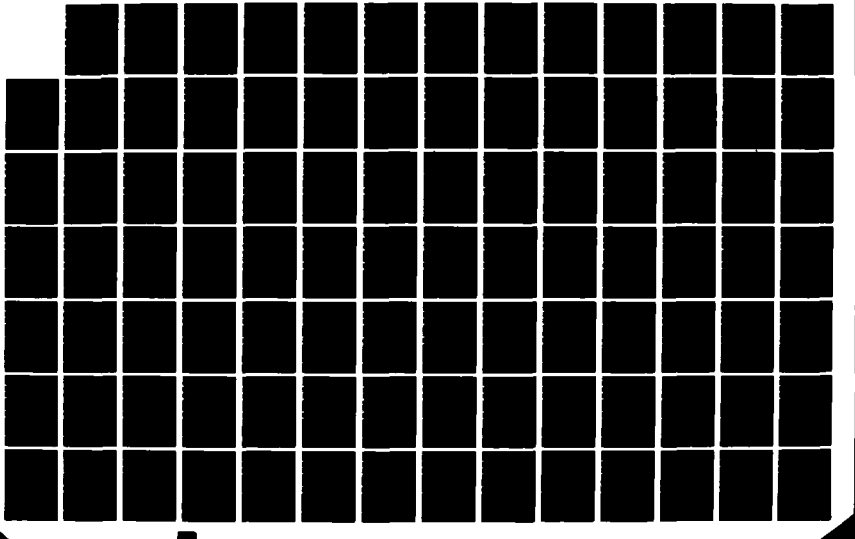

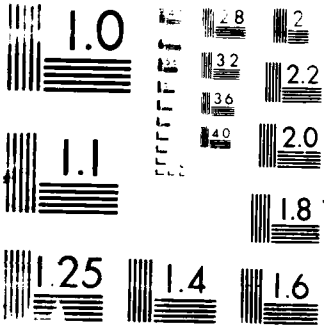
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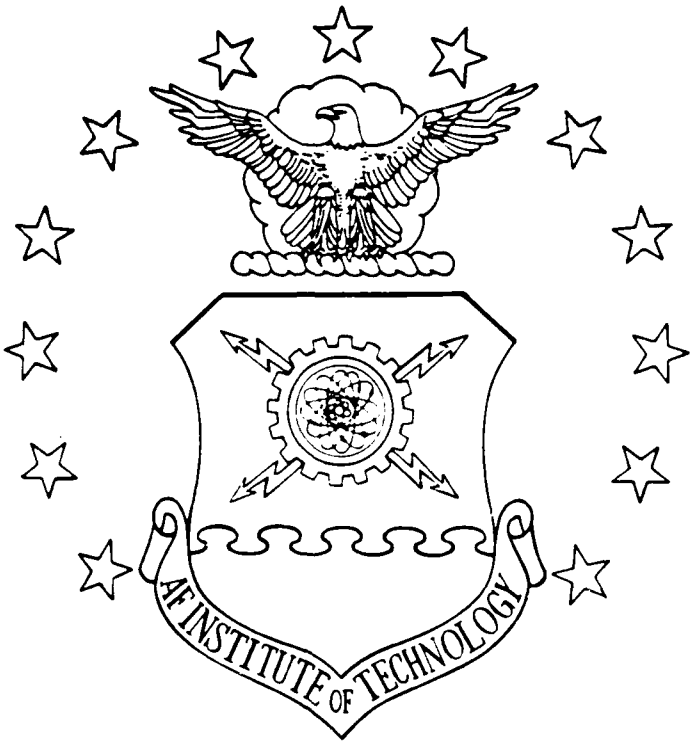

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A STUDY OF THE PERCEPTIONS OF ROLES, RESPONSIBILITIES, AND PROBLEM AREAS DURING FACILITY TRANSITION IN THE THE MILITARY CONSTRUCTION PROGRAM

THESIS

Bernard Marcos, Jr.

AFIT/GEM/LSMB/87S-16

ABSTRACT

This study examined the perceptions of the U.S. Army Corps of Engineers (COE) and the U.S. Air Force (USAF) Base Civil Engineering (BCE) managers regarding the management relationships between the COE and the USAF during the transition of a Military Construction Program (MCP) Facility from the construction agent (COE) to the user (USAF).

The study resulted in three types of perceptions: (1) congruent perceptions in which both agencies agreed that a suspected problem area was really not a problem, (2) congruent perceptions in which both agencies agreed that a suspected problem area was indeed perceived to be a problem, and (3) conflicting perceptions in which the COE and the USAF disagreed on whether a suspected problem area was a problem or not.

The study found that perceptions where both agencies agreed that there was no problem represented the strengths of the management relationship between the COE and the USAF; these strengths lie in areas where both agencies understood each other's mission objectives, and have a professional working relationship.

The study results found that perceptions where both agencies agreed that there was a problem represented field problems; problems that should be resolved by the field management. Field problems existed in areas concerning emphasis on Operations and Maintenance (O&M) aspects, recovery of expended USAF resources, understanding retainage requirements, as-built drawings, warranty processing and early user occupancy of the facility.

Using conflicting perceptions to represent upper management problems, the study revealed that management problems exist in the lack of effective procedures for warranty management, punchlist completion, BCE surveillance, accuracy of the as-built drawings, O&M training, COE assistance to recoup USAF resources and retainage of contractor payment. Among the recommendations provided to alleviate the difficulties between the agencies are the supportive attitudes of the working level of both the COE and the USAF to listen to and to understand each other's point of view.

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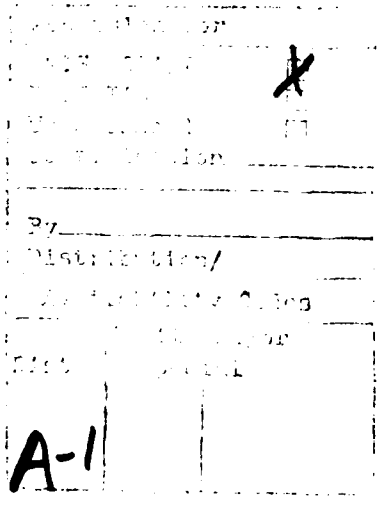

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THESIS

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of the Air Force Institute of Technology
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In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Engineering Management

Bernard Marcos, Jr., B.S., P.E.

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Bernard Marcos, Jr.

Table of Contents

List of Figures

List of Tables

Abstract

This study examined the perceptions of the U.S. Army Corps of Engineers (COE) and the U.S. Air Force (USAF) Base Civil Engineering (BCE) managers regarding the management relationships between the COE and the USAF during the transition of a Military Construction Program (MCP) Facility from the construction agent (COE) to the user (USAF).

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A STUDY OF THE PERCEPTIONS OF ROLES, RESPONSIBILITIES, AND PROBLEM AREAS DURING FACILITY TRANSITION IN THE MILITARY CONSTRUCTION PROGRAM

I. Introduction

Chapter Overview

The Military Construction Program (MCP) is an extremely complicated process which basically consists of five interrelated phases: (1) conceptual; (2) program; (3) design; (4) construction; (5) close-out and start up (30:240). This study focuses on the final phase of the MCP and the warranty enforcement period for an MCP constructed facility. For the purposes of this study, the final phase is defined as the last five percent of construction and the acceptance by and turnover to the United States Air Force (USAF). This study refers to the final phase and the warranty enforcement period as the facility transition from the construction agent (Corps of Engineers) to the user (USAF).

Background

In accordance with Public Law 94-431, Military Construction Authorization Act, 1977 (32), and Department of Defense (DoD) Directive 4270.5, Military Construction Responsibilities (12), the Corps of Engineers (COE),

Department of the Army, and the Naval Facilities Engineering Command (NAVFACENGCOM), Department of the Navy, are designated as the design and construction agents for the annual MCP (12:2; 32:Sec 604). Due to time limitations for this study only the COE/USAF management relationship is investigated. A high percentage of USAF facilities is designed and constructed by the COE. Therefore, the management relationship between the COE and USAF must be strong, and the management processes used for facility transition must be effective and efficient in order to meet the timely needs of both agencies.

Presently, each agency has regulations and policies that establish standard operating procedures in support of the COE/USAF MCP management relationship. Air Force Regulation (AFR) 88-3, New Construction: Air Force Contract Construction, also known as Army Regulation (AR) 415-11, is a joint service regulation that "establishes the basic principles and fundamental concepts of responsibilities agreed to by the military departments of the Department of Defense regarding Air Force contract construction" (8:1).

Since agency policies and DoD regulations are established, the accomplishment of the MCP contract construction should be well-defined and the facility transition should be smooth. Yet, there are difficulties between the COE and the USAF in their attempts to accomplish a smooth facility transition. The degree of difficulty which both agencies

encounter during facility transition serve as a preliminary measure of the effectiveness of the management processes used by the COE and the USAF to achieve a smooth facility transition.

Management Question

The basic management question of this study is: Are there difficulties that hinder the full success of the management processes for achieving a smooth facility transition from the construction agent (COE) to the user/owner (USAF) for MCP projects? This basic management question is applied to three periods that make up the final facility transition. These periods are the last five percent of construction, the acceptance and turnover period, and the warranty enforcement period. Thus, the following research questions were developed to support an answer to the basic management question.

Research Question A. During the last five percent of facility construction, are there conflicting perceptions of agency responsibilities and misunderstandings of the contract requirements?

Research Question B. During the facility acceptance and turnover period, are there misconceptions of organizational mission and conflicting perceptions of agency responsibilities?

Research Question C. During the warranty enforcement period, are there conflicting perceptions of agency

responsibilities and misunderstandings about the warranty management processes?

Investigative Hypotheses

In order to limit the scope of the study, only five difficulties encountered within each period of facility transition were chosen to be investigated in support of each research question. These difficulties were obtained from past studies (discussed in the literature review) and each difficulty was formulated into an investigative hypothesis. The following investigative hypotheses were developed to support each of the three research questions previously stated:

1. The Last Five Percent of Construction Period

a. The Operations and Maintenance (O&M) inspection and training are inadequate.

b. The BCE/COE working relationship is not effective.

c. The Air Force (AF) surveillance is inconsistent.

d. There is a lack of adequate retainage.

e. There are less qualified COE people for construction project close out.

2. The Acceptance and Turnover Period

a. The acceptable completion of deficiencies is compromised by the need for building occupancy.

b. There is untimely completion of punchlist items.

c. The user is not satisfied with the final product.

d. The as-built drawings are unacceptable because of inaccuracies.

e. The O&M documentation is incomplete.

3. The Warranty Enforcement Period

a. There is no standard procedure to obtain contractor support to fix latent deficiencies.

b. There is no standard procedure to recoup additional Government resources that are expended to fix latent deficiencies.

c. The equipment warranty enforcement is weak.

d. There is a lack of qualified people to handle warranty enforcement.

e. The warranty process is cumbersome.

Two to four measurement statements were developed to support each investigative hypothesis. These measurement statements became the statements in the survey instrument. A research hierarchy, as shown in Figure 1, was developed.

The responses to the measurement statements supported the investigative hypotheses, which in turn supported an answer to each of the research questions. Finally, an answer to the basic management question is obtained from an overall assessment of the results of this research study.

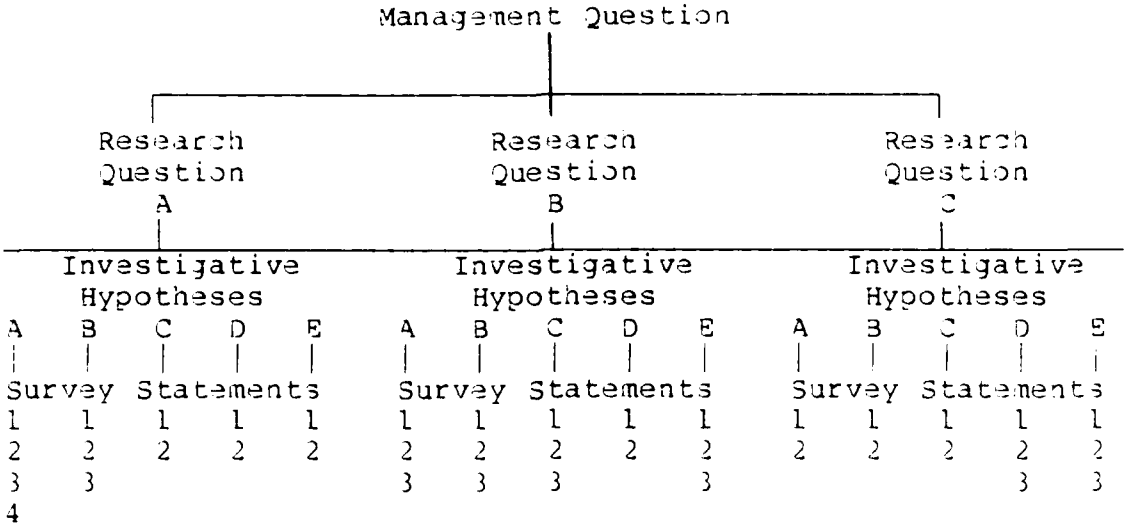


Figure 1. Research Hierarchy

Scope

The scope of the research was limited to the following:

1. MCP projects managed and administered by the COE as a service to the USAF.

2. MCP in the Continental United States (CONUS) only.

3. Survey responses from Area, Resident, and Project Engineers/Construction Managers of the COE.

4. Survey responses from the USAF Base Civil Engineers' (BCE) Chiefs of Engineering, Chiefs of Contract Management, and Project Engineers.

Limitations

This research study is limited to the perceived difficulties identified in past studies. A major study by retired Air Force General Bryce Poe II and retired Air Force Lieutenant General Devol Brett entitled, Observations on

United States Air Force Construction Programs with Emphasis on U.S. Army Corps of Engineers Involvement (dated 6 August 85), reported perceptions that the USAF leadership had of the COE construction contract execution (22). These perceptions made up the majority of the fifteen investigative hypotheses of this research study. Data for the Poe/Brett study were gathered through personal interviews with USAF military and civilian personnel at all command levels. However, COE personnel were not interviewed in the Poe/Brett study and, therefore, the COE perspective was not presented.

Other studies which offered perceived difficulties during facility transition were:

1. Project IMAGE: Innovative Management Achieves Greater Effectiveness, a USAF study on various functional areas of USAF BCE operations (18).

2. A COE Customer Care Survey, a survey on customer satisfaction that was accomplished by the COE Mobile District, Alabama (9).

In both of these studies, the COE perspective on management difficulties concerning the facility transition was not presented.

This research study sought to obtain the perceptions that both the COE and USAF have about management difficulties in the three periods of facility transition.

Objectives

This study has three basic objectives:

1. To identify the perceptions that project managers in each agency have about roles, responsibilities, standard procedures, management processes, and contract requirements during facility transition.

2. To rank order five problems encountered within each of the three periods of facility transition according to their order of significance.

3. To provide resolution suggestions that could be used by the management of both agencies in the resolution of any problems identified in this study.

Conflicting perceptions about the same problem area represent differences between the agencies; this conflict tends to weaken the COE/USAF management relationship and hinder the effectiveness of the management processes for smooth facility transition. Therefore, these types of perceptions should become management problems that need resolution.

Thesis Organization

This thesis is organized as follows:

1. The literature review chapter focuses on the present state of knowledge in construction management as seen in industry and as seen in the DoD.

2. The methodology chapter explains the research objectives, assumptions, questions, approach taken, and the

analysis used on the data obtained from the survey instrument.

3. The results chapter discusses the results of the survey and its data analysis and focuses on the support of the investigative hypotheses and the results of the rank order analysis.

4. The conclusions and recommendations chapter evaluates the analysis of the statistical results and draws conclusions from the analysis. This chapter also offers recommendations to help alleviate any problems found by this study and suggests areas for further study.

II. Literature Review

Chapter Overview

The final milestone in any MCP project is the facility transition from the construction agent to the user. During facility transition, the COE and the USAF management relationship is critical to the satisfactory completion of the facility and the follow-on warranty enforcement period. Accordingly, both agencies must have effective procedures when dealing with the contractor and when dealing with each other.

To fully understand the COE/USAF management relationship and the management processes during the facility transition, this review discusses the following:

1. The findings of past studies in regard to USAF perceptions of the U.S. Army COE performance.

2. The knowledge gained by the USAF BCE in regard to having a separate Air Force MCP section with design and construction agent responsibility under the USAF Model Installation Program (MIP).

3. The nature of perceived organizational differences as they may relate to negative perceptions identified in past studies.

4. The USAF/Army regulations that stipulate the responsibilities of each agency in the management relationship.

5. The construction industry trends for construction management, for closing out a construction project, and for warranty enforcement.

Perceptions about the USAF/COE Management Relationship

In July 1985, General Bryce Poe II and Lieutenant General Devol Brett, both retired USAF, briefed Lieutenant General E.R. Heiberg III, U.S. Army Commanding General, U.S. Army Corps of Engineers, on a special study entitled Observations on United States Air Force Construction Programs with Emphasis on U.S. Army Corps of Engineers Involvement. The U.S. Army COE requested this special study with a mission aim of giving "considerations to improve USAF/Corps of Engineers construction process quality and mutual confidence" (22:6). On 6 August 1985, the final report on the findings of their study revealed USAF perceptions of the COE construction contract execution. These perceptions serve as a platform on which the investigative hypotheses of this study were built.

The Last Five Percent of Construction. The Poe/Brett study reported a USAF perception of the last five percent of construction as:

> Too often excellent COE performance through design and 95% of construction is overshadowed by serious problems in the last 5%--turnover to the customer. The USAF perceives this as a COE penchant for "building and moving smartly on" without regard to final condition or subsequent operation and maintenance of the facility. Complaints of this nature were heard on every station and at every Major Command [22:21].

A major criticism that was also stated in the Poe/Brett study was that the "Corps is not customer oriented" (22:35). This criticism was noted, in particular, at the base level. These perceptions may indicate that the USAF/COE management relationship is weak during the last five percent of construction and that smooth facility transition is hindered by serious problems.

The U.S. Army Engineering District, Mobile, Alabama, under the command of Colonel C. Hilton Dunn, conducted a survey called The Customer Care Survey (9) directed at different levels of the USAF BCE management. The results revealed that 66 percent of the survey respondents were satisfied overall with COE performance and 77 percent would choose the COE as their construction agent again; however, 56 percent felt that there were major problems in the way the COE interacts with its customers. The narrative responses to the COE Customer Care Survey concerning the COE interaction with the USAF supported the finding of the Poe/Brett study on "customer orientation" (9).

The Acceptance and Turnover. The Poe/Brett study reported the following USAF perception of the difficulties encountered in the turnover process during the acceptance and turnover period as:

> The fact that the USAF contributes to this--often through pressure to accept incomplete structures to meet mission requirements--is not seen as an excuse for COE delivery of sub-standard facilities. On the contrary, the COE is expected to

> make an extra effort to meet mission critical dates, and to follow through energetically in clearing discrepancies [22:21].

An overview within the Poe/Brett study revealed that there was:

> No positive COE/USAF process to insure all of the following:
> - Quality
> - Timely completion
> - Cost Control
> - Functionality (mission effectiveness)
> - Maintainability [22:35].

This observation may indicate that the management processes needed to achieve smooth facility transition are misunderstood and may need the attention of both the COE and the USAF management to clarify these management processes.

The Poe/Brett study reported another USAF perception of the difficulties encountered in the turnover process during the acceptance and turnover period as:

> The COE is seen as losing interest in clearing punch lists or insuring prompt contractor response to equipment malfunction or construction errors. The turnover is relegated to less qualified people who have fewer resources and lower priority. The result is a wound that festers until the facility is finally completed, sometimes after months or even years of frustration. In fact, such frustration often leads the USAF to go ahead and spend additional funds, manpower and material resources to solve the problem, guaranteeing lost revenue to the government and a bad reputation for the COE [22:21].

The "frustration" indicated in this perception may be representative of the COE as well as the USAF. These perceptions

may indicate that smooth facility transition may be hindered by the lack of responsiveness on the part of both agencies, by the conflicting perceptions of agency responsibilities, and by misunderstandings of the management processes or standard operating procedures.

The Warranty Process. The Poe/Brett study reports that the warranty process:

- Is not strong enough to insure the desired standards of enforcement.
- Enforcement, certainly at base level, is difficult and cumbersome.
- COE is often not helpful in assisting the USAF to enforce warranties.
- Attempts at enforcement can and often do result in a backlash to the BCE and base [22:22].

These perceptions indicate that there is a USAF/COE management process for handling warranty items, but that this management process may not achieve the proper enforcement and timeliness needed to satisfy both the COE and the USAF.

The Air Force Project IMAGE study, Innovative Management Achieves Greater Effectiveness, dated October 1986 (18), also indicated that there were significant problems with the present state of the COE/USAF management relationship during the facility transition. Under the functional area of construction management, one of the major issues presented by the Chiefs of Engineering in the Base Civil Engineering Organizations stated that there was:

> . . . the general dissatisfaction at base level with the handover and start up procedures for new MCP projects. Design Agents lose interest--contract finalization, completion of deficiencies and punch list, obtaining guarantees and warranties, obtaining proper maintenance manuals and start up training, all receive low level attention [18:3].

All of the previously identified perceptions are taken from an Air Force perspective. The COE perspective on facility transition must also be represented to better understand the present state of the management relationship between the USAF and the COE. An investigation of both viewpoints concerning the management processes for smooth facility transition may reveal some agreement and/or disagreement in the management of both agencies. The result would be the promotion of further understanding so that effective management processes for smooth facility transition can be developed.

Model Installation Program Bases

On many occasions, the USAF has requested design and construction agent responsibility for MCP projects. One of the survey questions used in the Poe/Brett study asked the USAF respondents if they had requested design and construction agent responsibility and, if so, why? Of those respondents who had requested such responsibility, some of the reasons given were:

1. less overhead costs for a quality product
2. dissatisfaction with the COE and the AFRCE
3. demonstration of MCP management procedures to help COE improve their service
4. more USAF control of MCP
5. quicker response to user needs [22:100].

The Model Installation Program (MIP) was designed so that Department of Defense agencies, including the USAF, could find better and easier ways of doing business (4). This program promotes the use of innovative ideas through the submission of these ideas in the form of initiatives. MIP works well because the submission of initiatives or ideas are originated by the people actually doing the job (4). In January of 1984, Moody AFB, Georgia, was given the authority under the MIP to take over the MCP projects from "cradle to grave." According to Mrs. Barbara C. Jarvis, Program Manager for MIP, very tight restrictions were placed on the authority of the USAF to be its own design and construction agent. These restrictions included:

1. Constraints on the size of the projects.
2. No additional people to do the job.
3. Actual work had to be contracted out.
4. No funding allowed for overhead costs (presently, the amount for Supervision, Inspection, and Overhead (SIOH) of a project is allowed) (19).

A telephone interview was held with Mr. Jesse Corbett, Industrial Engineer for Moody AFB Design Engineering and Inspection Section, 347 Civil Engineering Squadron,

Industrial Engineering Section, to determine the present state of the MCP under the MIP. With the support of Headquarters, Tactical Air Command (TAC), a small MCP section in the BCE organization was developed and is presently staffed by overhire personnel. This MCP section is supervised by the BCE Chief Engineer and operates separately from the BCE Engineering staff.

According to Mr. Corbett, all activities in the supervision, inspection, and administration of a construction contract essentially remain the same as they were with the COE as the construction agent. Thus, the transition of a new facility from the MCP section to the user still involves: A prefinal and a final inspection and systems testing during the last five percent of construction, acceptance by the MCP section, turnover of the facility to the user, and finally, the warranty enforcement.

According to Mr. Corbett, the major differences between a BCE MCP section being the construction agent and the COE being the construction agent are the following:

1. There is a quicker response to user needs, to the completion of required paperwork, and to the approval process.

2. There is a more direct line of communication between the BCE and the facility user because of the elimination of the COE and the Air Force Regional Civil Engineer (AFRCE).

3. There is closer coordination between the MCP section and the BCE maintenance shops. BCE shops are included in all inspections and are given all pertinent documentation for coordination.

4. Conflicts are kept to a minimum due to the fact that all parties involved work for one commander, the BCE. Thus, unresolvable problems are resolved by the decision of one person.

Because of the four major differences mentioned above, Mr. Corbett stated that the job of managing a construction project is easier (4).

The major differences cited by Mr. Corbett between the USAF BCE MCP section being the USAF construction agent, and the COE being the construction agent for MCP projects, represent the knowledge gained by the USAF BCE at Moody AFB in regard to having construction agent responsibility. As previously stated, the major differences involved quicker overall response, more direct lines of communication, closer coordination and minimization of conflicts. These differences are aspects of the USAF/COE management relationship that need to be considered when conflict between the agencies occurs.

The Nature of Perceived Differences

According to Schmidt and Tannenbaum in their article "Management of Differences," the differences between organizations can cause complications in management; therefore,

the management of any organization must understand and effectively handle these differences (25:107). The perceptions previously reviewed indicate that some basic organizational differences between the COE and the USAF may exist. If such differences exist, the identification of the issues which underlie these differences could serve as a good starting point for the resolution of the inter-organizational differences.

The following excerpt offers one possible viewpoint on the nature of perceived differences which may help in the identification of the issues. According to Schmidt and Tannenbaum:

> . . . the nature of the difference will vary depending on the kind of issue on which people disagree. And there are four basic kinds of issues to look for:
>
> Facts. Sometimes the disagreement occurs because individuals have different definitions of a problem, are aware of different pieces of relevant information. . .
>
> Goals. Sometimes the disagreement is about what should be accomplished. . .
>
> Methods. Sometimes individuals differ about the procedures, strategies, or tactics which would most likely achieve a mutually desired goal.
>
> Values. Sometimes the disagreement is over ethics. . . [25:108].

Facts. As an example, disagreement between the USAF and the COE may occur because of the differing perceptions that each agency may have of the term "acceptable." In this case, the kind of issue on which people disagree is "facts" oriented. The USAF orients their definition of "acceptable"

from the viewpoint of functionality for mission accomplishment, operability, and maintainability (22:39); whereas, the COE may orient their definition of "acceptable" from the viewpoint of contract technical requirements, contract legalities, and contract completion dates. A mutual understanding and definition of the term "acceptable" may be needed.

Goals. The problem of "what is acceptable?" could also involve a "goals" oriented issue because "sometimes the disagreement is about what should be accomplished" (25:108). The USAF sets their end goal on a facility that is functional for the mission; thus, what should be accomplished is oriented toward that goal. During the construction phase, the COE sets their goal on the administration of the contract and completing the construction project within the required time period; thus, what should be accomplished is oriented toward that goal. The difference in goals may cause disagreements about what should be accomplished.

Methods. Another example is the disagreement that may occur because of differences in standard procedures for warranty enforcement. Here, the kind of issue on which people disagree is "methods" oriented. The perceptions in the Poe/Brett report strongly indicate a frustration with the management process for warranty enforcement. Yet, the management process for warranty claims is governed by the same document, AFR 85-4, Implementing Guarantees of Equipment Installed in the Air Force Construction, also

known as AR 415-14 (7). Thus, the disagreement between the agencies may be rooted in the differing perceptions between the agencies about the procedures, or methods, for warranty enforcement.

Values. Individuality is at the root of the fourth type of issue suggested by Schmidt and Tannenbaum--values. For example, a major weakness that was reported in the Poe/Brett study was the dependency of the USAF/COE management relationship on individual personalities (22:36). Differences in values may cause personality conflicts. The differences that exist due to issues involving values may exist because individuals are significantly influenced by their roles in the organization (25:108).

Once the issue is identified, Schmidt and Tannenbaum suggest that the underlying factors should be diagnosed in order to disclose the reasons that differences between individuals or organizations exist. The underlying factors beneath the issues could involve: Access to the same information, differing perceptions of common information, or the influence of individual roles within each organization (25:108).

Conflicting perceptions represent a disagreement between the agencies on various areas of the USAF/COE management relationship. The identification of the kind of issues behind the conflicting perceptions between the agencies allows the management of both agencies to address the issues

of the problem. When the issues are identified, the reasons for the conflicting perceptions can then be identified and a solution to the problem can be found. In any case, the goal, before any resolution of disagreements between the agencies can be made, is to create an atmosphere in which the parties involved would be willing to understand the other's point of view (23:49).

The Regulations Governing The Agencies

The management relationship which the USAF and the COE share is established by Public Law 94-431, Military Construction Authorization Act 1977 (32), and DoD Directive 4270.5, Military Construction Responsibilities (12). Both documents state that the Department of the Air Force shall use the services of the Corps of Engineers for design and construction of the annual MCP (12:2; 32:Sec 604). The management relationship structure and the management processes for facility transition are established both by joint service regulations and by separate agency regulations. These regulations are shown in Table 2.1.

The structure of the management relationship as established by AFR 88-3, New Construction: Air Force Contract Construction, is shown in Figure 2. AFR 88-3, also known as AR 415-11, is the joint service regulation that:

> Establishes basic policies and fundamental concepts of responsibilities agreed to by the military departments of the Department of Defense regarding Air Force contract construction [8:1].

Table 2.1

DoD Regulations

Army Regulations	Joint Service Regulations	Air Force Regulations
AR 415-10	AFR 88-3 (AR 415-11)	AFR 89-1
ER 415-345-38	AFR 85-4 (AR 415-14)	AFR 85-1
EP 415-1-260		
ER 1180-1 through 7		

The acronyms represent the following:

AR: Army Regulation
AFR: Air Force Regulation
ER: Engineering Regulation
EP: Engineering Pamphlet

On the project management side, the USAF (owner/user) establishes the design requirements from which the design drawings and specifications are generated. The COE project management administers and supervises the Architect-Engineer (AE) contract which generates project drawings and specifications. On the construction management side, the USAF is the functional evaluator of the construction project and "exercises surveillance of construction operations" (8:3), while the construction agent, the COE, is the technical evaluator of the construction project and administers, supervises and inspects the construction contract for proper performance and execution (8:1-5).

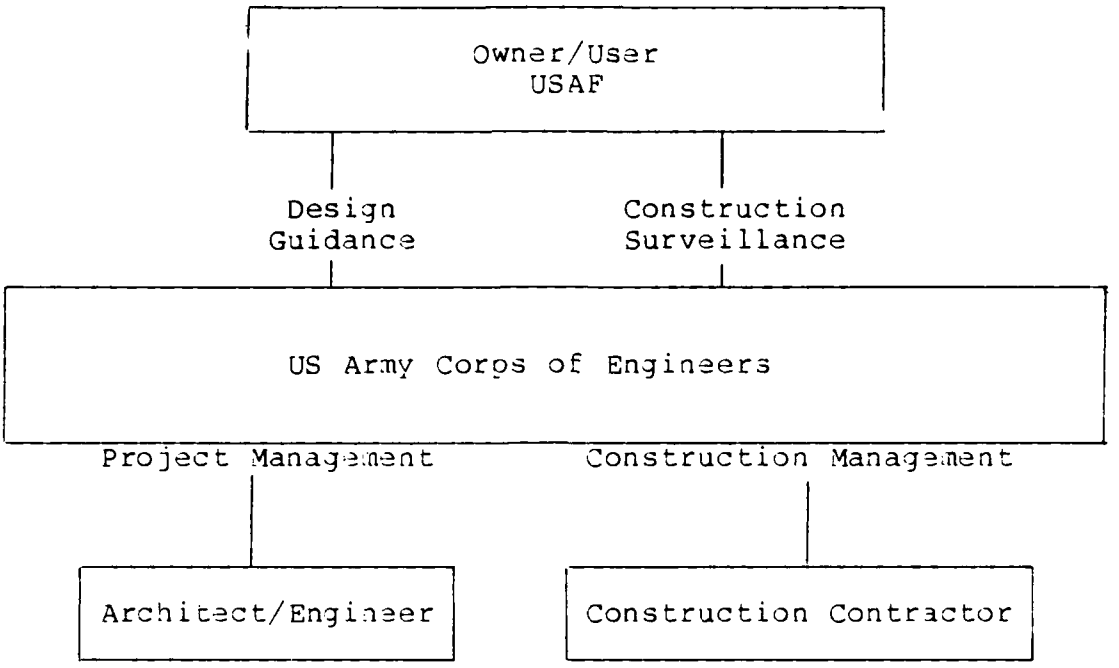


Figure 2. Structure of the Management Relationship

The effectiveness of the management processes for facility transition, as established by the regulations shown in Table 2.1, may be dependent on how well these regulations complement each other. Any inadequacies between the regulations could possibly cause management difficulties encountered during facility transition. The Air Force regulations were compared to the Army Regulations to identify any inadequacies that may exist. The joint service regulations were used as starting points in this comparison since each agency writes its regulations starting from an interpretation of the joint service regulations.

AFR 89-1, Facility Construction: Design and Construction Management (5), which establishes USAF procedures for completion, acceptance, and turnover of facilities, has undergone a major rewrite which is expected to be approved at HQ USAF by September 1987, according to Captain Bob Cullison, Policy and Resources Branch, Construction Division, HQ USAF/LEECD. Because of the anticipated approval of this revised AFR 89-1, the comparisons that were made included this revised, but unapproved, version of AFR 89-1, Facility Construction: Design and Construction Management (6).

COE Engineering Pamphlet (EP) 415-1-260, Resident Engineer Management Guide (11), is a management guide as opposed to a regulation. However, for the purposes of the following discussion on the comparison of regulations, the rules and policies set forth in EP 415-1-260 will be assumed to be required by the COE Resident Engineer.

The comparison of the regulations revealed some inadequacies which could possibly affect the effectiveness of the management processes for facility transition.

Inadequacies Concerning Joint Inspections. Using the requirements established in joint service regulation AFR 88-3 (AR 415-11) as a starting point, paragraph 5f requires that the construction agent will "make acceptance inspection jointly with the Air Force at a time in consonance with

terms of the contract and prior to final settlement with the contractor" (8:3).

The following inadequacies concerning joint inspections were found:

1. A preliminary inspection involving the USAF and the COE is required by the present AFR 89-1 (5:Par 14-5.a.1) and the revised AFR 89-1 (6:Par 6-2.a.1). There is no formal requirement in the COE regulations to have a preliminary inspection with the USAF and without the contractor. According to the revised AFR 89-1, the preliminary:

> inspection is made when the facility is substantially complete and allows both the Air Force and the construction agent a time to discuss and settle construction questions without the contractors presence [6:Par 6-2.a.1].

2. A prefinal inspection involving only the COE and the contractor is required by the revised AFR 89-1 (6:Par 6-2.a.2). However, the COE Engineering Pamphlet (EP) 415-1-260, Resident Engineer Management Guide (11), requires a prefinal inspection involving the USAF, the COE, and the contractor (11:7-8). The discrepancy between the regulations about the parties involved in the prefinal inspection must be corrected.

3. The prefinal inspection can become a final inspection by judgement of the COE Resident Engineer if "no deficiencies or only a few minor ones would be expected at the final inspection" (11:7-8). There is no formal requirement

for the COE to obtain USAF agreement to the decision of changing a prefinal inspection into a final inspection. The present AFR 89-1 requires the BCE's agreement to, and verification of, the final inspection date only (5:Par 14-5.b.2); the revised AFR 89-1 requires that before the final inspection is scheduled, "full agreement should be reached between the Construction Manager (CM) and the construction agent . . . " (6:Par 6-2.a.3).

4. "The Resident Engineer determines final acceptance following a final inspection which yields no further difficulties" (11:7-8). Also, the COE regulation, ER 415-345-38, Construction Transfer and Warranties, requires that "transfer of construction to the using service will be simultaneous with acceptance of the construction from the contractor" (10:Par 4a). There is no provision for a mutual agreement between the USAF and the COE in the determination of a final acceptance and turnover.

5. The revised AFR 89-1 provides for mechanical and electrical systems to be operating during the preliminary inspection "unless otherwise specified in the contract documents or by mutual agreement" (6:Par 6-2a.1). However, there is no provision in the COE regulations for a preliminary inspection with the USAF; thus, unless the contract documents specify that there will be a preliminary inspection and that mechanical and electrical systems will be running during the preliminary inspection, a mutual

agreement on the operation of mechanical and electrical systems prior to joint inspections is needed.

These five inadequacies concerning joint inspections impact the effectiveness of the management processes for facility transition by creating differing perceptions of the requirements for joint inspections and final acceptance. The differing perceptions of the requirements may cause some of the management difficulties encountered during the completion and acceptance of facilities.

Inadequacies Concerning DD Form 1354. AFR 88-3, paragraph 5g.3, requires that "the Air Force will promptly sign and accept responsibility for facilities upon completion. . . " (8:4), and paragraph 5f.3 requires that the construction agent will "furnish the agency responsible for accepting the construction an executed copy of DD Form 1354" (3:1), upon completion and acceptance. DD Form 1354 is a document used for the transfer of Real Property from the COE to the USAF. The acceptance of Real Property by the USAF from the COE is signified by the signature of the Base Civil Engineer on the DD Form 1354. The following inadequacies concerning the DD Form 1354 were found:

1. The time frame in which the BCE must sign the DD Form 1354 is stated in several ways by the Air Force regulations and by the Army regulations. The present AFR 89-1, which allows 30 days for the submission of the DD Form 1354, states that the BCE shall sign the DD Form 1354

"within reasonable time after receipt" (5:Par 14-5.c.1.e). The revised AFR 89-1 states that the BCE shall sign the DD Form 1354 "upon receipt" on the Beneficial Occupancy Date (BOD) (6:Par 6-2.b.3.c). However, the Army regulations state that the BCE shall sign the DD Form 1354 in accordance with AFR 88-3 which states that "the Air Force will promptly sign and accept responsibility for the facility upon completion" (8:5). In addition, the COE policy requires that acceptance from the contractor and transfer to the USAF occurs simultaneously (10:Par 4a). Thus, the BCE must sign the DD Form 1354 as soon as the final acceptance occurs. A mutual agreement concerning the signing of the DD Form 1354 and a clarification of responsibilities for both agencies are needed.

2. In order for the COE to accomplish acceptance from the contractor and transfer to the USAF simultaneously, the DD Form 1354 is required to be prepared by the COE in time for the final inspection (10:Par 5c.1). Thus, in the event that the final inspection is determined to be the final acceptance and transfer, the COE will be able to give the BCE the DD Form 1354 for signature with the stipulation that "occupancy will not occur without a signed DD Form 1354" (10:Par 5c.2). From the COE perspective, the signing of the DD Form 1354 occurs at the final acceptance. From the USAF perspective, the revised AFR 89-1 requires the BCE to sign the DD Form 1354 upon receipt on the Beneficial Occupancy

Date (BOD) and any deficiency lists will not delay the signing of the DD Form 1354 unless the deficiency precludes the BOD (6:Par 6-2b.3.c). Thus, unless the final acceptance, the facility transfer, and the BOD are the same event or occur simultaneously, there is a discontinuity between the regulations that may cause disagreement between the agencies. Therefore, mutual definitions of final acceptance, transfer, and Beneficial Occupancy Date are needed.

The inadequacies found concerning DD Form 1354 may cause difficulties during facility transition by creating differing perceptions of the requirements stated in the regulations. The differing perceptions of the requirements may cause some of the management difficulties encountered during the acceptance and turnover of facilities.

Inadequacies Concerning Warranty Enforcement. The management processes for the administration and the enforcement of warranty items for newly constructed, MCP funded facilities has a limited provision under Air Force regulation AFR 85-4 (7). AFR 85-4, Implementing Guarantees of Equipment Installed in the Air Force Construction, also known as AR 415-14, is a joint service regulation which applies:

> only to equipment, covered by a guarantee, that is installed by a construction contractor in Air Force facilities constructed under authority of a Military Construction Authorization Act of Congress [7:1].

Army regulation ER 415-345-38, Construction Transfer and Warranties (10), provides the only procedure between the agencies for the administration and enforcement of warranty items other than equipment covered by a guarantee.

An analysis of both AFR 85-4 and ER 415-345-38 revealed the following inadequacies in the enforcement of warranty procedures that could cause difficulties between the COE and the USAF during the warranty enforcement period:

1. When mission critical equipment, covered by a guarantee, must be repaired immediately using Air Force resources, itemized repair costs are sent to the COE for assistance on the recovery of the funds expended (7:2). There is no requirement for a feedback loop from the COE to the BCE for coordinating the status of efforts to regain funds expended or for the transferring of regained funds from the contractor.

2. If equipment repair is not covered by a guarantee, USAF resources must be expended (7:2). If the facility is still within its warranty enforcement period, the regulations do not state whether the USAF must repair the item by using BCE resources and personnel or by using the COE capabilities.

3. When the contractor refuses to repair equipment covered by a guarantee, the controversy over the repair of the equipment is treated as a case. AFR 85-4 states that cases must be forwarded by the installation commander per

AFR 89-1 (7:Par 1.e.2). However, the present and the revised AFR 89-1 neither provides a procedure for forwarding a case nor establishes an office of responsibility for receipt of the forwarded case. Army regulation ER 415-345-38 does require that "if the initial effort to solve the problem is unsuccessful, the defect will be referred to the district for correction" (10:Par 6a.2.a). Thus, more guidance on procedural requirements for forwarding a case may be necessary.

4. If the COE decides that an equipment repair is not the contractor's responsibility, the BCE must proceed with the repair using USAF resources (7:2). The regulations do not state whether the construction agency decision is final, nor at what level of authority such a final decision can be made, nor the necessary procedures for resolving any controversy over equipment repair.

5. The Army regulation, ER 415-345-38, requires that a "post acceptance" joint inspection be held at the fourth and the ninth month after acceptance (10:Par 6). AFR 89-1 presently calls for a ninth and a twelfth month "post acceptance" joint inspection (5:Par 14-7), while the revised AFR 89-1 calls for an inspection nine to eleven months after construction completion (6:Par 6-5a). A mutual agreement on the time period between joint inspections after acceptance is needed.

6. The COE is normally requested to assist in the immediate repair of a warranty item when the contractor contends that it is not his responsibility. The request for COE action is processed as specified by ER 415-345-38. The process states that the COE has the capability to take "immediate corrective action with the most expedient means using the appropriate funds" (10:Par 6). If additional funds are necessary, a request is made through "proper channels" (10:Par 6). Immediate corrective action can be taken by the COE on any defective item under warranty (10:Par 6). However, the length of time required to take "immediate corrective action" may depend on a clear definition of "the most expedient means using appropriate funds" and "proper channels." The time frame for the implementation of corrective action is not specifically stated in the Air Force regulations.

The inadequacies of the joint service regulation, AFR 85-4 (AR 415-14) and Army regulation, ER 415-345-38, can cause management difficulties between the COE and the USAF by not providing standard procedures that consist of feedback loops, funding methods, case forwarding, agreement on "post acceptance" joint inspection time intervals, and a specific time frame allowed for corrective action. The resolution of these inadequacies may require inter-organizational policy changes which need the support of both agencies' executive management.

Adequacies Concerning Deficiency Corrections. Air Force and Army regulations complement each other well in regard to the requirements stated in AFR 88-3, paragraph 5f.2, concerning the correction of construction deficiencies which states:

> Correct by appropriate action under the contract, any construction deficiency resulting from failure to comply with plans and specifications as mutually determined by the Air Force and the construction agent and approved by the contracting officer [8:4].

The present AFR 89-1 requires the major command (MAJCOM) to obtain an agreement from the CE to correct all construction deficiencies in accordance with AFR 88-3. Any contractual items are negotiated and unresolvable differences are elevated to higher levels for resolution and decision (6:Par 14-5.c.3.c). The revised AFR 89-1 did not revise any of the requirements for the correction of construction deficiencies. However, the revision placed the responsibility of obtaining an agreement from the CE to correct all construction deficiencies on the BCE Construction Manager instead of the MAJCOM (6:Par 6-2.b.1.e). The Army regulation complements these regulations by requiring the correction of deficiencies "within the scope of the contract" and a notification to the BCE of the deficiencies that are considered as "not within the scope of the contract" (10):Par 5d). Unresolvable differences in regard to the correction of a

deficiency are elevated to higher authority for resolution and decision.

Adequacies Concerning Transfer Documents. Air Force and Army regulations also complement each other in regard to the requirements for the transfer of related documents. This requirement is stated in AFR 88-3, paragraph 5f.4 as:

> Transfer to the Air Force all items related to the constructed facilities and required for the operation or maintenance of such facilities or for the protection of the Air Force interests and investments as follows:
> a. Manufacturers catalogs, maintenance and operating manuals and instructions. . .
> b. Equipment guarantees by the contractor. . .
> c. Originals or copies of all records and maps, complete legible and reproducible as-built drawings and specifications corrected to show all changes from the originals including supporting utilities, within 90 days of acceptance of facilities by the Air Force [8:4].

The present AFR 89-1 requires that the major command insures that the [illegible] provides the BCE O&M manuals, manufacturers catalogs, equipment guarantees (5:Par 14-5.c.3.6) and that the BCE insures the transfer of as-built drawings and specifications within 90 days of acceptance of facilities (5:Par 14-5.c.1.d). The revised AFR 89-1 did not revise any of the requirements for the transfer of related documents, however, the major command responsibility was placed on the BCE Construction Manager (6:Par 6-2.b.1.c). The Army regulations complement these regulations by requiring the transfer of operating and maintenance instructions and warranties

(10:Par 5b.2-Par 5b.7) and the transfer of as-built drawings and specifications no later than 90 days after acceptance (10:Par 5a.1-Par 5a.4).

The management processes for facility transition are established by regulations. The previous discussion showed both inadequacies and adequacies in the regulations concerning these management processes. The inadequacies between the regulations of each agency could be a source of disagreement between the agencies. These inadequacies should be addressed by both the COE and the USAF management so that there are clear and specific responsibilities, definitions, and procedures for joint inspections, for the signing of the DD Form 1354, and for the enforcement of warranty items. Although these inadequacies were found, the regulations of each agency complemented each other in areas concerning the correction of construction deficiencies and the transfer of related documents.

Construction Industry Trends on Construction Management

The following discussion presents the current construction industry trends in construction management, the evaluation criteria for measuring the potential and the performance of construction management, and a review of organizational structures for large projects.

Trends in Construction Management. In the construction industry there are various organizational concepts involving the owner, the engineer, and the contractor. The

most simple and basic treatment of these concepts is given by K.A. Kettle, a management consultant and an American Society of Civil Engineers (ASCE) author. The four basic project delivery systems which he presents are:

1. The Engineer-Contractor System: This system has direct and responsible relationships between the owner, the engineer, and the contractor. Normally, this system uses one contract for both the design and the construction and, usually, there is no overall project manager who answers for both engineering and construction (20:576).

2. The Engineer plus Contractor System: This system also involves the owner, the engineer, and the contractor. During a project's design phase, a direct relationship exists between the owner and the engineer. However, during the construction phase, a direct relationship exists between the owner and the contractor. The owner also maintains an "as needed" relationship with the engineer while the contractor has a direct relationship with the engineer during the construction phase (20:577-579).

3. The Professional Construction Management System: This system involves the owner, the engineer, and the contractor and adds a Professional Construction Manager (PCM) as a focal point for the relationship. All relationships go through the PCM and are maintained through the entire life of the project (20:579).

4. The Performance Specification System: This system involves only one direct relationship for the owner and that relationship is with the contractor. In this system, the engineer is selected by the contractor and, therefore, there is a direct relationship between the contractor and the engineer. There is no direct relationship between the owner and the engineer in this system (20:579).

Of these four basic project delivery systems, the system of interest to this research is the PCM system because the PCM system is very similar to the present USAF COE management relationship structure established by joint regulation AFR 88-3. The following discussion focuses on various aspects of the PCM system as it applies to the USAF/COE management relationship.

There is "an increased use of some form of construction management" (31:114) in the construction industry and major issues are arising from this increased use of the PCM field. These issues concern the liabilities and the responsibilities of the owner, the engineer, the contractor, and the professional construction manager for each construction project. Such a concern "indicates a strong need for the clarification of relationships between the various potential organizations" (31:114). Thus, as the construction industry uses PCM management techniques, which the USAF and the COE have used for years, the industry is finding similar problems which face the COE and the USAF, such as "the

growing need for agreement regarding the scope, activities and responsibilities of each of these parties" (31:114); that is, the owner, the professional construction manager, the engineer, and the contractor.

The clarification of relationships begins with the responsibilities of the owner under the PCM system.

> The owner should have at least one experienced representative assigned to the project full-time. This representative must have the experience and authority to make most of the owner's decisions. . . [21:98].

The owner must also maintain the following functions:

> . . . - Define specific roles and responsibilities of project parties including his own and incorporate these roles in service agreements and project procedures.
> - Approve all significant commitments and expenditures. . .
> - Support project cost, schedule, and other goals by making timely decisions and lending support to the project parties in any way requested.
> - Monitor performance of AE and the CM and insist that these parties meet their obligations and project goals and inspections, attendance at meetings, etc. [21:98].

The responsibilities which the owner must relinquish to the construction manager are:

> - All those responsibilities which he agrees to place under the CM, including day to day direction of the project.
> - Giving direction to the contractors, testing labs, or any other project parties whom he has assigned to the CM. A single line of direction should be maintained.

> The major problem that an owner faces under CM is that his own staff sometimes unofficially changes the rules and assumes responsibilities previously given to the CM. . . This . . . can only lead to confusion among project participants [21:99].

The responsibility of the construction manager is "to plan, to administer and control in a professional manner an overall construction program best suited to the individual project objectives of the owner" (2:430). The objectives of the owner include minimum cost, minimum time frame, compliance to requirements, quality and utility in the finished product (2:430). To obtain essential facts and information necessary to construct a successful project, the construction manager must:

> . . . meet with the owner's representatives to understand his objectives and requirements including:
>
> 1. Project schedule requirements, completion priorities and other scheduling information. . .
> 5. Define responsibilities of both owner, designer, and professional construction manager as well as the extent of delegation to each.
> 6. Determine the specific functions the owner intends to perform for himself and the extent that supplementary assistance may be required.
> 7. Define responsibilities of key individuals on both the owners staff and that of the professional construction manager [2:431-432].

The responsibilities of the construction manager include faithful and professional representation, and keeping "the owner fully informed at all times regarding the current

status of the project in comparison to the overall plan" (2:430). It must be noted that:

> While the Construction Manager's primary duties and responsibilities are oriented towards the owner's objectives, he has a professional responsibility for basic fair and business-like dealings with other participants in the project including the designer, contractors, labor unions and the industry as well as the general public [2:430].

The Professional Construction Management system has gained increased usage in the construction industry as a viable option for managing construction projects. This increased usage has brought about the need for a clear definition of responsibilities between the owner, the contractor, the engineer, and the professional construction manager. The USAF/COE relationship is very similar to the owner/professional construction manager relationship described in the literature; thus, the USAF/COE relationship must also have clear definitions of roles and responsibilities in order to maintain clearer boundaries between the agencies.

Evaluation Criteria. The evaluation criteria that could be used for measuring the potential and the performance of the COE as the USAF Construction Manager during the last five percent of construction and the acceptance and turnover periods is well presented by the ASCE Construction Division Committee on Professional Construction Management

in the article Evaluating PCM Firm Potential and Performance:

> This final phase of construction management projects requires systems validation, testing, startup, and overall project closeout. The primary focus of evaluation in this phase is the number and scope of open items remaining for the owner's resolution. On projects involving extensive process systems, the schedule and results of the startup program are important evaluation criteria. PCM performance in this phase may also be judged by the orderliness of records turnover and the completeness of final reporting. The following specific evaluation criteria are suggested:
>
> 1. Degree of consideration given to closeout and startup in overall plans, contract documents, and inspection programs;
> 2. Effectiveness in identifying deficient items, reporting status, and obtaining resolution;
> 3. Satisfaction of all functional and preoperational testing requirements defined by project specifications, codes, or other applicable criteria;
> 4. Orderliness of turnover program as indicated by actual schedules and number of owner rejections;
> 5. Completeness and accuracy of documentation packages as determined by system audits; and
> 6. Number of deficiencies, open items, and action items remaining for the owner after acceptance [30:248].

According to the ASCE Committee, the results of the start up program, the effectiveness of the PCM to identify and resolve deficiencies, satisfactory completion of testing, orderliness of the turnover program, the completeness of final reporting, and the number and scope of open items left for the owner's resolution are the important criteria in the evaluation of the PCM during the final phase

of construction. These six criteria offer a sound basis for the owner's evaluation of the performance of the PCM, the owner being the USAF and the PCM being the COE.

The performance of the COE should be evaluated by the USAF not only for the owner to have a track record of the quality and efficiency of the COE performance, but also for the COE to know how to improve management techniques to better satisfy the customer. Past studies indicate various compliments as well as complaints about different aspects of the COE construction contract execution, but these studies may not provide the information needed to evaluate the COE performance as suggested by the ASCE Construction Division Committee.

Organizational Structure. The Poe/Brett study reported the following perception of the USAF/COE/Navy Civil Engineering organizational structure:

> It appears that the three service engineering organizations have not kept up with the current trends in USAF Military Construction. . . we interviewed several differing views as to how the organizations should be structured. It seems, however, there is sufficient evidence to warrant an individual service review of how the organizations that support the USAF should be structured, as well as, a joint COE/USAF look at the basics of the organizations responsible for USAF Construction Management [5:23].

An article in the Journal of Construction Engineering and Management, Organizational Alternatives For Large Projects by C.B. Tatum and R.P. Fawcett, reviews five

organizational structures used for large projects. For each of the five projects, the authors show a construction management structure consisting of one site manager supported by one office manager, one test and turnover manager, one planning and control manager, one materials manager, one project field engineering manager, and one construction manager. The management structure would also include a staff of two or three, divided by function or discipline, under each of these managers (15:52-58). The organizational structure chosen for each project is dependent upon the critical aspects of each individual project.

In the Government sector, staffing authorizations are a key factor in deciding the management structure for each project and is dependent upon "monetary value and complexity of the contract" (26:22). Once manpower authorizations are established:

> The Corps administers construction contracts in one of two manners:
> 1. On site Resident Engineer
> 2. Project Engineer from an Area Office [26:19].

The choice between the two is made by the District Engineer. The organizational structure used by the COE is often a matrix organization, where the project engineer draws his needed resources from a central office. For example, if an electrical engineer is needed to witness a system test, that engineer would be obtained from a pooled source of engineers at the Central Area or Resident office. The Poe/Brett study

suggests that there needs to be a "review of how the organizations that support the USAF should be structured" (22:23); this review may be needed to insure that the organizational structure used in the management of an MCP project meets the critical aspects of that project. For example, if a project needs a quick turnaround of a high volume of submittals, then a dedicated engineering staff may be needed to meet this project criticality.

A review of organizational structure alternatives would reveal many alternatives that could support the USAF Military Construction Program. The selection process would be complex because not only is there a myriad of possible organizational structures, but also the selection of a particular organizational structure would be dependent on various factors such as organizational goals, external influences, design technology, and work technology (15:49-50). In lieu of a detailed discussion of the various structures available, the following discussion focuses on a method for evaluating and selecting the most effective organizational structure, and on the basic principles that guide the choice of an organizational structure.

ASCE authors C.B. Tatum, former Chairman of the ASCE Committee on Professional Construction Management, and R.P. Fawcett, Vice President of Management Analysis Co., outlined a logical process for the design of a more effective organizational structure. The following provides a brief summary

of the organizational structure process as recommended by the ASCE authors:

1. Do "an analysis of the project situation--its goals and objectives, external influences, technology and phase" (15:49).

2. Brainstorm organizational structure alternatives. The project situation analysis in step one "in turn will dictate which organizational structure is suitable to the project" (15:51). Seven basic principles are suggested to guide the choice of an organizational structure:

> 1. Establish clear responsibility for external influence with engineering, purchasing, and operations.
> 2. Provide single point of responsibility at the lowest practical level.
> 3. Integrate craft, engineering, planning and materials resources at the lowest practical level.
> 4. Establish and enforce craft discipline priorities consistent with the construction phase of the project.
> 5. Limit manageable spans of control.
> 6. Assure clear and effective reporting relationships.
> 7. Assure most effective utilization of available management, support, and craft resources [15:51].

3. Develop criteria for specific performance attributes, addressing the major difficulties expected to be encountered, then assigning priorities to various criteria (15:60).

4. Establish a matrix of structure alternative versus criteria (15:60).

5. Select the structure best suitable to the project (15:59-60).

In step two, the purchase aspect of basic principle number 1 would not be applicable to a USAF/COE organizational structure for a construction project because both the USAF and the COE do not typically purchase materials for construction projects. In the same manner, the craft discipline aspect of basic principles 3 and 4 would not be applicable because contractors manage the craft disciplines for construction projects. Otherwise, these basic principles provide a good guide for selecting an organizational structure which meets the construction project's needs. In step 5, it must be understood, that no one alternative will fit all the criteria developed in step 3, and at the same time, meet all the basic principles stated in step 2. Therefore, the evaluation of each structure alternative will involve both the weaknesses and the strengths based on the criteria developed and basic guide principles.

This organizational structuring process could be used for selecting the construction management structure for each project. In the Government sector, time, funding, and manpower constraints often limit the management structure alternatives. The executive management of the USAF and the COE should consider all the manpower and funding resources that are available to support a construction project and generate management structure alternatives which will use

these resources most efficiently. Then, criteria could be developed that addresses the critical attributes needed by each construction project using the basic guide principles presented. Once the criteria are developed, the management structure alternatives and the project criteria could be placed into a matrix format and each alternative's ability to meet the set criteria for each project could be rated. The final selection is subjective because no one alternative will meet all of the established criteria; however, this organizational structuring process will provide the COE management a systematic procedure for making the final selection.

Another guideline for successful construction management is stated by D.S. Barrie, ASCE author and Vice President of Kaiser Engineers, Inc., in his article, Guidelines for Successful Construction Management:

> Professional Construction Management (PCM) involves a three party team of owner, designer, and construction manager. Its success depends on elimination of adversary relationships among team members. Should one or more of the team members introduce concepts or policies detrimental to mutually satisfactory relationships, PCM deteriorates into an adversary situation with an inevitable negative effect upon the project as well as upon the individual participants [1:237].

In an overview of the relation between the COE and the USAF in the Poe/Brett study, it was reported that "all" the USAF individuals interviewed, when asked how they felt about the

USAF/COE relationship, they stated, "We like it" (22:35). This perception implies that the "adversary relationship" between the agencies is limited.

III. Methodology

Chapter Overview

The fundamental purpose of this research was to study the management relationship between the USAF and the COE and to determine if there are any difficulties that hinder the full success of the management processes for achieving smooth facility transition. The negative perceptions concerning facility transition that were identified in the Poe/Brett study may indicate that there could be three categories of difficulties:

1. Misconceptions of organizational roles and mission.
2. Conflicting perceptions of responsibilities.
3. A misunderstanding of the contract requirements and standard operating procedures.

In order to verify that these three categories of difficulties exist, a survey instrument was chosen as the most efficient method of obtaining pertinent analytical data.

Management Question

The basic management question of this study was: Are there difficulties that hinder the full success of the management processes for achieving a smooth facility transition from the construction agent (COE) to the user/owner (USAF) for MCP projects?

Research Hierarchy

The four level hierarchy, shown in Figure 3, was developed to aid in the design of a survey instrument that would give enough data to support each level of the research hierarchy. The basic management question, the three research questions, and a statement of each of the investigative hypotheses on the third level were given in Chapter I.

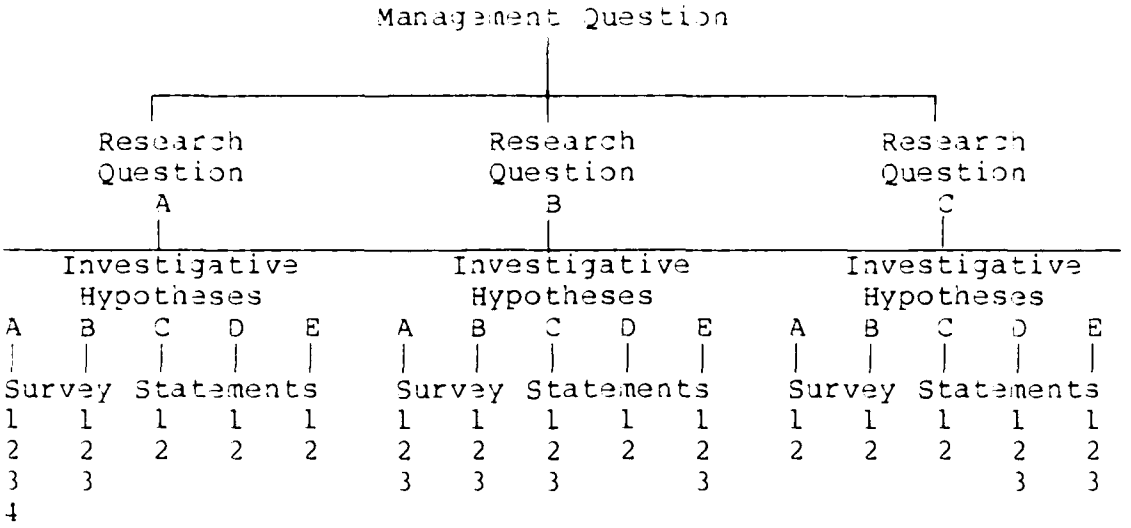


Figure 3. Research Hierarchy

As can be seen in the hierarchy diagram, the first level asked the basic management question. The second level asked three research questions corresponding to the three periods of the facility transition, namely, the last five percent of construction period, the acceptance and turnover period, and the warranty enforcement period. The third level stated five investigative hypotheses for each of the three periods of facility transition. The third level

identified perceptions of the difficulties encountered in each period of facility transition that were identified by past studies. The fourth level of the hierarchy consisted of two to four statements of suspected problem areas for each of the investigative hypothesis. Each suspected problem statement became actual statements of the survey instrument.

Responses to these statements were analyzed statistically. The hierarchy was used as a model for analysis. The data analysis results, the types of perceptions obtained, and the content of each survey statement at the fourth level supported the hypotheses of the third level. The content of each survey statement and the the results of the hypotheses at the third level supported answers to the research questions of the second level. Finally, an overall look at the research hierarchy at the second, third, and fourth levels supported an answer to the basic management question. Thus, the hierarchy offered a systematic approach for obtaining conclusions to the hypotheses and answers to the research questions.

In addition to the analysis above, the third level of the hierarchy was used for a rank order analysis. Each hypothesis in this level represented a negative USAF perception of the COE execution of facility transition as was identified by past studies (9; 18; 22) and was presented in the survey as a problem to be ranked. The survey asked the

respondent to rank five problems encountered in each period of facility transition by order of significance. The rank order analysis resulted in five prioritized problems for each of the three periods of facility transition.

Survey Justification

The investigative hypotheses were tested using the perceptions of personnel within each organization. Thus, the survey technique lends itself naturally to the gathering of the necessary data. There were two survey techniques which would have been effective. These were interviews, both personal and by telephone, and mailed survey. The mailed survey instrument was determined to be the most time efficient and cost effective method for the size of population under consideration.

The Survey Instrument

The survey instrument is shown in Appendix A. The following discussion focuses on the validity, the reliability, and the structure of the survey that was used to generate the data for the research study.

Validity. The validity refers to "the extent to which a measure reflects the theoretical construct that a researcher has in mind" (13:62) or "the extent to which a test measures what we actually wish to measure" (14:91). This study used expert opinion to verify face validity and to assure that the items making up the measure were representations of the items making up the survey (33). First,

the survey was built around the perceptions and ideas revealed in past studies. These studies include:

1. The study by General Bryce Poe II and Lieutenant General Devol Brett (22) that was requested by the COE to identify "considerations to improve the USAF/Corps of Engineers construction process quality and mutual confidence" (22:6).

2. The Project IMAGE study (18), an Air Force wide study to identify the current status of functional areas and propose changes to improve functions.

3. The COE Customer Care Survey (9) that was carried out by the COE Mobile District, Alabama.

Secondly, the survey for this study was reviewed by Major General George E. Ellis, USAF, Director of Engineering and Services, HQ USAF, Office of the Deputy Chief of Staff for Logistics and Engineering, and by Major General Mark J. Sisinyak, USA, Assistant Commander and Director of Engineering and Construction, U.S. Army Corps of Engineers. Lt. Col. A. Gillis, USAF, Assistant Director of Engineering and Construction, U.S. Army Corps of Engineers and Major Dan Kohlnaas, USAF, executive officer to General Ellis, also reviewed the survey. Finally, the survey was reviewed by Captain William M. Duncan and Captain Larry J. Blake, thesis advisors for this study, and then, tested on fellow Air Force Institute of Technology officers who had varying backgrounds in Civil Engineering and Construction Management.

Based on these expert reviews and on comments made on the pretest, the original survey instrument was modified to insure that the survey questions were a true representation of the overall management question. Therefore, the above reviews and follow-up pretest served to verify the content validity of the survey used to gather data.

Reliability. Reliability is the degree to which a measure supplies consistent results (14:98). Reliability has two components, the true value and some error of measurement, which can be estimated (24:102). The reliability of the survey was calculated for each of the three periods of facility transition using the RELIABILITY Subprogram in the SPSSX statistical package on the VAX 11/785 Academic Support Computer (ASC). Data were entered into the RELIABILITY subprogram in SPSSX. The RELIABILITY subprogram calculates Cronbach's alpha coefficient which varies from zero to one depending upon the reliability of the survey instrument. A value of zero indicates that all variations are due to errors of measurement, while a value of one indicates that no measurement errors occurred (16:251). The set ranges of the Cronbach's alpha coefficient which represent the relative reliability of this survey (i.e., excellent, good, fair, marginal) are discussed in the results analysis.

The Survey Structure. The survey had three sections:

1. The statements of suspected problem areas that occur during the last five percent of construction period,

the acceptance and turnover period, and the warranty enforcement period.

2. The rank ordering of the five problems in each period of facility transition.

3. The demographics of the respondents, and an open ended question requesting that the respondent share any additional areas of management concerns.

In section I, the statements represented suspected problem areas that occur within the three periods of facility transition. The statements were worded so that the responses could be scored using a seven-point Likert scale; thus, the survey provides ordinal level data. The ordinal level data allows both rank and order to be determined and may be analyzed using nonparametric or parametric techniques (17:27). The seven point Likert scale ranges from "strongly disagree" at point 1 to "strongly agree" at point 7. The midpoint of the scale is "neither agree nor disagree" at 4.

In section II, the difficulties encountered in each period as identified by past studies were presented as problems to be ranked by order of significance. The data obtained in this section allowed a rank order analysis which resulted in five prioritized problems for each of the three periods of facility transition as perceived by the managers of both agencies.

In section III, the demographic questions simply identified the respondent by years of experience, grade level,

and position held and the open ended question asked for any additional management concerns. All responses were strictly confidential and could not be linked to an individual respondent.

Population

The population consisted of the construction managers of the Military Construction Program; specifically, the Area, Resident, and or Project Engineers of the Corps of Engineers and, the Chiefs of Engineering and the Chiefs of Construction Management in the Base Civil Engineering Organizations for each USAF base in the CONUS. Thus, the population under consideration was stratified consisting of the COE and the USAF BCE in the Continental United States (CONUS).

The COE has eleven Divisions within the CONUS. Each Division is subdivided by Districts. Each COE District

> . . . administers construction contracts in one of two manners:
> 1. On-site Resident Engineer.
> 2. Project Engineer from an Area Office [26:19].

Eighteen Districts were identified as supporting USAF MCP construction projects within CONUS. Each of these Districts was called and the names of 100 Area, Resident, and/or Project Engineers interfacing with the USAF BCE were identified. This study considers these 100 Engineers as the COE population of interest.

The USAF population consisted of all the Chiefs of Engineering and Chiefs of Construction Management for each base that dealt with the COE. Eighty-two active USAF CONUS bases were identified. Ten of these bases were either Model Installation Program bases or bases whose MCP construction agent was the Naval Facilities Engineering Command (NAVFACENGCOM); therefore, they were not surveyed. The USAF BCE population consisted of 144 individuals at 72 CONUS bases.

The total population for this study consisted of 244 individuals.

Data Collection Plan

A census of both populations was attempted. The support of Major General Ellis and Major General Sisinyak aided in obtaining a good census response percentage from the construction managers of both the USAF BCE and the COE.

Statistical Tests

Parametric Tests are used in the analysis of the data even though the survey instrument provides ordinal level data. In recent years this approach has become generally accepted since:

> A statistic is completely independent of the numbers on which it operates and is totally unconcerned about the nature of the measurement scales to which the numbers are fitted [17:27].

Further, it has been shown by:

> . . . definitive evidence that statistics calculated on ordinal measurements are just as reliable and meaningful as statistics calculated on interval or ratio scales of measurement [17:27].

Thus, parametric procedures that were available on the software system for data analysis, called SPSSX, were used to analyze the results of each of the survey statements. The SPSSX system is on the VAX 11/785 Academic Support Computer (ASC).

As shown in Figure 3, Level IV of the hierarchy represented the actual statements in the survey. A basic T-Test was performed for each survey statement using the SPSSX subprogram T-TEST and a 95 percent confidence interval (alpha = 0.05). The T-Test evaluated the equality or the inequality between the means of the scores of each agency on each survey statement. The Null Hypothesis was

$$H_0 : u_1 = u_2$$

where u_1 was the mean of responses from the COE and u_2 was the mean of responses from the USAF. If the data were not significant, i.e., the null hypothesis was true, then both agencies statistically scored the statement of the problem with the same value. When the means were equal such that $u_1 = u_2$, one of three perceptions were possible:

1. Both agencies agreed with the statement.

2. Both agencies disagreed with the statement.

3. Both agencies were undecided on the statement, which may indicate a poorly worded statement.

If the data were significant, i.e., $u_1 \neq u_2$ and the null hypothesis was rejected, then both agencies scored the statement of the problem with different values. One of two possibilities may occur:

1. Both agencies scored different mean values on the same side of the scale. In this case the different mean scores represent varying degrees of a congruent perception of the problem, e.g., both agree but the COE only slightly agrees while the USAF strongly agrees.

2. Both agencies scored different mean values on opposite sides of the scale. In this case, one agency agreed with the statement of the problem, while the other agency disagreed with the statement of the problem. Conflicting perceptions of the same problem statement may indicate a source of conflict and, therefore, may require the attention of the management of both agencies.

The combination of the results of the test of means on the survey data, the type of perceptions obtained, and the content of the survey statements allowed inferences to be made which supported or refuted the investigative hypotheses. Between the investigative hypotheses level and the research questions level, only inferences could be made

Table 3.1

Hierarchy Relationships

LEVEL II Research Question	LEVEL III Investigative Hypotheses	LEVEL IV Statement Numbers
A	A. O&M inspection and training are inadequate	1 2 17 18
	B. BCE/COE working relationship is not effective	3 19 20
	C. USAF surveillance is inconsistent	4 21
	D. There is a lack of adequate retainage	5 22
	E. There are less qualified COE people to close out job	6 23
B	A. Compromising acceptable completion of deficiencies	7 24 34
	B. There is untimely completion of punchlist	8 25 26
	C. User not satisfied with the final product	9 27 28
	D. As-built drawings are unacceptable because of inaccuracies	10 29
	E. O&M documentation is incomplete	11 30 31
C	A. There is no standard procedure to obtain contractor support to fix latent deficiencies	12 32
	B. There is no standard procedure to recoup resources spent to fix latent deficiencies	13 33
	C. Equipment warranty enforcement is weak	15 36
	D. Lack of qualified people to handle warranty enforcement	6 14 35
	E. Warranty process is cumbersome	15 16 37

on the results of the investigative hypotheses and survey statements to show the support of an answer to the research questions. Finally, an answer to the basic management question was obtained from an overall assessment of the results of Level II, Level III, and Level IV of the research hierarchy.

The stated approach had a possibility of breakdown if the five investigative hypotheses of each period of facility transition were not supported by the data analysis. In this situation, inference statements could not be made with any confidence and the support structure of the research hierarchy would collapse.

A rank order analysis on the ranking of problems encountered during each of the three periods of facility transition was performed by using the KENDALL subprogram of SPSS-K. This analysis resulted in five prioritized problems encountered in each of the three periods of facility transition. The five prioritized problems in each of the three periods of facility transition were the result of the ranks established by each agency separately and ranks established by both agencies combined.

The results of this methodology were intended to show:

1. The reliability of the survey instrument for each period of facility transition.

2. The conflict or congruence in perceptions between the agencies for each of the problem areas as stated by the survey.

3. The support of the investigative hypotheses through data analysis results and inferences on the content of the survey statements.

4. The rank ordering of the problems identified in past studies that have been encountered during facility transition.

5. A method of assessing all levels of the research hierarchy as a basis for answering the basic management question.

IV. Results

Chapter Overview

The results of the survey instrument are presented in this chapter. As was stated in the methodology chapter, the validity of the survey was verified by expert opinion. The survey return rates establish the confidence level of the survey by meeting or exceeding a minimum sample size. This confidence level is supported by the demographic data which identifies the level of responsibility and experience of the survey respondents for each agency. The reliability of the survey instrument for each period of facility transition describes the consistency of the survey and is determined by the relative size of the calculated reliability coefficients. The confidence level and reliability together lend credibility to each agency's perceptions on the statements of the survey. A simple test of means reveals the degree of conflict or consistency of perceptions that the USAF and the USN have on each survey statement. Each survey statement is considered as a variable of interest and, as such, these variables allow a better interpretation of the data analysis results. Inferences using the results of the test of means, the types of perceptions obtained, and the content of each survey statement show the support or non-support of each investigative hypothesis. An analysis of the ranks that were established by each respondent for five of the problems

encountered within each period of facility transition sets up organizational and inter-organizational priority lists. Additional respondent concerns and comments were presented in answers to the opened ended question. Finally, "success factors" that should be considered by the COE and the USAF management for a better USAF/COE working relationship are drawn from personal interviews with personnel in key positions and from the comments to the open ended question.

Survey Confidence Level

The survey was mailed to a COE population consisting of 100 Area, Resident, and/or Project Engineers and to a USAF population consisting of 144 BCE Chiefs of Engineering and Chiefs of Construction Management. Of the 100 COE surveys, 80 responses were received, and of the 144 USAF surveys, 104 responses were received. Since the COE and the USAF were surveyed by mail, their return rates of 80 percent and 72 percent, respectively, represent a very high confidence level. If a sample of both populations were taken based on a 95 percent confidence level, the size of the sample, n, for each population would be calculated as 74 samples for the COE populations and 105 samples for the USAF population (Ref). Therefore, both return rates should statistically yield 95 percent confidence levels and generalization of the results can be made with a high level of confidence.

Demographics

The level of responsibility of the respondents was determined by the organizational positions and the grade levels of the respondents, while the level of knowledge of the respondents was evaluated based on the years of experience.

The 80 DOE respondents consisted of 61 percent Resident Engineers, 24 percent Project Engineers and 11 percent Construction Managers; 4 percent failed to respond to the demographic question concerning the position held. Evidently, 11 percent of the DOE population surveyed were construction managers who were given the task of answering the survey. The DOE respondent grade levels consisted of 75 percent GS-11 through GS-13, and 10 percent GS-14 and above; 11 percent failed to respond to the demographic question concerning the grade level. The responsibility of the DOE Manager is the "supervision, inspection and administration of all contracted construction activities within his assigned geographic area" [Ref:9]. The experience level represented by the DOE respondents was 32 percent with 6 to 10 years experience, 25 percent with 11 to 15 years, and 32 percent with 16-25 years of experience in construction and or construction management; 11 percent failed to respond to the demographic question concerning years of experience. Overall a very high percentage of the respondents are in highly responsible positions that deal with the subject

matter of the research and because the level of experience represents a high level of construction knowledge, the demographic data representing the COE population adds strength to the confidence level of the survey.

The 104 USAF respondents consisted of 36 percent Chiefs of Engineering, 50 percent Chiefs of Construction Management, and 8 percent Project Engineers; 6 percent failed to respond to the demographic question concerning position held. Evidently, 8 percent of the USAF population surveyed were project engineers who were given the task of answering the survey. The USAF respondent grade levels consisted of 65 percent GS-11 through GS-13, 7 percent GS-14 and above, 16 percent officer level O-1 through O-3, 2 percent GS-7 through GS-10, and 4 percent enlisted men level E-2 through E-9; 6 percent failed to respond to the demographic question concerning grade level. The experience represented by the USAF respondents was 24 percent with 6-10 years experience, 24 percent with 11-15 years, 34 percent with 16-25 years, and 16 percent with more than 25 years of experience in construction and or construction management; 2 percent failed to respond to demographic questions concerning experience level. Thus, the demographic data representing the USAF population also adds strength to the confidence level of the survey in the same manner as stated for the COE population.

Reliability

Section I of the survey consisted of statements of suspected problem areas that exist within the three periods of facility transition. Each statement measured perceptions concerning a suspected problem area and each statement was tied specifically to one of the three periods of facility transition. Coefficients of reliability, which measure the degree to which a survey statement yields consistent results, were calculated for each of the three periods of facility transition. Three groups of respondents were considered for this analysis: The USAF/COE responses combined, the COE responses only, and the USAF responses only. Table 4.1 lists the resulting coefficients of reliability, or Cronbach's alpha, for each of the survey periods of facility transition and for each group of responses considered.

Table 4.1

Survey Reliability

Period	Reliability Coefficients		
	COE Respondents	USAF Respondents	COE/USAF Respondents
A. Last Five Percent of Construction	.6391	.5786	.5566
B. Acceptance and Turnover	.8107	.8314	.8613
C. Warranty Management	.7575	.7311	.7298

The following ranges of Cronbach's alpha represent the relative reliability of a survey instrument depending upon the value of alpha (28).

0.90 - 1.00	Excellent
0.80 - 0.89	Good
0.70 - 0.79	Fair
<0.70	Marginal

The reliability of the statements for the last five percent of construction period was marginal for the COE responses, with a coefficient value of 0.6391, very marginal for the USAF responses, with a coefficient value of 0.6786, and "cause for concern" for the combination of COE/USAF responses, with a coefficient value of 0.5566. The reliability of the survey for the acceptance and turnover period and the warranty enforcement period was generally good. The survey statements of the acceptance and turnover period had very good reliability with a coefficient value 0.8107 for the COE respondents, [illegible] for the USAF respondents, and 0.8613 for the combined respondents. The survey statements of the warranty enforcement period had fair reliability with coefficient values of 0.7098 for the combined respondents, 0.7311 for USAF respondents, and 0.7575 for the COE responses.

Because of the marginal values of the coefficient of reliability that were obtained for the last five percent of construction period, "it is necessary to decide both what kind and what level of reliability are appropriate. . . "

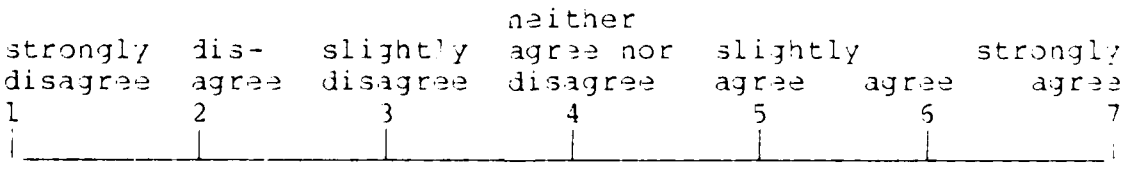
(13:261) for the investigation of the difficulties encountered during this period of facility transition. The coefficient of reliability values that were obtained for this p riod can be considered as appropriate for this investigation because:

> The point is that a measure that does not meet the high criterion of high reliability with respect to individual scores might well be good enough for making comparisons between group means, provided that the groups are large enough [13:262].

The size of both groups of respondents is large in comparison to the total population, as was discussed previously in regard to the survey's confidence level. Because of this, the measure obtained from the survey statements that were tied to this period are considered good enough to make comparisons between the group means. Therefore, the reliability of the survey statements for the last five percent of construction period are considered appropriate for this research investigation.

Test of Means

The means of the responses were tested based upon the following Likert scale that was used in the survey:



The results of the test of means based on this seven-point Likert scale are shown in Table 4.2. The variable designation is shown as an alpha-numeric. The first letter designates one of the three periods of facility transition; A - for the last five percent of construction period, B - for the acceptance and turnover period, and C - for the warranty enforcement period. The second letter designates one of the five investigative hypotheses for each period of facility transition. There are a total of fifteen investigative hypotheses as stated in Chapter 1. The number in the variable designation corresponds to the number of the survey statement. Thus, the variable designation AA1 represents a statement concerning the last five percent of construction (A), the first investigative hypothesis (A), and the first survey statement (1).

Each statement describes a suspected problem area within one of the three facility transition periods and the survey asks the respondent for agreement or disagreement with that statement. The mean score of all responses for each agency is then obtained for each statement. The mean score on each survey statement is intended to reveal each agency's perception of the suspected problem area.

The mean scores for each survey statement for both the COE and the USAF are tabulated to show the difference (conflict) or similarity (congruence) between the scores. From the Likert scale, scores that are less than four

Table 4.2

Results of the Test of Means

Variable Designation	COE (mean)	USAF (mean)	Agency Congruence	Significance (mean equal)
AA1	4.84	4.13	YES	NO
AA2	5.41	6.15	YES	NO
AB3	4.30	3.95	NO	YES
AC4	3.53	5.32	NO	NO
AD5	3.43	4.88	NO	NO
AE/CD6	5.62	4.54	YES	NO
BA7	4.20	2.79	NO	NO
BB8	4.77	3.94	NO	NO
BC9	5.39	4.88	YES	NO
BD10	5.01	3.54	NO	NO
BE11	5.28	4.58	YES	NO
CA12	4.14	3.62	NO	YES
CB13	3.15	3.35	YES	YES
CD14	6.08	4.49	YES	NO
CC/CE15	4.74	4.95	YES	YES
CE16	3.82	4.58	NO	NO
AA17	4.77	3.75	NO	NO
AA18	5.09	4.05	YES	NO
AB19	5.03	5.58	YES	NO
AB20	5.68	5.15	YES	NO
AC21	4.13	5.52	YES	NO
AD22	6.43	5.59	YES	NO
AE23	5.66	4.88	YES	NO
BA24	4.97	4.71	YES	YES
BB25	3.84	3.02	YES	NO
BB26	4.12	3.33	NO	NO
BC27	6.63	5.01	YES	NO
BC28	5.71	4.71	YES	NO
BD29	3.95	2.53	YES	NO
BE30	4.96	4.04	YES	NO
BE31	5.47	4.67	YES	NO
CA32	4.05	3.32	NO	NO
CB33	4.25	3.48	NO	NO
BA34	4.86	4.91	YES	YES
CD35	4.60	4.73	YES	YES
CC36	4.40	5.00	YES	NO
CE37	4.29	4.85	YES	NO

represent disagreement with the survey statement while scores that are greater than four represent agreement with the survey statement. The tabulated means shown in Table 4.2 represent the position of each agency on each survey statement. These mean scores indicate whether the agencies stand on the same side of the scale, representing congruent perceptions, or on opposite sides of the scale, representing conflicting perceptions. As can be seen in Table 4.2, a "yes" in the agency congruence column represents a congruent perception while a "no" represents a conflicting perception.

The "significance" column manifests another aspect of the survey analysis. When the means of both agencies are similar or statistically equal, a "yes" is tabulated. "Yes" indicates that, depending on the agencies' perception of the survey statement, both agencies are scoring the survey statement with the same statistical value. Unequal means, or statistically significant data, are tabulated as "no." "No" indicates that, depending on the agencies' perceptions of the survey statement, both agencies are scoring the survey statement with different values.

Four cases can occur on the perceptions of the agencies on each survey statement:

Case 1. Congruent perceptions of the survey statement with both agencies scoring the statement with the same value.

Case 2. Congruent perceptions of the survey statement with the agencies scoring the statement with significantly different values.

Case 3. Conflicting perceptions of the survey statement with the agencies scoring the statement with significantly different values.

Case 4. Conflicting perceptions of the survey statement with both agencies scoring the statement with the same value.

The fourth situation indicates that the mean scores of both agencies, although on opposite sides of the scale, are considered, statistically, to be equal. The outcome is that the statement is scored as a four on the Likert scale which indicates that both agencies "neither agree nor disagree" with the survey statement. Table 4.3 summarizes these situations. All four situations did occur in the data analysis.

The following discussion presents the author's interpretation of the data analysis as described above for survey statements AA1 through CE37. In this discussion, the ranges of Likert scores are interpreted as indicated by the following:

1.00 - 1.49	strongly disagree
1.50 - 2.49	disagree
2.50 - 3.49	slightly disagree
3.50 - 3.99	barely disagree
4.0	neither agree nor disagree
4.01 - 4.49	barely agree
4.50 - 5.49	slightly agree
5.50 - 6.49	agree
6.50 - 7.00	strongly agree

Table 4.3

Data Interpretation Summary

Position of Scores on Rating Scale	Mean Values: Similar	Mean Values: Different
Same Side	congruent with the same score Case 1	congruent with different scores Case 2
Opposite Sides	conflicting with the same score Case 4	conflicting with different scores Case 3

In a Case 2 situation, the significant difference between the scores indicate the degree of agreement or disagreement that each agency has with the survey statement. According to the interpretation of the Likert scores established above, the mean scores of the agencies could be considered significantly different, statistically, yet, these scores could still be within the same range of interpretation. For example, 5.50 and 6.49 may be considered significantly different, yet, the interpretation of the Likert scores is that both agencies fully agree. Thus, the scores, 5.5 and 6.49, give an indication of the degree of agreement with the survey statement.

Survey Statement-AA1. This statement is a Case 2 situation as indicated in Table 4.3. The COE and the USAF have congruent perceptions on this survey statement; both agree that the training sessions per the contract are effective in preparing the BCE to maintain and operate the facility. The mean scores are statistically different with the COE slightly agreeing (4.84) and the USAF barely agreeing (4.13) with this statement.

Survey Statement-AA2. This statement is a Case 2 situation as indicated in Table 4.3. The COE and the USAF have congruent perceptions on this survey statement; both agree that contract requirements should place more emphasis on the operation and maintenance aspects of a facility. The mean scores are statistically different with the USAF fully agreeing (6.15) and the COE slightly agreeing (5.41) with this statement.

Survey Statement-AB3. This statement is a Case 4 situation. The COE and the USAF neither agree nor disagree that there is an effective and efficient standard procedure for the coordination of pertinent information. Although the mean scores of each agency are on opposite sides of the Likert scale with a COE mean score of 4.30 and a USAF mean score of 3.95, the T-Test result indicates that the difference between the mean scores is insignificant or that the scores are statistically the same. Therefore, a score of 4 must be assessed to this statement and, the result is

"neither agree nor disagree." This result could indicate either the statement and/or terms in the statement were not understood or the standard procedure for the purpose of coordination of pertinent information was not understood.

Survey Statement-AC4. This statement is a Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that the BCE maintains high interest in the construction through weekly surveillance so that the final inspection is carried out expediently and effectively. The mean scores are significantly different with the COE slightly disagreeing (3.53) and the USAF slightly agreeing (5.33) with this statement.

Survey Statement-AC5. This statement is Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that the contract requirement for withholding of payment is not adequate for the enforcement of the completion of punchlist items. The mean scores are significantly different with the COE slightly disagreeing (3.43) and the USAF slightly agreeing (4.88) with this statement.

Survey Statement-AE/CD6. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both agree that the COE project engineer remains the COE point of contact for the BCE until the warranty enforcement period on the facility is expired. The mean scores are significantly different with the COE fully

agreeing (5.62) and the USAF slightly agreeing (4.54) with this statement.

Survey Statement-BA7. This statement is a Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that the contract completion dates are met with all major punchlist items completed. The mean scores are significantly different with the COE barely agreeing (4.2) and the USAF slightly disagreeing (3.7) with this statement.

Survey Statement-BB8. This statement is a Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that all punchlist items are well coordinated between the COE and the USAF BCE. The mean scores are significantly different with the COE slightly agreeing (4.77) and the USAF barely disagreeing (3.94) with this statement.

Survey Statement-B13. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both agree that the functionality of the completed facility satisfies the user's mission requirement. Although the COE slightly agrees (5.39) and the USAF also slightly agrees (4.88) with this statement, the mean scores were significantly different, statistically. This is interpreted as the COE having a higher degree of agreement with this statement than the USAF.

Survey Statement-BD10. This statement is a Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that the as-built drawing are accurate and up-to-date. The mean scores were significantly different with the COE slightly agreeing (5.01) and the USAF barely disagreeing (3.54) with this statement.

Survey Statement-BE11. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement and both agree that the Operations and Maintenance (O&M) documents are usually acceptable. Although the COE slightly agrees (5.28) and the USAF also slightly agrees (4.58) with this statement, the mean scores are significantly different, statistically. This is interpreted as the COE having a higher degree of agreement with this statement than the USAF.

Survey Statement-CA12. This statement is a Case 4 situation. The COE and the USAF neither agree nor disagree on the statement that there is an effective procedure for handling construction errors or latent defects not specifically covered by equipment warranty. Although the mean scores (COE: 4.14 and USAF: 3.62) were on opposite sides of the scale, the means were statistically equal. Thus, they neither agree nor disagree. This could indicate either a misunderstood statement or a misunderstood procedure for handling construction errors.

Survey Statement-CB13. This statement is a Case 1 situation. The COE and the USAF have congruent perceptions on this statement. Both agencies disagree that the BCE keeps records of funds spent on unanswered warranty claims and that BCE requests the assistance of the COE in collecting these spent funds from the contractor. The mean scores are statistically equal with the COE slightly disagreeing (3.15) and the USAF also slightly disagreeing (3.35) with this statement.

Survey Statement-CD14. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both agree that when the contractor is non-responsive on a warranty claim, the COE is supportive in resolving the problem. The mean scores were significantly different with the COE fully agreeing (6.08) and the USAF barely agreeing (4.49) with this statement.

Survey Statement-CC/CE15. This statement is a Case 1 situation. The COE and the USAF have congruent perceptions on this statement; both agree that the COE and the USAF BCE know the procedures to be followed under the BCE warranty and guarantee program in order to effectively process all warranty claims. The mean scores were statistically equal with the COE slightly agreeing (4.74) and the USAF also slightly agreeing (4.95) with this statement.

Survey Statement-CE16. This statement is a Case 3 situation. The COE and the USAF have conflicting

perceptions on the statement that there is an effective procedure and program established by the BCE to handle claims on warranty for equipment in new facilities. The mean scores are significantly different with the COE barely disagreeing (3.82) and the USAF slightly agreeing (4.58) with this statement.

Survey Statement-AA17. This statement is a Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that O&M training sessions are adequate. The scores are significantly different with the COE slightly agreeing (4.77) and the USAF barely disagreeing (3.75) with this statement. This statement is very similar to statement AA1. The COE mean score was consistent in slightly agreeing (4.84 and 4.77) with both statements, while the USAF mean score switched from barely agreeing (4.13) in statement AA1 to barely disagreeing (3.75) in statement. This may indicate that the USAF perceives a difference between what is required by the [illegible] cation and what is actually carried [illegible]

Survey Statement-AA18. [illegible]

situation. The [illegible]

on this statement; [illegible]

maintenance [illegible]

[illegible]

AD-A186 480 A STUDY OF THE PERCEPTIONS OF ROLES RESPONSIBILITIES 2/2
AND PROBLEM AREAS DU (U) AIR FORCE INST OF TECH
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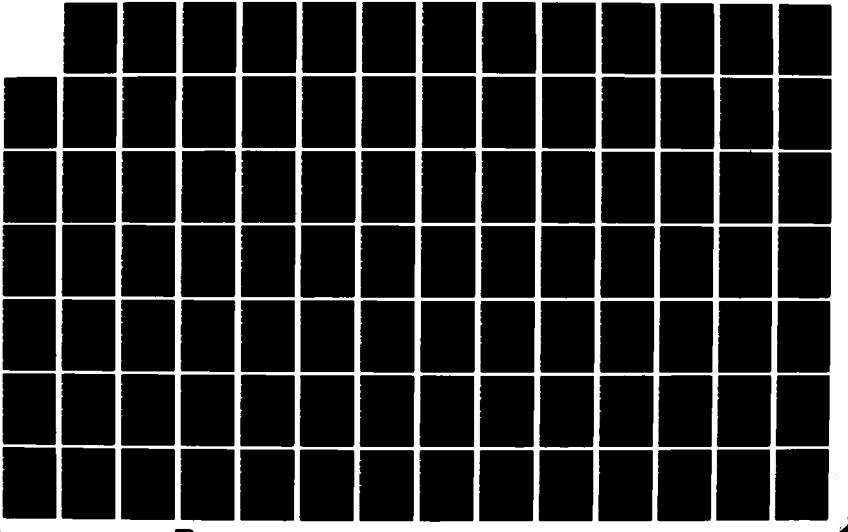

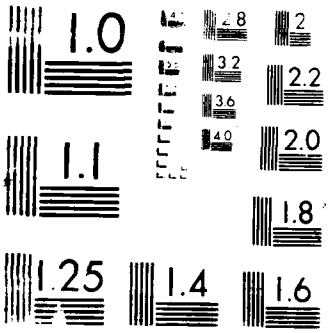
1.0
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1.25
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2.8
3.2
3.6
4.0

Survey Statement-AB19. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both agree that the BCE responds to COE requests for utility support in a manner which does not impact the construction completion. The mean scores differ significantly with the COE slightly agreeing (5.03) and the USAF fully agreeing (5.58) with this statement.

Survey Statement-AB20. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both agree that the COE allows the BCE a reasonable response time when requesting utility shop support. The mean scores differ significantly with the COE fully agreeing (5.68) and the USAF slightly agreeing (5.15) with this statement.

Survey Statement-AC21. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both agree that the BCE surveillance is consistent in using the same inspectors who understand their roles on the construction project. The mean scores differ significantly with the COE barely agreeing (4.13) and the USAF fully agreeing (5.52) with this statement.

Survey Statement-AD22. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both agree that retainage on the contractor payment should be at least 100 percent of the cost to complete all punchlist items. Although the COE fully agrees

(5.43) and the USAF also fully agrees (5.59) with this statement, the mean scores differ significantly. This is interpreted as the COE having a higher degree of agreement with the statement than the USAF.

Survey Statement-AE23. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both agree with the statement that the COE Project Engineers are trained to properly close out an MCP project. The mean scores differ significantly with the COE fully agreeing (5.66) and the USAF slightly agreeing (4.88) with this statement.

Survey Statement-BA24. This statement is a Case 1 situation. The COE and the USAF have congruent perceptions on this statement; both agree that a primary objective is to maintain the original contract completion date. The mean scores were statistically equal with the COE slightly agreeing (4.97) and the USAF also slightly agreeing (4.71) with this statement.

Survey Statement-BB25. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement; both slightly disagree that the contractor completes all punchlist items within a given response time. The mean scores were statistically different with the COE barely disagreeing (3.84) and the USAF slightly disagreeing (3.02) with this statement.

Survey Statement-BB26. This statement is a Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that there is an effective procedure for action against a contractor who does not complete all punchlist items in a timely manner. The mean scores differ significantly with the COE barely agreeing (4.12) and the USAF slightly disagreeing (3.33) with this statement.

Survey Statement-BC27. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement and both agree with the statement that the COE strives for a high quality facility as governed by the contract specifications. The mean scores differ significantly with the COE strongly agreeing (6.63) and the USAF slightly agreeing (5.01) with this statement.

Survey Statement-BC28. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement and both agree that the quality of the facility satisfies the user. The mean scores differ significantly with the COE fully agreeing (5.71) and the USAF slightly agreeing (4.71) with this statement.

Survey Statement-BD29. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement and both disagree that the as-built drawings are provided within 30 days of construction completion. The mean scores differ significantly with the COE

barely disagreeing (3.95) and the USAF slightly disagreeing (2.53) with this statement.

Survey Statement-BE30. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions which agree with the statement that all warranty agreements of the facility contain accurate effective dates. The mean scores differ significantly with the COE slightly agreeing (4.96) and the USAF barely agreeing (4.04) with the statement.

Survey Statement-BE31. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement and both agree that the operation and maintenance manuals for installed equipment contain accurate information. Although the COE slightly agrees (5.47) and the USAF also slightly agrees (4.67) with this statement, the mean scores differ significantly. This is interpreted as the COE having a higher agreement with this statement than the USAF.

Survey Statement-CA32. This statement is a Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that there is an effective procedure for the BCE to obtain quick response from the contractor, his subcontractors or his suppliers for warranty claims on facility equipment. The mean scores are significantly different with the COE barely agreeing (4.05) and the USAF slightly disagreeing (3.32) with this statement.

Survey Statement-CB33. This statement is a Case 3 situation. The COE and the USAF have conflicting perceptions on the statement that the COE effectively assists in the recovery of USAF resources spent to fix latent construction deficiencies. The mean scores differ significantly with the COE barely agreeing (4.25) and the USAF slightly disagreeing (3.48) with this statement.

Survey Statement-BA34. This statement is a Case 1 situation. The COE and the USAF have congruent perceptions on this statement and both slightly agree that user occupancy of the facility prior to 100 percent completion reduces a contractor's liability for correction of deficiencies and punchlist items. The mean scores were statistically equal with the COE slightly agreeing (4.86) and the USAF also slightly agreeing (4.91) with this statement.

Survey Statement-CD35. This statement is a Case 1 situation. The COE and the USAF have congruent perceptions on this statement and both slightly agree that the COE and the BCE have qualified personnel that handle all warranty claims on newly constructed facilities. The agencies' mean scores were statistically equal with the COE slightly agreeing (4.60) and the USAF also slightly agreeing (4.73) with this statement.

Survey Statement-CC36. This statement is a Case 2 situation. The COE and the USAF have congruent perceptions on this statement and both slightly agree that the warranty

and guarantee program established by the BCE immediately includes the new equipment in a completed MCP facility. The mean scores differ significantly with the COE barely agreeing (4.40) and the USAF slightly agreeing (5.00) with this statement.

Survey Statement-CE37. This statement is a Case 1 situation. The COE and the USAF have congruent perceptions on this statement and both slightly agree that the warranty claims processing procedures are cumbersome. The mean scores differ significantly with the COE barely agreeing (4.29) and the USAF slightly agreeing (4.85) with this statement.

Support of the Investigative Hypotheses

There are a total of fifteen investigative hypotheses, five for each period of transition. Each investigative hypothesis within each period of facility transition is evaluated using the following:

1. The mean score of each agency on each survey statement which shows the conflict or congruence of perceptions.

2. The results of the test of means previously discussed.

3. The content and reasoning behind each of the statements that were used to support the investigative hypothesis.

As discussed previously, the mean score for each statement shows either congruent perceptions or conflicting

perceptions between the agencies. The test of means shows whether the scores of each agency are considered, statistically, the same or different from the other agency's scores. Congruent perceptions could show that a suspected problem is either "no problem" or a problem that both agencies feel needs to be resolved. Problem areas that are agreed upon by both agencies give strong evidence to support the investigative hypotheses.

Conflicting perceptions about any of the survey statements represent inter-organizational differences between the agencies and, therefore, should be considered a management problem. The resolution of inter-organizational differences may involve organizational and/or inter-organizational policies and procedures. Thus, any survey statement resulting in a conflicting perception immediately causes the investigative hypothesis to be supported.

The content and reasoning behind each statement help to formulate inference statements. Inferences are drawn from a combination of the content of each statement, the type of perceptions obtained, and the results of the test of means mentioned previously. The results and inferences directly support the conclusion to each investigative hypothesis.

The following discussion focuses on each investigative hypothesis within each facility transition period. For each investigative hypotnesis, inferential statements are drawn as previously discussed. The discussion on each hypothesis

concludes with a statement of support or non support of the investigative hypothesis based on the inferences made.

Last Five Percent of Construction, Period A. The following discusses the evaluation of each investigative hypothesis that was considered in this period of facility transition.

Investigative Hypothesis AA. This hypothesis states that the Operation and Maintenance (O&M) inspection and training are inadequate. The four variables stemming from this investigative hypothesis are AA1, AA2, AA17, and AA18.

On statements AA1 and AA17, the COE slightly agreed (AA1: 4.84 and AA17: 4.77) that O&M training sessions are effective for preparing BCE personnel to operate and maintain the facility and that the O&M training sessions are adequate. The USAF, on the other hand, barely agrees (4.13) that the training sessions per the contract are effective for preparing BCE personnel to operate and maintain the facility; and slightly disagrees (3.75) that the training sessions are adequate. The USAF disagreement with the statement that training sessions are adequate may indicate that the USAF feels that the training sessions called for in the contract are different from those actually obtained at the site.

AA18 resulted in a congruent perception that access to HVAC equipment for routine maintenance was acceptable;

therefore, AA18 poses no problem to the management of both agencies. AA2 resulted in a congruent perception that more emphasis should be placed on O&M aspects. AA2 may indicate that more reliable equipment is desired.

Based on conflicting perceptions between the USAF and the COE on the adequacy of the training sessions and on the congruent perception of both agencies that more emphasis is needed on O&M aspects, this investigative hypothesis is supported. Therefore, it can be concluded that O&M inspection and training are not adequate.

Investigative Hypothesis AB. This hypothesis states that the USAF BCE/COE working relationship is not effective. The variables stemming from this investigative hypothesis are AB3, AB19, and AB20.

Statements AB19 and AB20 establish that the COE and the USAF BCE have a professional working relationship because both agencies agree that the BCE responds to COE requests for support (AB19) and that the COE allows good lead time for that support (AB20).

Statement AB3 resulted in a "neither agree nor disagree" on the statement that there is an effective and efficient standard procedure for coordination between the COE and the USAF. As stated previously, there are two possible reasons for this result. Statement AB3 may not have been understood well enough or the standard procedure

for coordination between the COE and the USAF is not understood.

Because of the result on AB3 inferences about this investigative hypothesis cannot be made. Therefore, this investigative hypothesis stands neither supported nor refuted.

Investigative Hypothesis AC. This hypothesis states that the USAF surveillance is inconsistent. The variables stemming from this investigative hypothesis are AC4 and AC21.

The USAF mean scores on statements AC4 and AC21 indicate that the USAF fully agrees (5.52) that BCE surveillance is consistent and slightly agrees (5.32) that the BCE maintains high interest in construction through weekly surveillance. However, the COE mean scores on statements AC4 and AC21 indicate that although the COE barely agrees (4.13) that the BCE is consistent in using the same inspectors for each project, the COE barely disagrees (3.53) that the BCE maintains high interest in construction through weekly surveillance. This result implies that although the BCE inspectors are consistent because one inspector, who understands his role, is used on each construction project, the COE may feel that the weekly surveillance by the BCE is not maintained consistently throughout the life of the construction project.

Based on the conflicting perceptions between the COE and the USAF on BCE level of interest on construction projects through weekly surveillance, this investigative hypothesis is supported. Therefore, it can be concluded that the BCE surveillance is inconsistent.

Investigative Hypothesis AD. This hypothesis states that there is a lack of adequate retainage. The variables stemming from this investigative hypothesis are AD5 and AD22.

Both agencies agree with statement AD22 which states that 100 percent of the cost of completing all punchlist items should be retained from the contractor. There is, however, a conflicting perception between the agencies concerning the adequacy of the retainage; the COE feels that the present retainage requirement is adequate, but the USAF feels that the retainage is not adequate. The inference drawn from the COE perspective is that the retainage is adequate and that an amount, at least 100 percent of the cost of completing all punchlist items, should be retained from the contractor payment. The inference drawn from the USAF perspective is that the retainage is inadequate and at least 100 percent of the cost of completing all punchlist items should be retained from the contractor.

This conflict in perceptions on the adequacy of retainage may indicate a source of management difficulty. The inferences stated above may indicate that a clarification of

the retainage requirement per the contract may be needed; also, an agreement to retain a certain amount from the contractor payment to enforce the completion of the punchlist may be needed.

Based on the conflicting perception concerning adequate retainage and the need for management to resolve this problem, this investigative hypothesis is supported. Therefore, it can be concluded that there is a lack of adequate retainage.

Investigative Hypothesis AE. This hypothesis states that there are less qualified personnel used by the COE for project close out. The variables stemming from this hypothesis are AE/CD6 and AE23.

Both agencies agree that the COE project engineer is trained to properly close out a job (AE23) and remains the point of contact throughout the facility transition (AE6). Therefore, based on these perceptions, this hypothesis is refuted. Thus, there are qualified COE personnel for project close out.

Acceptance and Turnover, Period B. The following discusses the evaluation of each investigative hypothesis considered in this period of facility transition.

Investigative Hypothesis BA. This hypothesis states that an acceptable completion of deficiencies is compromised by the need for building occupancy. The

variables stemming from this investigative hypothesis are BA7, BA24 and BA34.

Both agencies agree with statement BA24 that a primary objective is to meet the original contract completion dates. Both agencies also agree with statement BA34 that user occupancy prior to 100 percent completion reduces a contractor's liabilities for deficiencies and correction of punchlist items. However, statement BA7 resulted in a conflicting perception that completion dates are met with all major punchlist items completed. The USAF disagreed that completion dates are met with all major punchlist items completed. The conflict may be caused by a lack of a common definition for major punchlist items. The inference drawn from these results is that if the building needs to be occupied by the USAF with major punchlist items still pending, but occupying the building reduces the liability of the contractor to correct deficiencies and open punchlist items, then acceptable completion of deficiencies could be compromised by the USAF occupancy of the facility.

Based on these inferential statements, this investigative hypotnesis is supported. Therefore, the conclusion is that acceptable completion of deficiencies is compromised by the need for building occupancy.

Investigative Hypothesis BB. This hypothesis states that there is untimely completion of punchlist items.

The variables stemming from this investigative hypothesis are BB8, BB25 and BB26.

Both agencies agree with statement BB25 which states that the contractor does not complete all punchlist items within the given response time; therefore, both agencies feel that this is a problem area. Part of the problem of untimely completion of punchlist items may be indicated in the conflicting perceptions that were obtained from statement BB8 which states that the punchlist items are well coordinated between the COE and the BCE. The USAF disagrees that the punchlist is well coordinated while the COE agrees that the punchlist is well coordinated.

Another part of the problem of untimely completion of punchlist items may be indicated in the conflicting perceptions that were obtained from statement BB26 which states that there exists an effective procedure for action against a contractor for untimely completion of punchlist items. The USAF, again, disagrees that there exists an effective procedure to use against a contractor while the COE agrees with this statement.

Based on the results of these statements, this investigative hypothesis is supported. Therefore, the conclusion is that there is untimely completion of punchlist items.

Investigative Hypothesis BC. This hypothesis states that the user is not satisfied with the final

product. The variables stemming from this hypothesis are BC9, BC27, BC28.

Both agencies agree with each of the statements used to support this hypothesis. Both agencies agree that the facility functionality satisfies user mission requirements (BC9); that the COE strives for a high quality facility as governed by the specifications (BC27); and that the quality of the facility satisfies the user (BC28).

Based on these statements, this hypothesis is refuted. Therefore, the conclusion is that the user is satisfied with the final product.

Investigative Hypothesis BD. This hypothesis states that as-built drawings are unacceptable because of inaccuracies. The variables stemming from this investigative hypothesis are BD10 and BD29.

The survey results show both agencies agreeing that as-built drawings take longer than 30 days to turnover to the USAF BCE. However, because the regulations allow 90 days for as-built submission, this result is not applicable to the support of this investigative hypothesis.

There are conflicting perceptions that the as-built drawings are accurate and up-to-date. The inference from the COE perspective is that the COE may feel that the as-built drawings are accurate and up to date. The inference from the USAF perspective is that the USAF feels that the as-built drawings are inaccurate. The conflict between the

agencies about the accuracy of the as-built drawings is a management problem that must be resolved.

Based on the conflicting perceptions of the accuracy of the as-built drawings, this hypothesis is supported. Therefore, the conclusion is that the as-built drawings are unacceptable because of inaccuracies.

Investigative Hypothesis BE. This hypothesis states that the O&M documentation is incomplete. The variables stemming from this hypothesis are BE11, BE30, and BE31.

Both agencies agree that O&M documents are acceptable (BE11) and that they contain accurate information (BE31). In addition, both agencies agree that warranty agreements contain accurate effective dates (BE30).

Based on these results, this hypothesis is refuted. Therefore, the conclusion is that the O&M documentation is complete.

Warranty Enforcement, Period C. The following discusses the evaluation of each investigative hypothesis considered in this period of facility transition.

Investigative Hypotnesis CA. This hypothesis states that there is no standard procedure to obtain contractor support to fix latent deficiencies. The variables stemming from this hypothesis are CA12 and CA32.

The test of means for statement CA12 resulted in "neither agree nor disagree" with the statement that there

is an effective procedure for handling construction errors and latent defects. Therefore, no inferential statements can be drawn on statement CA12. Although there were conflicting perceptions between the agencies about statement CA32, which states that there is an effective procedure for obtaining quick response from the contractor, the statement referred to warranty claims and not to the fixing of latent deficiencies. This conflicting perception must be resolved at the upper management level because the resolution may involve policy and procedural changes.

Based on the results of statement CA12, and the inapplicability of statement CA32, this investigative hypothesis cannot be supported nor refuted. Therefore, no conclusion can be drawn on whether there is a standard procedure to obtain contractor support to fix latent deficiencies.

Investigative Hypothesis CB. This hypothesis states that there is no standard procedure to recoup additional government resources expended to fix latent deficiencies. The variables stemming from this investigative hypothesis are CB13 and CB33.

Both agencies agree with statement CB13 that the BCE does not keep records of all funds expended on unanswered claims. However, there are conflicting perceptions on the COE effectiveness in assisting the USAF to recover resources spent to fix latent deficiencies (CB33); the USAF perception

is that the COE is ineffective in assisting in the recovery of expended funds, while the COE feels otherwise.

Based on the conflicting perceptions about the COE effectiveness in recouping USAF resources and the congruent perception that the USAF does not document the resources that are expended to fix latent deficiencies, this hypothesis is supported. Therefore, the conclusion is that there is no standard procedure to recoup additional government resources expended to fix latent deficiencies.

Investigative Hypothesis CC. This hypothesis states that the equipment warranty enforcement is weak. The variables stemming from this hypothesis are CC/CE15 and CC36.

Both agencies agree with statement CC36 which states that the BCE guarantee program includes new facility equipment; both agencies also agree with statement CC/CE15 which states that both agencies know the procedures to effectively process warranty claims in this program. The inference from these survey statements is that new equipment is part of the BCE guarantee program and that warranty claims are effectively processed by procedures that are known and understood by both the BCE and the COE.

Based on the inference drawn from statements CC/CE15 and CC36, this investigative hypothesis is refuted. Therefore, the conclusion is that the equipment warranty enforcement is not weak.

Investigative Hypothesis CD. This hypothesis states that there is a lack of qualified personnel to handle warranty enforcement. The variables stemming from this hypothesis are CD6, CD14 and CD35.

Both agencies agree that the COE project engineers remain as the point of contact through the warranty enforcement period (CD6); that the COE is supportive in resolving nonresponsive contractor problems on warranty claims (CD14); and that there are qualified personnel to handle all warranty claims on new facilities (CD35).

Based on these results, this investigative hypothesis is refuted. Therefore, it can be concluded that there are qualified personnel to handle warranty enforcement.

Investigative Hypothesis CE. This hypothesis states that the warranty process is cumbersome. The variables stemming from this hypothesis are CC/CE15, CE16 and CE37.

Both agencies agree with statement CE37 which states that the warranty process is cumbersome. However, there are conflicting perceptions about statement CE16 with the COE disagreeing that there exists an effective procedure to handle warranty claims for new equipment. The results of statement CC/CE15 indicated that a procedure for effectively processing of all warranty claims is known and understood by both the COE and the BCE. The contradictory results between CC/CE15 and CE16 may indicate that the

statements may not have been understood. However, the inference that is drawn from these results is that from the COE perspective there may be a procedure for processing equipment warranty claims, but that this procedure is not effective. This inference is supported by the result that both agencies agreed that the warranty process is cumbersome.

Based on the results of CE37 and the inference drawn from CC/CE15 and CE16, this investigative hypothesis is supported. Therefore, the warranty process is cumbersome.

Table 4.4 presents a summary of the findings on each of the investigative hypothesis.

Rank Order

The following discussion focuses on the rank ordering of the problems encountered during the facility transition period. The problems that were ranked by the survey respondents were difficulties that were identified in past studies. These difficulties were essentially the investigative hypotheses and were considered as variables in this rank order analysis.

The rank order analysis was done by the nonparametric subprogram, KENDALL, on the SPSSX computer package. The KENDALL subprogram analyzes all of the ranks placed on each of the five variables (problems encountered) for each period of facility transition and computes a mean rank for each

Table 4.4

Investigative Hypotheses Inferential Support Summary

Period	Investigative Hypothesis/ Statement	Supported/Refuted
A	A. O&M inspection and training are inadequate.	Supported
	B. BCE/COE working relationship is not effective.	Neither
	C. USAF surveillance is inconsistent.	Supported
	D. There is a lack of adequate retainage.	Supported
	E. There are less qualified COE personnel for project close out.	Refuted
B	A. Acceptable completion of deficencies is compromised by the need for building occupancy.	Supported
	B. There is untimely completion of punchlist items.	Supported
	C. The user is not satisfied with the final product.	Refuted
	D. As-built drawings are unacceptable because of inaccuracies.	Supported
	E. O&M documentation is incomplete.	Refuted
C	A. There is no procedure for obtaining contractor support to fix latent deficiencies.	Neither
	B. There is no standard procedure to recoup additional government resources spent to fix latent deficiencies.	Supported
	C. Equipment warranty enforcement is weak.	Refuted
	D. There is a lack of qualified personnel to handle warranty enforcement.	Refuted
	E. The warranty process is cumbersome.	Supported

variable over all the responses (27:823). This measure describes the relationships between variables which consists of the positions of the variables relative to each other which can be called ranks or rank order. The interpretation of the rank order analysis refers back to the problems encountered which are represented by the variables under investigation. A perceived order of significance for the problems ranked in each transition period results. This perceived order of significance is referred to as the priority list in the discussion that follows.

Table 4.5 tabulates the ranks of these problems with the corresponding KENDALL mean ranks as rank ordered by three groups of responses: the combination of both the COE and the USAF, the COE, and finally, the USAF. Each group is called a data group for discussion purposes.

The problems in each period of transition are discussed consecutively according to the priority established by the combined USAF/COE data group. As each difficulty is discussed, comparisons between the results of the rank order analysis for each of the three data groups are made. The result is a priority listing of the problems encountered during each period of facility transition.

The Last Five Percent of Construction Period. The following is a discussion of the priority listings of problems encountered during the last five percent of construction.

Table 4.5

Results the KENDALL Rank Order Analysis

Problems Encountered in Period	Mean Ranks		
	USAF/COE	COE	USAF
Last Five Percent of Construction Period			
Lack of adequate O&M inspection and training	2.24	2.39	2.14
Lack of adequate retainage	2.77	3.07	2.56
Lack of good BCE/COE work relationship	3.29	3.19	3.37
Less qualified personnel for job close out	3.31	3.49	3.18
Lack of consistent USAF surveillance	3.38	2.86	3.76
Acceptance and Turnover Period			
Untimely completion of punchlist	2.24	2.19	2.28
Compromise acceptable completion of deficiencies	2.96	3.02	2.92
User not satisfied	2.97	2.78	3.11
Unacceptable as-built drawings	3.39	3.57	3.27
Incomplete O&M documents	3.43	3.44	3.42
Warranty Enforcement Period			
Lack of contractor response to fix latent defects	2.00	2.07	1.95
Warranty enforcement is weak	2.85	2.83	2.86
Additional resources spent to fix latent deficiencies	2.99	3.25	2.81
Warranty process is cumbersome	3.32	3.15	3.44
Lack of qualified personnel to handle warranty	3.84	3.69	3.94

The First Priority. The lack of adequate O&M inspection and training was the first priority based on the results of the rank order analysis of all three data groups.

This result supports the congruent perception between the COE and the USAF that more emphasis is needed on O&M aspects and also agrees with the conclusion on the investigative hypothesis AA that the O&M training and inspection are not adequate.

The Second Priority. The lack of adequate retainage was the second priority based on the results of the rank order analysis of the combined USAF/COE data group and also of the USAF data group. This result supports the perception that both agencies agreed that 100 percent of the cost of completing the punchlist items should be retained (AD22). The results of the rank order analysis of the COE data group established the lack of adequate retainage as a third priority. This result reflects the fact that although the COE felt that the retainage was adequate (AD5), they also felt that at least 100 percent of the cost of completing the punchlist should be retained (AD22).

The Third Priority. The lack of a good COE/USAF working relationship was the third priority based on the results of the rank order analysis of the combined COE/USAF data group. However, the results of the rank order analysis of the COE data group and of the USAF data group indicated that the lack of a good COE/USAF working relationship was a fourth priority. The fourth priority as established by the COE and the USAF data groups is more supportive of the results discussed earlier which stated that the COE and the

BCE does have a professional working relationship (AB19 and AB20); thus, the agencies would tend to rank this problem area with a lower priority. The conclusion for the investigative hypothesis concerning the COE/USAF working relationship was inconclusive because no inference could be drawn on the survey statement which stated that there is an effective and efficient standard procedure for coordination (AB3). When this fourth priority established by each agency is combined with the results of the survey statements, the indication may be that this difficulty is not really a problem during the last five percent of construction.

The Fourth Priority. Using less qualified personnel to close out the job was the fourth priority based on the results of the rank order analysis of the combined COE/USAF data group. The rank order analysis of the COE data group established this difficulty as a fifth priority. This investigative hypothesis was refuted as identified earlier and is, therefore, essentially not a problem which agrees with priority established by the rank order analysis of the COE data group. The result of the rank order analysis of the USAF data group established this problem as a third priority. If the third priority is really not a problem then this result indicates that the USAF data group's fourth and fifth priority may not be a problem to the USAF during the last five percent of construction; the fourth priority being the lack of good BCE/COE working

relationship, and the fifth priority being the lack of consistent USAF surveillance.

The results of survey statement AB3 forced an inconclusive result on the investigative hypothesis which stated that the BCE/COE working relationship is not effective. However, the results of AB19 and AB20 give an indication that the BCE/COE working relationship is at least professional. This result does support a low priority on this problem area and thus, may render this problem as a "no problem" area.

The results of AC4 and AC21 indicate that from the Air Force perspective, the inconsistency of BCE surveillance is not a problem. Therefore, from the USAF perspective the results on AC4 and AC21 support the low priority established by the USAF on the problem of inconsistent BCE surveillance and this indicates that this may not really be a problem.

These results lead to the conclusion that from the USAF perspective, the third, fourth, and fifth priorities during the last five percent of construction are really not problems.

The Fifth Priority. The lack of consistent USAF surveillance was established as the fifth priority based on the results of the rank order analysis of the combined COE/USAF data group and of the USAF data group. However, the results of the rank order analysis of the COE data group established this difficulty as a second priority, which

supports the COE disagreement that the BCE maintains high interest in the construction through weekly surveillance. The conclusion of this investigative hypothesis was that the BCE surveillance was inconsistent because of the conflict in perceptions between the COE and the USAF. This conflict is again reflected by the large difference in the priority rank of this problem area.

The Acceptance and Turnover Period. The following is a discussion of the priority listings of the problems encountered during the acceptance and turnover period.

The First Priority. The untimely completion of the punchlist items was the first priority based on the results of the rank order analysis of all three data groups; the USAF/COE combined, the COE, and the USAF. The high priority of this difficulty, in addition to the conclusion that there is untimely completion of the punchlist, may indicate that punchlist completion is a serious problem. The inferences drawn from the survey statements which stem from this investigative hypothesis indicated two aspects of this problem area; these were the coordination of punchlist items and the non-existence of an effective procedure against a contractor who is untimely in the correction of punchlist items. The existence of these two problem areas support the high priority given to this investigation hypothesis.

The Second Priority. The compromising of the acceptable completion of deficiencies was the second priority based on the results of the rank order analysis of the combined USAF/COE data group and the USAF data group. However, the rank order analysis of the COE data group established this difficulty as a third priority, which may have been a result of a higher COE priority being placed on "user satisfaction." The high priority that was placed on this problem is supported by the conclusion of the investigative hypothesis which states that user occupancy prior to 100 percent completion reduces the contractor liability. The high priority also establishes this area of difficulty as a problem.

The Third Priority. The satisfaction of the user was established as the third priority based on the results of the rank order analysis of the combined USAF/COE data group and of the USAF data group. The COE data group established this difficulty as a second priority. The relatively high priority established on this problem area contradicts the conclusion of the investigative hypothesis which was: The user is satisfied with the final product. However, the survey respondent was requested to rank user satisfaction in regard to satisfactory completion of construction deficiencies. Thus, although the user is satisfied with the final product, the user dissatisfaction with the completion of construction deficiencies may be a

serious problem, as evidenced by the relatively high priority.

The Fourth Priority. Unacceptable as-built drawings was established as the fourth priority based on the results of the rank order analysis of the combined USAF/COE data group and of the USAF data group. The inferences drawn from the survey statements which stem from the investigative hypothesis concerning as-built drawings was that the USAF felt that the as-built drawings were inaccurate. From the COE perspective, the analysis of the COE data group established this problem as a fifth priority, which agrees with the fact that the COE felt that the as-built drawings were accurate and up to date. The conclusion to the investigative hypothesis concerning as-built drawings established this problem area as a management problem; however, the relatively low priority established by the rank order analysis may indicate that inaccurate as-built drawings were considered less of a problem than punchlist completion, deficiency correction, and user satisfaction. The low priority may also indicate that the respondent did not consider this area as a problem but ranked the problem simply as part of the survey.

The Fifth Priority. Incomplete O&M documents was established as the fifth priority based on the results of the rank order analysis of the combined USAF/COE data group and also of the USAF data group. This priority agrees

with the fact that this investigative hypothesis was refuted and is, therefore, not considered a problem. From the USAF perspective, O&M documentation is not considered to be a problem. The analysis of the COE data group, however, established this investigative hypothesis as a fourth priority. This COE fourth priority for O&M documents may be a result of the COE fifth priority being as-built drawings; the COE perception was that the as-built drawings were accurate and up to date and, therefore, were not considered as a problem. From the COE perspective, both the O&M documents and the as-built drawings may not be a problem.

The Warranty Enforcement Period. The following is a discussion of the priority listings of the problems encountered during the warranty enforcement period.

The First Priority. The lack of contractor support to fix deficiencies was established as the first priority based on the results of the rank order analysis of all three data groups; the USAF/COE combined, the COE, and the USAF. The investigative hypothesis which stated that there was no standard procedure to obtain contractor support to fix latent deficiencies was inconclusive and offers no support of this rank order result. However, the high priority established by all three data groups indicates that the lack of contractor support to fix latent deficiencies is a serious problem. This result may also indicate a strong

need for action against a contractor who fails to fix latent deficiencies.

The Second Priority. A weak warranty enforcement was established as the second priority based on the rank order analysis of the combined USAF/COE data group and the COE data group; it was given a third priority as a result of the rank order analysis of the USAF data group. This high priority does not support the conclusion of the investigative hypothesis which states that the equipment warranty program is effective. However, the survey asked the respondent to rank the problem of a weak warranty enforcement which included not only equipment, but also the facility itself. Thus, if the equipment warranty was considered effective, the inference drawn from this result is that the warranty enforcement of the facility itself is a serious problem. Serious consideration should be given to the enforcement of the warranty for the entire facility, other than just the warranted equipment.

The Third Priority. The spending of additional resources by the USAF to fix latent deficiencies was established as the third priority based on the results of the rank order analysis of the combined USAF/COE data group. The conclusion to the investigative hypothesis stated that there was no effective procedure to recoup the additional resources expended by the USAF. The relatively high priority of this problem area combined with the perception

that there is no procedure to recoup expended resources may indicate that this problem area is indeed a problem.

The results of the rank order analysis of the USAF data group established this problem as a second priority; thus, this may indicate that the USAF feels that additional resources expended to fix latent deficiencies is a serious problem. The results of the rank order analysis of the COE data group established this problem as a fourth priority. This result may indicate that the COE feels that this problem is either "less of a problem" or "not a problem." Therefore, the COE and the USAF conflict in the perception of the order of significance makes this problem area a management problem.

The Fourth Priority. The warranty process being cumbersome was established as the fourth priority based on the results of the rank order analysis of the combined USAF/COE data group and of the USAF data group. Since both agencies felt that the warranty process was cumbersome this difficulty is considered a problem. Yet, this lower priority result may indicate that the USAF and the COE feel that the correction of deficiencies, a stronger warranty enforcement and the spending of additional resources to fix latent deficiencies may be greater problems.

The Fifth Priority. A lack of qualified personnel to handle the warranty claims was the fifth priority based on the results of the rank order analysis of

all three groups. This result supports the conclusion to the investigative hypothesis that there are qualified personnel to handle the warranty claims and is, therefore, not considered a problem area.

Table 4.6 summarizes the priorities established by the three data groups that were considered for this rank order analysis. These priority lists are offered for management consideration.

Responses to the Open Ended Question

The final survey question requested respondents to state any significant areas of management concern and/or any disagreements with the survey statements. The following is a summary of the concerns and comments of each agency.

COE Concerns and Comments. The COE concerns and comments are grouped according to areas of difficulties encountered.

General Comment. The COE general concerns and comments were:

1. Truly, the biggest improvement for Air Force work would be the elimination of the "we versus them" attitude between the BCE and the COE.

2. Frequently, the roles of the different agencies and organizations are not understood by the personnel at the working levels whether due to personnel changes, experience, exposure, misconceptions, procedures, policies, etc.

Table 4.6

Priority Listing of Problems Encountered
During Facility Transition

Problems Encountered In Each Period	Data Group Priority		
	USAF/COE	COE	USAF
The Last Five Percent of Construction Period			
Lack of adequate O&M training and inspection	First	First	First
Lack of adequate retainage	Second	Third	Second
Lack of good BCE/COE work relationship	Third	Fourth	Fourth
Less qualified personnel for job closeout	Fourth	Fifth	Third
Lack of consistent USAF surveillance	Fifth	Second	Fifth
The Acceptance and Turnover Period			
Untimely completion of punchlist	First	First	First
Compromise acceptable completion of deficiencies	Second	Third	Second
User not satisfied	Third	Second	Third
Unacceptable as-built drawings	Fourth	Fifth	Fourth
Incomplete O&M documents	Fifth	Fourth	Fifth
The Warranty Enforcement Period			
Lack of contractor response fix latent defects	First	First	First
Weak warranty enforcement	Second	Second	Third
Additional resources spent to fix latent deficiencies	Third	Fourth	Second
The warranty process is cumbersome	Fourth	Third	Fourth
Lack of qualified personnel to handle warranty	Fifth	Fifth	Fifth

Continuous efforts are required to overcome these conflicts by both the user/customer and the COE.

3. The close out, O&M, and warranty issues are solvable. The root of these problems are manpower management and a clear cut definition of responsibilities. Personnel involved in these areas must be educated and dedicated to carry out these ends. Upper management must be involved; low graded civilians or enlisted men Army or Air Force cannot make it work.

4. The biggest problem in customer relations is defining the user need. The AFRCE does not understand the technical capability of the BCE. Consequently, most mechanical, electrical, EMCS systems cannot be maintained by BCE personnel. Contract requirements must be established by defining user needs and BCE capabilities.

5. The "meat" for contract enforcement exists; it is just a matter of utilizing it properly. Also, problems which exist could easily be worked if all parties agree to sit down and talk things out.

6. The local COE representative must be included in the Base staff meetings. Communication must be improved; the COE cannot do a good job for the USAF if the COE doesn't know what the USAF wants.

Regulations. The COE comment concerning the agency regulations was: A difference in the Army and the Air Force regulations causes disagreement between the BCE

and the BCE with regard to acceptance of the project and the start of warranty dates.

O&M Manuals and As-Built Drawings. The COE comments and concerns about O&M Manuals and as-built drawings were:

1. O&M manuals and as-built drawings are often not kept up to date or are misplaced by the user. This causes difficulties with continuous maintenance of the facility.

2. O&M manuals are reviewed by the BCE before approval by the COE to ensure that the manuals meet the needs of the USAF and to allow the USAF to comment on the submittal.

3. O&M instruction training is attended by individuals of the BCE who will not be responsible for the operation and maintenance of the facility.

4. O&M manuals are placed on the shelf and consulted only when the equipment stops functioning. Many of the systems installed require routine maintenance that is never performed.

5. O&M manuals fail to reach the proper hands, those of the mechanic responsible for the maintenance. As a result, the COE is blamed for not providing the manuals.

6. At the training sessions for various mechanical systems, the Air Force personnel often leave before the training is completed or, trained personnel are transferred out.

7. Air Force top management must place more emphasis on attendance of training sessions by the proper personnel and on the proper transfer and accountability for the O&M manuals.

8. A need exists for a better review and understanding by the user and the BCE on the individual contract requirements for O&M, e.g., a requirement for component O&M may exist but not as a total system O&M.

User Occupancy. The COE comments and concerns about user occupancy were:

1. Occupancy prior to 100 percent completion causes extreme difficulty in the determination of deficiencies as a result of user damage or construction error.

2. Occupancy prior to 100 percent completion cause additional cost due to the difficulties involved with user occupancy. Frequently, identified deficiencies are compromised by acts of the occupants. When the fix for these deficiencies is compromised, it leads to further disagreements and conflicts which lead to additional costs and the negotiation of a less than desired result. Thus, although the user satisfaction is high at the start, it declines as the conflicts over corrections occur.

Latent Deficiencies. A COE concern about latent deficiencies was: The current contract documents do provide for adequate remedies for punchlist correction and warranty work. The weakness of our system is that there is no quick

and efficient means by which the Corps (or any other construction agency) can routinely procure the corrective work. The alternative is to perform the work through the BCE shops, but this is rare and is typically portrayed as a failure of the Corps to properly manage its contractors. The solution is the implementation of a more cooperative policy by Air Force or procurement of special, indefinite delivery type contracts to be used in the absence of contractor timely response.

Warranty. The COE comments and concerns about the warranty process were:

1. Warranty procedures should be carefully worked out between the BCE and COE and periodically reviewed for continued applicability. This works!

2. The biggest warranty problem is enforcement. Usually, periodic maintenance is not performed by the BCE. Thus, the warranty is voided in these cases.

3. The three main causes of our warranty problem are:

a. The Army regulations, the COE regulations, and the Air Force regulations are all different in regard to the procedures for handling warranty issues and the timing of post-completion warranty inspections.

b. The COE is generally expected to handle all warranty issues on direct request from the user. The BCE does not contact the contractor nor do they verify whether

the issue is a bonafide warranty problem as opposed to a maintenance issue.

c. The BCE does not always perform and document the maintenance required by manufacturer's O&M instructions.

4. Prior to the facility turnover, the BCE should be educated as to warranty terms and implementation procedures on COE projects. Also, enforcement should be pursued to the greatest extent and greater involvement is required by the Chiefs of Construction Management and Design Section Deputies to ensure correction. Finally, the contractor's performance should be evaluated and kept on file.

5. The BCE rarely follows established procedures for implementing warranty. They should first establish that the problem is a legitimate warranty item and then contact the contractor. Instead, when a piece of equipment stops functioning the BCE immediately contacts the contractor and makes him determine the cause of the problem. Many times the problem is the result of a lack of maintenance, improper usage, etc., and therefore, is not the contractor's responsibility.

6. Warranty enforcement is dependent on a responsible contractor. If the contractor refuses to correct warranty items, there is absolutely no way to enforce the contract under current regulations.

7. The local COE representative accomplishes all warranty activities except for the initial evaluation by the

BCE. Typically the BCE does little in warranty enforcement other than to notify the local COE project engineer. Also, the BCE general maintenance is not organized or consistent and this leads to false warranty claims.

Retainage. One COE comment about retainage was: Contract punchlist items are not paid for through retainage. Retainage is brought into play when the work is behind schedule. Punchlist items are affected by payment for the direct work as the work is incomplete. The value to the Government to complete that work with other forces is not made until performance is complete.

BCE Surveillance. The COE comments and concerns about the BCE surveillance were:

1. Too close an association between the user, the construction project, and the contractor (BCE is not included in this comment) results in a loss of contractor efficiency, confusion, and ultimately, extra costs.

2. There is ZERO field surveillance by BCE personnel during construction. The general attitude is "not my job. . ."

Funding Procedures. The COE comments and concerns about the funding procedures were:

1. The COE needs a method of funding the fix for deficiency items and/or latent deficiencies that the contractor refuses to fix and then back charging that contractor for the costs.

2. The lack of expeditious funding of contract changes is a factor in missing a project completion date.

Comments on the Survey. The COE comments about the survey statements were:

1. The statements should have been separated between the COE responsibility and the USAF responsibility.

2. Survey rank ordering statements state problems that may vary from job to job; base to base; person to person.

Design and Review. The COE comments about design and review were:

1. BCE needs to be more accountable for adequate input during the design and review phase in order to eliminate dissatisfaction at the final inspection.

2. Improvement in design and construction interfaces with user at the design stage is required. Designers and reviewers should communicate comments to user or customer for better understanding of the requirements.

USAF Concerns and Comments. The USAF concerns and comments are grouped according to areas of difficulty encountered.

General Comments. The USAF general comments and concerns were:

1. The COE discounts many things that are critical to AF BCE operations and does not act upon USAF requests very favorably.

2. A close, amicable working relationship with the Corps is mandatory for optimum performance.

3. The COE should realize that the AF is the customer and that the AF is paying for the product.

4. The COE should be held accountable for poor designs.

5. Most problems are solved by addressing the user needs in the initial phases of construction. During the final phases of construction, it is too late.

Regulations. One USAF comment about the agencies' regulations was: Many of the problems would be cured if responsibilities were established in writing. Problems often occur due to a disagreement on who should do what. A Memorandum of Agreement between the Resident Engineer and the DEEC is needed.

O&M Manuals. The USAF comments and concerns about the O&M Manuals were:

1. Sometimes getting the right O&M's are a problem and the O&M's given are just not what we want.

2. The timely submission of the O&M manuals before any training, and also before prefinal inspections are held, is of great concern.

As-Built Drawings. The USAF concerns and comments about as-built drawings were:

1. We often do not get as-built drawings at all and the average time to receive documents except for the 1354 is a year.

2. As-builts do not correctly reflect the work accomplished and obstacles encountered.

Warranty. The USAF comments and concerns about the warranty process were:

1. The main problem is the lack of warranty data from the COE to BCE.

2. The COE should be responsible to handle all warranty claims during the one year warranty enforcement period.

3. The proper warranty claim processing procedures are not known.

Inspection. The USAF comments and concerns about inspection were:

1. Insufficient inspection and the management of manpower by the construction agent is an area of management concern.

2. Contractor Quality Control used by the COE does not work.

Contract Completion. One USAF comment about contract completion was: Timely completion is a big problem. The COE is more interested in meeting the completion dates by having a final inspection than by having a completed facility. The COE uses the pressure of the user

to get into the facility to force acceptance by the BCE of the signing of the 1354. A large punchlist on a 1354 does not constitute timely completion.

Design. The USAF comments and concerns about design were:

1. The real problems and conflicts occur in the overall design phase. The Air Force should do its own design so that the Air Force can get the product that they want.

2. There is a need for a procedure to expedite corrections of essential design errors or omissions.

3. The BCE should take a more active role in the project during the design.

Success Factors for Management Consideration

One of the USAF general comments suggested that a close, amicable working relationship with the Corps is mandatory for optimum performance. A telephone interview with Mr. Owen Brenden, Chief of Engineering at Minot AFB, North Dakota, revealed that such a close, amicable working relationship with the COE exists at his Base and that the management performance between the COE and USAF is close to optimum. Mr. Brenden admits that there are some problems, but these problems are always worked out. He shared the following success factors which made the working relationship between the COE and the USAF BCE successful (3):

1. An Air Force Regional Civil Engineer (AFRCE) liaison who promotes harmony between the agencies and is willing to try innovative ideas.

2. A COE Resident Engineer who knows Air Force ways, and is easy to work with.

3. The Engineers within the BCE Engineering section that are dedicated to MCP and exercise surveillance on MCP projects from cradle to grave (concept to construction complete).

4. Weekly meetings with the COE Resident Engineer and the contractor for each MCP project; plus, quarterly meetings with the AFRCE, the COE Area Engineer, the COE District Engineer and contractors of larger projects.

5. Delegated AFRCE authority for responsibility over design and construction of MCP.

6. BCE shop involvement on all inspections and close coordination with shop technicians.

7. A BCE Commander, Deputy Commander, and Chief of O&M who are willing to listen and understand problem situations and also share a willingness to use shop personnel to help the COE.

8. COE management personnel who are willing to help the BCE with problem situations with separate contracts to do a job and who are receptive to BCE needs and requests.

9. Integrated communication from top management down to shop level technicians.

10. A BCE who uses the established warranty procedure which entails first finding out where the fault lies, i.e., lack of maintenance or defective equipment. If the equipment is defective, the COE is then contacted for assistance.

11. Beneficial Occupancy Dates (BOD) are planned and are regarded as goals that will be reached only by working out all the bugs before getting to that point.

12. A BCE Office of Responsibility for the acceptance of, and an established procedure for the transfer of as-built drawings.

The comments to the open ended question presents additional success factors for management to consider in attempting to achieve smooth facility transition.

1. The elimination of the "we versus them" attitude.

2. A clear definition of roles and responsibilities at the working level of both agencies.

3. The involvement of upper management.

4. The education of the personnel who will be responsible to carry out O&M and warranty enforcement.

5. Representation by the local COE representative at the Base staff meetings.

6. Improved communications at all levels.

7. Joint service regulations or memorandums of agreement which establish clear management procedures.

8. Worthwhile O&M training attended by responsible, well prepared, and accountable technicians. The support of top management to make this work is important.

9. O&M manual accountability.

10. Better understanding of the contract requirements for O&M by the BCE and the facility user.

11. Avoidance of occupancy prior to 100 percent completion.

12. Correct and efficient means for COE to procure corrective work or the alternative of using BCE shops without the retribution and/or accusation of mismanagement of the contract.

13. Warranty implementation procedures that are carefully worked out and acceptable to both agencies which include:

a. Performed and well documented maintenance of equipment within the warranty enforcement period.

b. The education of accountable individuals on their responsibilities and the procedures to be used.

c. Documented contractor performance on file with definite courses of action for contractor nonperformance.

d. Enforcement alternatives in the event of a nonresponsive contractor.

14. Leverage, other than retainage, for the completion of punchlist items and latent deficiencies.

15. Accountability for the accuracy, transfer, and receipt of project as-built drawings.

These success factors that are offered for management consideration make good sense and are practical for application to the USAF/COE management relationship in general.

V. Conclusions and Recommendations

Chapter Overview

This final chapter presents the conclusions based on the results of Chapter IV. The results identified the perceptions that the COE and the USAF have about responsibilities, standard procedures, management processes, and contract requirements during the transition of a facility. The following discussion focuses on the answers to the three research questions of this study followed by a discussion that focuses on an answer to the basic management question. This chapter also presents suggestions for addressing the difficulties encountered during facility transition. These suggestions are generated from the sources presented in the Literature Review chapter, from a USAF BCE Chief of Engineering who feels that his base possesses a relatively successful management relationship with the COE, and also from the comments and concerns to the survey's open ended question. Finally, areas for further research, as suggested by the results of this study, are presented.

Conclusions

The answers to the three research questions are based on the perceptions of the respondents to each survey statement and on the inferences made on the investigative

hypotheses. The answers are also supported by the responses to the open ended question on the survey.

Conflicting perceptions appear to weaken the COE USAF management relationship and could, in itself, be a possible cause of difficulty encountered during facility transition. Congruent perceptions identify agreement between the agencies on problem areas or on non-problem areas. The results discussed in the [illegible] indicate the existence of both conflicting and congruent perceptions. The perceptions obtained from the survey instruments, the inferences made on the investigative protocols, the comments to the open ended question, and the information gathered in the Literature Review provide the basis for the following discussion on each of the research questions.

Research question 1. This question asks: During the last five years of facility construction, are there conflicting perceptions between agency responsibilities and misunderstandings of the requirements?

Conflicting Perceptions of Agency Responsibilities. Are there conflicting perceptions of agency responsibilities? The answer is "Yes." The results of the survey indicated conflicting perceptions by both agencies that the COE maintains a high level of involvement in construction projects through weekly conferences. Also, the COE perceived the problem of [illegible] as a priority 1 in the rank order analysis, while the USAF perceived this

problem as a priority 5. This conflicting perception involves the USAF BCE responsibility for project surveillance.

The results of the survey indicated conflicting perceptions that O&M training is inadequate. This conflict involves the COE responsibility to insure that the BCE maintenance personnel receive adequate O&M training; while the COE feels that they fulfill their O&M training responsibility per contract requirements, the USAF feels that the COE does not fulfill this responsibility. A COE comment stated that qualified, responsible, and prepared BCE personnel should attend the O&M training sessions. This comment supports a perception that the COE feels that the USAF BCE does not fulfill their responsibility to sending qualified, responsible, and prepared personnel to these O&M training sessions.

On the other hand, there are congruent perceptions that the BCE is consistent in using the same inspectors who understand their roles on the construction project; that the COE project engineer is trained to properly close out a construction project and remains the point of contact throughout the warranty enforcement period; that the BCE responds readily to the COE requests for support; and that the COE allows the BCE a reasonable response time for a request of support.

The results above indicate that there are two areas in which there are conflicting perceptions of agency responsibilities. These are:

1. The BCE's responsibility for project surveillance which is perceived as consistent by the USAF, yet inconsistent by the COE.

2. The COE's responsibility to insure the adequacy of O&M training which is perceived by the COE as being fulfilled, but perceived by the USAF as not being fulilled. In addition, the COE feels that the USAF must fulfill the responsibility of sending qualified personnel to these training sessions.

As discussed above, there were many congruent perceptions of the survey statements that could indicate that each agency's perception of the other agency's responsibility does not conflict. Since two conflicting perceptions of agency responsibilities were identified, the answer to this part of Research Question A is: "Yes," during the last five percent of construction there are conflicting perceptions of agency responsibilities.

A Misunderstanding of the Contract Requirements. Are there misunderstandings of the contract requirements? The answer is "yes." The results of the survey indicate congruent perceptions that the training sessions per the contract are effective in preparing the BCE to maintain and

operate the facility; yet, there are conflicting perceptions that the O&M training is inadequate. The results also indicate that the retainage on the contract payment should be at least 100 percent of the cost to complete all punchlist items; yet, the contract requirement for retainage of payment is not adequate for the enforcement of the completion of the punchlist items.

These results indicate that during the last five percent of construction, the O&M training per contract requirements is effective, yet the USAF questions the adequacy of the actual O&M training. The inference drawn from this statement is that there is a misunderstanding of the contract requirements for O&M training; that is, the USAF may feel that more training is required according to the contract than the actual training which the contractor is providing at the site. On the other hand, the COE, who administers the contract, may feel that the training which the contractor is providing is in accordance with the contract requirements. Thus, there may be a misunderstanding about the contract requirements for O&M training because, although since both agencies are reading from the same requirement specifications, there are different perceptions of what is required.

This inference is supported by the COE O&M comment number 8 which states that a need exists for a better review

and understanding by the user and the BCE on the individual contract requirements for O&M.

These results also indicate that although both agencies agree that at least 100 percent of the cost to complete all punchlist items should be retained, the USAF questions the adequacy of the present retainage requirement. The inference drawn from this statement is that there is a misunderstanding of the contract requirements for retainage; that is, the USAF may feel that a higher percentage of the contractor payment should be retained to cover the cost of punchlist completion. On the other hand, the COE may feel that the retainage held is in accordance with the contract requirement. Thus, there is a misunderstanding about the contract retainage requirement because, although both agencies are reading from the same contract specification, both have different perceptions of what is required.

Based on the results discussed, the answer to that portion of the research question about the contract requirements is: "Yes," there are misunderstandings of the contract requirements. Therefore, an accurate statement concerning the last five percent of construction period of facility transition would be: During the last five percent of facility construction, there are conflicting perceptions of agency responsibilities and there are misunderstandings of the contract requirements.

Research Question B. This question asks: During the facility acceptance and turnover period, are there misconceptions of organizational mission and conflicting perceptions of agency responsibilities?

Misconceptions of Organizational Mission. Are there misconceptions of organizational mission? The answer is "no." The results of the survey indicated congruent perceptions by both agencies that facility functionality satisfies mission requirements; that the COE strives for a high quality facility; and that the primary objective of both agencies is to meet the original completion dates. These results indicate that the agencies have a good concept of the other's organizational mission. Thus, the answer to that portion of the research question concerning organizational mission is: Both agencies have a good concept of each other's organizational mission.

Conflicting Perceptions of Agency Responsibilities. Are there conflicting perceptions of agency responsibilities during the acceptance/turnover period? The answer is "yes." The results of the survey indicate conflicting perceptions between the agencies that punchlists are well coordinated. The COE and the USAF may not understand each other's responsibility in coordinating all punchlist items as required by AFR 89 1 and ER 415-345-38, as discussed in the Literature Review.

The results also indicated that there are conflicting perceptions that the as-built drawings are accurate and up to date. This difference in perception between the COE and the USAF involves the COE responsibility of providing accurate as-built drawings to the USAF. This aspect may also involve the USAF responsibility to provide accurate original site plans.

The data analysis indicated that the O&M manuals are complete. However, the comments from the COE and the USAF concerning these manuals indicate differences in perceptions on the usage of the O&M manuals; for example, non-usage or distribution to individuals that have no need for O&M manuals. The USAF may not understand that the COE is not responsible for the distribution of the O&M manuals to the proper personnel. Based on the above discussion, the answer to the research question is: "Yes," there are conflicting perceptions of agency responsibilities.

An accurate answer to this research question is: During the facility acceptance and turnover, the agencies have a good concept of each other's organizational mission, however, there are conflicting perceptions of responsibilities.

Research Question C. This research question asks: During the warranty enforcement period, are there conflicting perceptions of agency responsibilities and misunderstandings about the warranty management processes?

Conflicting Perceptions of Agency Responsibilities. Are there conflicting perceptions of agency responsibilities? The answer is "yes." The results of the survey indicated that there were conflicting perceptions between the USAF and the COE on the following:

1. Whether an effective procedure for obtaining quick warranty claim response from the contractor exists; when the agencies are in conflict about whether a procedure exists, the awareness of agency responsibility is questionable.

2. Whether the COE is effective in assisting with the recovery of USAF resources spent to fix latent deficiencies. It was perceived that the USAF kept no record of expended USAF resources used to fix deficiencies; records of expended resources are required by AFR 85-4. In addition, the USAF perceived the COE as ineffective in their assistance to recover resources; yet, the USAF has not fulfilled the responsibility of documenting resources spent to fix deficiencies. On the other hand, the COE perceives that they are fulfilling their responsibility in effectively assisting the USAF in the recovery of resources spent.

These conflicts on agency responsibility support the answer to this part of the research question, which is: There are conflicting perceptions of agency responsibilities.

Misunderstandings About the Warranty Management Processes. Are there misunderstandings of the warranty

processes? The answer is "yes." The results of the survey indicated that although the COE is supportive in resolving the problem of a nonresponsive contractor, the USAF feels that there is no effective procedure to obtain a quick response from the contractor. The COE, on the other hand, feels that such a procedure exists. The inference drawn from these statements is that the procedure for obtaining contractor support, which would be part of the management process, is misunderstood.

The results of the survey also indicated that although the USAF feels that the COE is ineffective in assisting in the recovery of expended USAF resources, no records of these expended USAF resources are kept by the USAF. In accordance with AFR 85-4, itemized repair costs are to be sent to the COE for assistance on the recovery of funds expended (7:2). The inference drawn from these statements is that there is a misunderstanding of the warranty management process in regard to recovery of expended USAF resources. Finally, the results of the survey also indicated that the COE feels that there is neither an effective procedure nor an established program set up by the BCE to handle equipment warranty; yet, both the COE and the USAF agreed that both agencies know how to process warranty claims. The inference drawn from this statement is that the warranty management process is misunderstood by both the COE and the USAF.

The results discussed above support the answer to this part of the research question, which is: There are misunderstandings about the warranty management processes.

The responses obtained from the open ended questions concerning the warranty enforcement period supports the answer to the portion of the question about the warranty management processes being misunderstood. Some of the insights provided by the comments to the open ended question in regard to potential causes of the warranty management problems were:

1. The differences between the service regulations.
2. The lack of definitions of responsibilities.
3. The lack of performance and documentation of maintenance.
4. The needed education of the BCE on warranty terms and implementation.
5. The weak enforcement procedure.
6. The lack of warranty dates.
7. The lack of proper warranty claims processing procedures.

Thus, based on the above discussion, the answer to this research question is: During the warranty enforcement period, there are conflicting perceptions of agency responsibilities and misunderstandings about the warranty management processes.

The Basic Management Question

The basic management question is: Are there difficulties that hinder the full success of the management processes for achieving a smooth facility transition from the construction agent (COE) to the user/owner (USAF) for MCP projects? In order to answer this basic management question, the following discussion focuses on the thirty seven suspected problem areas stated in level IV of the research hierarchy. The results of the responses to each survey statement were presented in terms of congruent or conflicting perceptions. The following systematic approach was used to categorize the results of the survey responses. Four categories can occur in this approach:

1. Both agencies agree (congruent perception) that the survey statement is a problem; this situation is categorized as a "field problem." Since both agencies realize that there is a problem, the field level management should resolve the issue.

2. Both agencies disagree (conflicting perception) that the survey statement is a problem; this situation is categorized as a "management problem." The conflicts in the perception of the survey statement represent organizational differences between the COE and the USAF and, as discussed in the Literature Review, it is important to understand and effectively handle these differences (25:107) at a management level.

3. Both agencies neither agree nor disagree that the survey statement is a problem; this situation is categorized as a "neither/nor problem." No statements can be made about the statement.

4. Both agencies agree (congruent perception) that the survey statement is not a problem; this situation is categorized as a "non-problem."

"Non-problem" situations represent areas in which the COE and the USAF feel that their relationship is doing well and in which the working relationship is strong. "Field problem" situations represent areas in which both agencies realize that there is a problem and the field level management should resolve that problem. "Management problem" situations represent areas in which the solution should involve inter-organizational policy and procedures. The solution to the management problem is more complex and the discussion of each identified management problem draws on expert resources in the approach used to offer a solution to the problem.

Table 5.1 presents the possible categories of problem areas in which the results of the survey statements can be placed.

Table 5.2 presents a summary of the results for each of the survey statements in terms of the following:

1. The survey statement number.

2. The agreement (congruent perception) or disagreement (conflicting perception) between the agencies.

Table 5.1

Categories of Problem Perceptions

Perception	agree	neither agree nor disagree	disagree
problem	field problem	neither/nor	management problem
no problem	no problem	neither/nor	management problem

3. The agency's perception about the survey statement as a problem or a non-problem.

4. The category of the survey statement: field problem, management problem, no problem, or neither/nor problem.

In the situation where the agencies neither agree nor disagree, the survey statement is neither a problem nor a non-problem and the result is shown as "neither." In the situation where the agencies disagree on a survey statement, one agency feels that the statement is a problem while the other agency feels that the statement is not a problem; therefore, the result is shown as "both."

Strengths of the USAF/COE Management Relationship. According to the survey response, 18 out of 37 suspected problems resulted in being categorized as "no problems" and two were categorized as "neither/nor" problems. The 18 "no problem" situations are summarized by the following

Table 5.2

Survey Response Results

Survey Statement Number	Agencies Agree/ Disagree	Perceived as Problem/ No problem	Survey Statement Category
AA1	agree	no problem	no problem
AA2	agree	problem	field problem
AB3	neither	neither	neither/nor
AC4	disagree	both	management problem
AD5	disagree	both	management problem
AE/CD6	agree	no problem	no problem
BA7	disagree	both	management problem
BB8	disagree	both	management problem
BC9	agree	no problem	no problem
BD10	disagree	both	management problem
BE11	agree	no problem	no problem
CA12	neither	neither/nor	neither/nor
CB13	agree	problem	field problem
CD14	agree	no problem	no problem
CC/CE15	agree	no problem	no problem
CE16	disagree	both	management problem
AA17	disagree	both	management problem
AA18	agree	no problem	no problem
AB19	agree	no problem	no problem
AB20	agree	no problem	no problem
AC21	agree	no problem	no problem
AD22	agree	problem	field problem
AE23	agree	no problem	no problem
BA24	agree	no problem	no problem
BB25	agree	problem	field problem
BB26	disagree	both	management problem
BC27	agree	no problem	no problem
BC28	agree	no problem	no problem
BD29	agree	problem	field problem
BE30	agree	no problem	no problem
BE31	agree	no problem	no problem
CA32	disagree	both	management problem
CB33	disagree	both	management problem
BA34	agree	problem	field problem
CD35	agree	no problem	no problem
CC36	agree	no problem	no problem
CE37	agree	problem	field problem

five strengths; these are areas in which both agencies feel that the USAF/COE management relationship is doing well and in which strong relationships exist:

1. The quality and functionality of the facilities satisfy the user and the mission requirements; both agencies feel that that the COE strives for high quality facilities as governed by the contract with a primary objective of maintaining the original contract completion dates.

2. The BCE and the COE have a good working relationship. The COE project engineer is thought to be:

a. Properly trained to close out a project.

b. The point of contact for the USAF throughout the warranty enforcement period of the facility transition.

c. Supportive of the USAF throughout the warranty enforcement period of facility transition.

d. Supportive of the USAF on warranty claims with nonresponsive contractors.

3. The O&M training required by the contract specification is effective in preparing the BCE to operate and maintain the facility; the O&M manuals are acceptable and contain accurate information.

4. Warranty claims are processed by qualified people of the BCE and the COE; both agencies know how to process equipment warranty claims through the guarantee program established by the BCE. The COE is supportive in resolving

the problem of a nonresponsive contractor on a warranty claim.

5. The BCE surveillance personnel stay the same throughout a construction project and the BCE inspectors understand their role in the construction project.

The results above show that the USAF/COE management relationship is strengthened when both agencies have agreement on each other's mission, roles, and responsibilities. As suggested by a COE comment, continuous effort is required for harmony between the two agencies.

Field Problems. According to the survey response results, 7 out of the 37 suspected problems resulted in being perceived as problems by both agencies. These problems were categorized as field problems, as previously discussed, and are categorized by the following five field problems:

Field Problem 1. More emphasis should be placed on operation and maintenance aspects of a facility.

Solution to Field Problem 1. According to Mr. Jesse Corbett, Industrial Engineer on the Moody AFB Model Installation Program, and Mr. Owen Brenden, Chief of Engineering at Minot AFB, one factor of success at each of their bases, as presented in the Literature Review, was the close coordination with the BCE maintenance shops. These shops are included in all inspections and pertinent maintenance documentation is given close coordination through

these shops. This approach can be applied to the USAF/COE management relationship by encouraging the BCE project inspector to coordinate closely with the maintenance shops on each MCP construction project. The USAF project inspector must have the full support of the BCE in order to do his work right.

Another solution would be to increase emphasis on the O&M aspects at the contract requirements stage of the project. This solution is really not within the scope of this research study, however, this solution is supported by the COE general comment number 4 to the open ended question which states that contract requirements must be established by the user needs and the BCE capabilities.

Field Problem 2. The BCE must keep all records of funds expended on all unanswered warranty claims and request the COE assistance in recouping the expended resources.

Solution to Field Problem 2. The requirement for keeping documentation of funds expended on all unanswered warranty claims and requesting the COE assistance in recouping the expended resources is already established by AFR 85-4 (7:2). Therefore, the solution is the enforcement of this requirement through the BCE, Deputy BCE, and/or Chief of Operations and Maintenance (O&M).

Field Problem 3. The retainage on contractor payment should be at least 100 percent of the cost of

completing all punchlist items so that the contractor completes all punchlist items within a given response time.

Solution to Field Problem 3. The solution to this field problem is to give the contractor 30 days to complete all outstanding punchlist items. At the end of the 30 day period, an outside contractor should be contracted to complete all outstanding punchlist items; the cost of this new contract should be funded by the retainage held against the original contractor of the project. These contract terms for the construction completion must be specifically written into the general provisions of the contract specifications.

Field Problem 4. The user occupancy of a facility prior to 100 percent completion reduces the contractor's liability for deficiencies and correction of punchlist items.

Solution to Field Problem 4. A practical solution to this field problem is to avoid occupancy prior to the facility's 100 percent completion. But, if occupancy prior to 100 percent completion is unavoidable, then the solution is to plan every detail of the Beneficial Occupancy, such as designated work areas, mutual agreement on accepted areas of work, open punchlist items in user occupied areas, and safety precautions to be taken by the user occupants and the contractor. This plan must be clear and specific in detail so that the user, the construction

agent, and the contractor know the exact requirements placed on each party by BOD.

Field Problem 5. The warranty claims processing procedures are cumbersome.

Solution to Field Problem 5. This problem, although it falls in the field problem category, should be treated as a management problem because its solution may involve agency and inter-agency policies, standard operating procedures, and organizational management structure. One part of the solution involves the resolution of the inadequacies between the agency regulations, as was discussed in the Literature Review. This solution is supported by the COE comment to the open ended question concerning regulations which states that the differences between the regulations causes disagreement between the BCE and the COE. Another part of the solution is the implementation of a management structure which would effectively manage the warranty process. The Literature Review discusses a logical process for the design of an effective organizational structure. This organizational structure design process would require an analysis of all available resources by well qualified personnel who would be responsible for the design and selection of the most effective management structure for warranty management.

Four out of five field problems can be resolved by field management, while the fifth field problem should be elevated to a management problem. All solutions presented

are reasonable, practical, and achievable as discussed by the Literature Review, as recommended by key interview sources, and as commented on by the respondents to the survey's open ended questions.

Management Problems. According to the survey response results, 10 out of the 37 suspected problem areas were identified as management problems; these 10 problem areas are categorized by eight management problems. Each management problem represents a disagreement or a difference in perception between the USAF and the COE on the statement of the problem.

The solutions to management problems are more complex than the solutions offered for the field problems. Since these management problems represent differences between the agencies, the first step in the solution process is the identification of the kind of issue each management problem involves as discussed in the Literature Review in regard to perceived differences. Then, the solution must address the issues by some means such as:

1. The clarification of roles and responsibilities through a Memorandum of Agreement.

2. The generation of standard operating procedures.

3. The establishment of agency policies by writing new regulations or revising old regulations to resolve the inadequacies discussed in the Literature Review.

4. The creation of a more direct line of communication between the BCE and the COE as discussed in the Literature Review in regard to the Model Installation Program.

The concepts of these solutions are supported by the success factors that were shared by Mr. Brenden, Chief of Engineering, of Minot AFB, and that were brought out by the comments and concerns to the open ended question of the survey as discussed in the Results chapter. In addition, the Literature Review suggests an approach to the identification of the issues of each problem.

The following discussion focuses on the problem areas that were categorized as management problems. The discussion first identifies the issues according to the principles recommended by Schmidt and Tannenbaum as discussed in the Literature Review; then, it offers solutions which address the issues as dictated by the problem. These solutions are suggested by this author and supported by both the interview sources as discussed in the Literature Review and the Results chapter, and the comments and concerns of the respondents as expressed through the open ended question of the survey.

Management Problem 1. There was conflict in perceptions between the agencies concerning the existence of effective procedures for:

1. Handling facility warranty claims.

2. Taking action against a contractor who is untimely in punchlist completion.

3. Obtaining quick response from contractors on equipment warranty claims.

The Issue/Solution of Management Problem 1.

The issue behind management problem 1 could involve "the procedures which would most likely achieve a mutually desired goal" (25:108). Thus, this management problem involves a "methods" issue, as discussed in the Literature Review. The solution that addresses this issue would involve the generation of a joint standard operating procedure as a common document for both agencies. This solution may also involve a Memorandum of Agreement which would establish the roles and responsibilities of the personnel in each agency.

This solution is supported by a USAF comment that stated that many problems would be cured if responsibilities were established in writing; it also stated that problems often occur due to a disagreement on who should do what; finally, it stated that a Memorandum of Agreement between the Resident Engineer and the Chief of Contract Management (DEEC) is needed. Along the same line, one COE comment stated that the difference in the Army and the Air Force regulations cause disagreement between the BCE and the CO.; therefore, a joint standard operating procedure or a Memorandum of Agreement would help eliminate this disagreement.

Management Problem 2. There was a conflict in perceptions between the agencies concerning the sustained interest of BCE surveillance.

The Issue/Solution of Management Problem 2. The issue behind management problem 2 could involve the differing definition of the term "consistent surveillance." Thus, this management problem involves an issue on facts (25:108). The solution to this problem could be handled at the field level with a coordination meeting. This solution is supported by the success factors brought out by responses to the open ended question in regard to the necessity of having a COE representative in the BCE staff meeting to insure proper coordination regarding MCP projects.

Management Problem 3. There was conflict in perceptions between the agencies concerning the adequacy of retainage for punchlist completion.

The Issue/Solution of Management Problem 3. The issue behind management problem 3 could involve a combination of both the differing definitions of a problem and the strategies to achieve the mutually desired goal of punchlist completion through higher retainage. Thus, this management problem involves an issue on facts and on goals (25:108). The existence of the differing definition issues is supported by an open ended comment about retainage, as discussed in the Results chapter, which showed concern that the concept and purpose of retainage was misunderstood.

Thus, part of the solution is to define the purpose of retainage through a Memorandum of Agreement. The other part of the solution to this management problem involves strategies to complete punchlist items through adequate retainage. Using retainage as a leverage against contractors for the completion of punchlist items may require changes to contract requirements which would allow the use of such retainage for the completion of punchlist items in the event of nonperformance.

Management Problem 4. There was conflict in perceptions between the agencies on whether the contract completion dates are met with all major punchlist items completed.

The Issue/Solution of Management Problem 4. The issue behind management problem 4 could involve a combination of both the differing definitions of a problem and the strategies to achieve a mutually desired goal (25:103). A definition may be needed for the term "major punchlist items." The lack of a common understanding of this term may have caused the disagreement between the agencies. Strategies to achieve punchlist completion could be positive, such as monetary reward for early finish, or negative, such as charging the prime contractor of the project the cost of a separate contractor to complet the punchlist.

Management Proolem 5. There was conflict in perceptions between the agencies concerning the coordination of punchlist items between the BCE and the COE.

The Issue/Solution of Management Problem 5. The issue behind management problem 5 could involve the procedure used for coordination or lack thereof. The management structure, the lines of communication, and the processes for coordination are the elements that may be involved in the solution of this problem. Specifically, the COE Area, Resident or Project Engineer must be the focal point of all coordination. This individual is responsible and should be held accountable for keeping the USAF fully informed of the status of the punchlist. The USAF/BCE Construction Manager or the USAF Project Engineer assigned to the project must be responsible and should be held accountable for keeping the BCE staff, as well as the maintenance shop technicians, informed about the status of the punchlist. Every punchlist item generated by the COE and the USAF must be dated, supported by contract specification requirements, and accountable to an individual. All completions to the punchlist must be coordinated through the COE Project Engineer and cosigned by the USAF Construction Manager or designated USAF representative. Weekly meetings are highly recommended until the punchlist is such, that weekly meetings are not warranted.

As discussed in the Literature Review concerning trends in construction management, the Professional Construction Management (PCM) system, which is similar to the USAF/COE management relationship, uses the PCM as the focal point for the relationship. All coordination goes through the PCM. Thus, it is the responsibility of the PCM (COE) to keep the owner (USAF) "fully informed at all times regarding the current status of the project. . ." (2:430).

Management Problem 6. There was a conflict in perceptions between the agencies concerning the accuracy of the as-built drawings.

The Issue/Solution of Management Problem 6. The issue behind management problem 6 could involve the perception that each agency may be "aware of different pieces of relevant information" (25:108). The accuracy of the as-built drawings could encompass the accuracy of the original site plans, the accuracy of the original contract drawings, the accuracy of all of the contract modifications, the accuracy of all verbal agreements, and the accuracy of all of the field changes. Each piece of relevant information could cause inaccuracies if the information is inaccurate itself or if the information is not coordinated with the proper personnel. Addressing the coordination and eventual inclusion of each piece of relevant information onto the as-built drawings may involve management structure, manpower,

and the process used for coordination. Thus, the solution to this management problem should involve:

1. The personnel who are qualified in the design of management structure to address the processes for coordination.

2. The executive management who would establish both the procedures for the coordination process and the policies defining all roles and responsibilities.

More specifically, the problem should be resolved by clear and specific written responsibilities in a Memorandum of Agreement, an inter-agency regulation, or an inter-agency management guide. The written document would resolve the problem of "who should do what" and individual accountability would better insure the accuracy of the as-built drawings.

Management Problem 7. There was a conflict in perceptions between the agencies concerning the adequacy of the O&M training sessions.

The Issue/Solution of Management Problem 7. The issue behind management problem 7 could involve a "disagreement about what should be accomplished" (25:108) in the O&M training sessions. Thus, the issue involves the goal of the O&M training. The best solution for this problem is a meeting between the BCE and the COE to discuss the expectations of the user concerning these training sessions and the requirement of the contract specifications as perceived by both agencies. This solution is supported

by the COE general comment number 8 to the open ended question concerning O&M aspects which states that a need exists for a better review and understanding by the user and the BCE on the individual contract requirements for O&M. This solution is also supported by COE comments concerning O&M training; these comments concerned:

1. The attendance of O&M training sessions by BCE individuals who would be responsible for the operation and maintenance of that facility.

2. The training sessions provided by the contractor often being left before the session is completely over, and trained BCE individuals transferring to other bases.

3. The involvement of the Air Force upper management on placing more emphasis on attendance of training sessions by the proper personnel.

Management Problem 8. There was a conflict in perceptions between agencies concerning the effectiveness of the assistance of the COE to recoup USAF resources expended to fix latent deficiencies.

The Issue/Solution of Management Problem 8. The solution to management problem 8 was discussed earlier - to enforce the requirements of AFR 85-4 which requires that the documentation of USAF expended resources to fix latent deficiencies be sent to the COE in order to recoup the resources expended by the USAF. Unless this solution is

implemented, the COE cannot effectively assist the USAF in recouping expended resources.

Once the COE obtains the documentation of USAF expended resources and the USAF request for assistance, the COE must pursue the recovery of the expended resources through legal channels. As discussed in the Literature Review, there is no requirement for a feedback loop from the COE to the BCE for coordinating the status of efforts to regain expended resources. AFR 85-4 does not specify any provision for the recovery of expended resources, once the COE has the documentation of the expended resources. Therefore, a feedback loop requirement should be included as a joint COE/USAF requirement.

Summary. The management problems are a bigger challenge to the USAF/COE management relationship, especially at the top level where policies are established. The solutions offered are not irresolvable and both agencies must take the responsibility for their achievement. The answer to the basic management question is: "Yes," there are difficulties that hinder the full success of the management processes for achieving a smooth facility transition from the construction agent (COE) to the user/owner (USAF) for MCP projects. The postscript to this answer, though, is that the working level is willing to listen to and understand each others' point of view. This attitude is supported by comments from the working level throughout

CONUS that involve phrases such as: "the elimination of the we versus them attitude"; "continuous efforts are required to overcome these conflicts"; "a close, amicable working relationship is mandatory for optimum performance"; "the upper management must be involved"; "close out, O&M, and warranty issues are solvable"; "problems which exist could easily be worked if all parties agree to sit down and talk things out"; "communication must be improved"; "a need exists"; and finally, "promote harmony between the agencies."

Recommended Follow-On Study

The scope of this research study was purposely narrowed in order to accommodate the time required for completion, the complexity and cost of the survey, and the elimination of a broad general study of the COE/USAF management relationship. With this research study as background material, the following research could be done to further investigate the COE/USAF management relationship:

1. The scope of this research study could be expanded by the consideration of MCP outside of the continental United States, and/or the consideration of a different population of study which would include the top management of both agencies or the inspectors of both agencies.

2. The investigative approach of this study could be used to consider MCP projects managed by the Naval Facilities Engineering Command as the construction agent.

3. This research could be done again as a verification of the results of this research study by examining the areas chosen for this study and selecting other areas of concern within each period of facility transition. The same research hierarchy should be used so that the data analysis results of this study could be used along with any new results.

One comment to the open ended question of the survey stated that the areas of concern for this study represented the tip of the iceberg and that the real root and bulk of the problems lie in the concept, design and review stages. Project scope needs to be better defined and established at an earlier stage in the life of the project. User involvement must increase in emphasis and quality. An investigation on the factors that hinder the production of a high quality design package could be done. The hypothesis would be: A well designed project may decrease the amount of difficulties encountered in the facility transition phase.

Conclusion

This study had three objectives:

1. To identify the perceptions that project managers in each agency had about roles, responsibilities, standard procedures, management processes, and contract requirements during facility transition.

2. To rank order five problems encountered within each of the three periods of facility transition according to their order of significance.

3. To provide resolution suggestions that could be used by the management of both agencies in the resolution of any problems identified in this study.

This research study met its first objective by identifying three types of perceptions which resulted in three categories of problem areas. These were:

1. The congruent perception in which both agencies agreed that a supported problem area was really not a problem. This problem category was called "no problem"; these represented strengths in the USAF/COE relationship.

2. The congruent perception in which both agencies agreed that a suspected problem area was indeed perceived as a problem. This problem category was called "field problem"; these represented problems that could be resolved by the field management.

3. The conflicting perception in which the COE and the USAF disagree on whether a suspected problem area was a problem. This problem category was called "management problem"; these represented disagreement between the agencies and the solution involved inter-agency policies and procedures.

This research met its second objective by generating prioritized lists of problems encountered during facility

transition according to the COE perspective, the USAF perspective and the combined USAF/COE perspective.

The third objective was met by addressing the basic management question. The field problems and the management problems were identified and this study offered practical solutions to each of these problems.

This research study accomplished its objectives, and in doing so, it identified the difficulties between the COE and the USAF management that hinder the full success of the management process for achieving smooth facility transition. By identifying these difficulties, it is the author's hope that harmony between the agencies is increased so that optimum performance can be achieved and high quality products result.

Appendix A: Survey Questionnaire

USAF SCN : 87-43

A SURVEY OF MANAGEMENT CONCERNS ABOUT THE FINAL PHASE OF CONSTRUCTION AND THE WARRANTY PERIOD FOR MCP PROJECTS.

SECTION I

The statements below should be evaluated with respect to the last 5% of facility construction, the acceptance and turnover, and the warranty period for facilities built in Military Construction Program (MCP). Please respond to the following statements by using the scale shown and mark your response on the answer sheet provided with a no. 2 lead pencil.

strongly disagree	dis-agree	slightly disagree	neither agree nor disagree	slightly agree	agree	strongly agree
1	2	3	4	5	6	7

1. Training sessions required by the contract specifications are effective in preparing the BCE to maintain and operate the facility.

2. Contract requirements should place more emphasis on the operation and maintenance aspects of a facility such as adequate accessibility, lower maintenance products and equipment and accurate O&M information.

3. The COE and the BCE have an effective and efficient standard procedure for the coordination of pertinent information (i.e., contract changes or schedule impacts).

4. The BCE maintains high interest in the construction through weekly surveillance so that the final inspection is carried out expediently and effectively.

5. The contract requirement for retainage of payment is not adequate for the enforcement of the punchlist completion.

6. The COE project engineer remains the COE point of contact for the BCE until the warranty period on the facility has expired.

strongly disagree	dis-agree	slightly disagree	neither agree nor disagree	slightly agree	agree	strongly agree
1	2	3	4	5	6	7

7. The contract completion dates are met with all major punchlist items completed.

8. All punchlist items are well-coordinated between the COE and BCE.

9. Typically, the functionality of completed facilities satisfies the user mission requirements.

10. The as-built (red-lined) drawings are accurate and up-to-date.

11. The O&M documents are usually acceptable.

12. There is a effective procedure for handling construction errors, or latent defects not specifically covered by equipment warranty (e.g., roof leaks, bad plumbing, etc.).

13. The BCE keeps all records of funds spent on all unanswered warranty claims and requests the COE to assist in collecting from the contractor.

14. When the contractor is non-responsive on a warranty claim, the COE is supportive in resolving the problem.

15. The COE and the BCE know the procedures to be followed under the BCE warranty and guarantee program in order to effectively process all warranty claims.

16. There is an effective procedure and program established by the BCE to handle claims on warranty for equipment in new facilities.

17. The O&M training sessions are adequate.

18. The access for routine maintenance on facility equipment is acceptable (i.e. HVAC filters can be replaced without obstruction, control values are accessible, etc.).

19. The BCE responds to COE requests for utility support in a manner which does not impact the construction completion (i.e. for testing Fire Protection, EMCS, or HVAC Controls).

strongly disagree	dis-agree	slightly disagree	neither agree nor disagree	slightly agree	agree	strongly agree
1	2	3	4	5	6	7

20. The COE allows the BCE a reasonable response time when requesting utility shop support.

21. The BCE surveillance is consistent (i.e. same inspectors, understands the role that they play).

22. The retainage on contractor payment should be at least 100% of the cost to complete all punchlist items.

23. The COE Project Engineers are trained to properly close out an MCP project (i.e. know the proper transfer documents such as 1354's and warranty agreements).

24. A primary objective is to maintain original contract completion dates.

25. The contractor completes all punchlist items within the given responsive time.

26. There is an effective procedure for action against a contractor who does not complete all punchlist items in a timely manner.

27. The COE strives for a high quality facility as governed by the contract specifications.

28. The quality of the facility satisfies the user.

29. The "as-builts" are provided within 30 days of construction completion.

30. All the warranty agreements of the facility equipment contain accurate effective dates.

31. The operation and maintenance manuals for installed equipment contain accurate effective dates.

32. There is an effective procedure for the BCE to obtain quick response from the contractor, his subcontractors, or his suppliers for warranty claims on facility equipment.

33. The COE effectively assists in the recovery of AF resources spent to fix latent construction deficiencies.

strongly disagree	dis-agree	slightly disagree	neither agree nor disagree	slightly agree	agree	strongly agree
1	2	3	4	5	6	7

34. The user occupancy of a facility prior to 100% complete reduces a contractors' liability for deficiencies and correction of punchlist items.

35. The COE and the BCE have qualified people that handle all warranty claims on newly constructed facilities.

36. The warranty and guarantee program established by the BCE immediately includes the new equipment in a completed MCP facility.

37. The warranty claims processing procedures are cumbersome.

SECTION II

Please provide your perception of the order of significance of the following problems. Rank these problems from 1 to 5.

1 = the most significant problem
2 = the second most significant problem, etc. . . .
5 = the fifth significant problem of those listed

38. LACK OF ADEQUATE "O & M" INSPECTION AND TRAINING [Explanation: There is a lack of emphasis on operation and maintenance aspects, such as adequate accessibility, high maintenance products, and accurate O & M information.]

39. LACK OF A GOOD BCE/COE WORKING RELATIONSHIP [Explanation: The BCE and the COE representatives lack good communication and proper coordination of changed requirements, and acceptability criteria.]

40. LACK OF CONSISTENT AIR FORCE SURVEILLANCE [Explanation: The Air Force inspectors change too often and there is a misunderstanding of the role that they play on the construction site.]

41. LACK OF ADEQUATE RETAINAGE OF CONTRACTOR PAYMENT [Explanation: The required retainage should be adequate enough to cover the cost of completing the punchlist.]

42. LESS QUALIFIED PERSONNEL [Explanation: Less qualified personnel are left to close out the construction job.]

Please provide your perception of the order of significance of the following problems. Rank these problems from 1 to 5.

1 = the most significant problem
2 = the second most significant problem, etc. . . .
5 = the fifth significant problem of those listed

43. COMPROMISING ACCEPTABLE COMPLETION OF DEFICIENCIES
[Explanation: As the final acceptance and turnover date gets close to or passes the AF mission critical date, the BCE and the COE compromise the acceptable correction of deficiencies in order to gain occupancy of the facility.]

44. UNTIMELY COMPLETION OF PUNCHLIST
[Explanation: There is no effective method to resolve uncorrected, long standing punch list items of an nonresponsive contractor.]

45. USER NOT SATISFIED
[Explanation: The user occupancy of a facility prior to 100% complete reduces a contractors' liability for deficiencies and correction of punchlist items. As a result, the user is unhappy when the contractor states that a certain deficiency was not his responsibility.]

46. UNACCEPTABLE AS BUILTS
[Explanation: The as-built drawings provided by the contractor are usually not accurate.]

47. INCOMPLETE "O&M" DOCUMENTS
[Explanation: The operations and maintenance aspects of the facility are at times unacceptable and unsatisfactory to the user.]

Please provide your perception of the order of significance of the following problems. Rank these problems from 1 to 5.

1 = the most significant problem
2 = the second most significant problem, etc. . . .
5 = the fifth significant problem of those listed

48. LACK OF CONTRACTOR RESPONSE TO FIX LATENT DEFECTS
[Explanation: The contractor response to construction error, latent defects and equipment failure is very slow and at times non-existent.]

49. ADDITIONAL RESOURCES SPENT TO FIX LATENT DEFICIENCIES
[Explanation: Additional BCE resources are spent to fix the warranty items and latent deficiencies with no hope of timely cost reimbursement.]

50. WARRANTY ENFORCEMENT IS WEAK
[Explanation: The warranty enforcement for a new MCP facility and its equipment is weak because COE/BCE standard operating procedures for enforcement are ineffective.]

51. LACK OF QUALIFIED PEOPLE TO HANDLE WARRANTY
[Explanation: There are no designated and qualified personnel to handle warranty claims from birth to grave.]

52. WARRANTY PROCESS IS CUMBERSOME

SECTION III

The following questions serve to categorize respondents for statistical analysis only. Your anonymity is assured as the data can not be used to identify individual respondents.

53. At what organizational level are you working?
    a. Chief of Engineering
    b. Project Engineer
    c. Construction Manager
    d. Resident Engineer
    e. Contract Inspector
    f. Other

54. To what organization do you belong?
    a. U.S. Army Corps of Engineers
    b. U.S. Air Force Base Civil Engineering
    c. Other

55. What is your current grade level?
    a. GS-07 through GS-10
    b. GS-11 through GS-13
    c. GS-14 and above
    d. E-2 through E-9
    e. O-1 through O-3
    f. O-4 through O-5

56. How many cumulative years of experienced do you have in the construction and/or construction management of Air Force facilities in the Military Construction Program?
    a. 0 through 5 years
    b. 6 through 10 years
    c. 11 through 15 years
    d. 16 through 25 years
    e. more than 25 years

57. If you perceive of any additional significant areas of management concern between the COE and the BCE that exist during the final phases of a MCP project or if you have any disagreement with any of the statements above, please write them on the back of this page.

Appendix B: Questionnaire Cover Letters

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

DAEN-ECZ-A

MEMORANDUM FOR PROJECT ENGINEERS/MANAGERS, U. S. ARMY CORPS OF ENGINEERS

SUBJECT: Air Force Institute of Technology Advanced Degree Research - Survey

1. The enclosed survey supports advanced research for an advanced engineering degree candidate at the Air Force Institute of Technology. It speaks to the concerns about management relationships and perceptions between the Corps of Engineers as construction agent and the USAF Base Engineer as customer user.

2. As an educational instrument, this study/survey will provide insight and perspective to the student about the way the Corps approaches Customer Care and our relationship to mission accomplishment.

3. Completion of the survey by Project Managers and Project Engineers is, of course voluntary. I highly encourage your support of this fine endeavor.

FOR THE COMMANDER:

MARK J. SISINYAK
Major General, USA
Assistant Commander and Director
Engineering and Construction

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

6 APR 1987

ATTN OF: LSM

SUBJECT: Research Survey

TO:

1. The management relationship that exists between the Army Corps of Engineers (COE) and the USAF Base Civil Engineer (BCE) is the subject of this study. The attached survey requests data that will be used in a thesis that fulfills the partial requirement for a Masters Degree at the Air Force Institute of Technology.

2. The objective of this survey is to provide insights into the COE/BCE management relationship from the perspective of the managers who are at the interface between the two agencies. The scope is limited to the final phase of construction, the acceptance and turnover, and the warranty period of Air Force facilities constructed under the Military Construction Program (MCP) and managed by the COE.

3. As a project engineer on a MCP project, your response is vital in determining interagency roles, responsibilities, and requirements.

4. The data gathered from this survey will be analyzed statistically. Once the analysis is completed, an overall response pattern will be developed from which insights on the COE/BCE management relationship will be obtained.

5. Please take the time to complete this survey and return it in the enclosed envelope within five working days.

6. Your participation in this research is voluntary and all responses will be held in strict confidentiality. There is no way to tie a specific questionnaire to a particular individual. We would certainly appreciate your help. Any questions concerning this survey should be directed to Mr. Bernard Marcos, Jr., AFIT/LSG, (513) 237-9529 or AUTOVON 785-6569.

JOHN M. HALLIDAY, Lt Col, USAF
Head, Dept of Log Mgt
School of Systems and Logistics

2 Atch
1. Survey
2. Envelope

Bibliography

1. Barrie, D. S. "Guidelines for Successful Construction Management," Journal of the Construction Division, ASCE, 106 (No.CO3): 237-245 (September 1980).

2. Barrie, D. S., and B. C. Paulson, Jr. "Professional Construction Management," Journal of the Construction Division, ASCE, 102 (No.CO3): 425-436 (September 1976).

3. Brenden, Owen. Chief of Engineering. Personal Interview. 91CES DEE, Minot AFB ND, 22 June 1987.

4. Corbett, Jesse. Industrial Engineer for a Model Installation Air Force Base. Personal Interview. 347CES/DEI, Moody AFB GA, 24 June 1987.

5. Department of the Air Force. Facility Construction: Design and Construction Management. AFR 89-1. Washington: HQ USAF, 20 June 1978.

6. Department of the Air Force. Facility Construction: Design and Construction Management. AFR 89-1 Revised. Washington: HQ USAF, version not yet published.

7. Department of the Air Force. Implementing Guarantees of Equipment Installed in the Air Force Construction. AFR 85-4. Washington: HQ USAF, 30 October 1963.

8. Department of the Air Force. New Construction: Air Force Contract Construction. AFR 88-3. Washington: HQ USAF, 4 February 1960.

9. Department of the Army. Customer Care Survey. Corps of Engineers, Mobile District, Alabama, 1986.

10. Department of the Army. Construction Transfer and Warranties. ER 415-345-38. Washington: HQ US Army Corps of Engineers, 30 July 1986.

11. Department of the Army. Resident Engineer Management Guide. EP 415-1-260. Washington: HQ US Army Corps of Engineers, June 1986.

12. Department of Defense. Military Construction Responsibilities. DOD Directive 4270.5. Washington: Government Printing Office, 2 March 1982.

13. Dominowski, Roger L. Research Methods. Englewood Cliffs: Prentice-Hall, 1980.

14. Emory, William C. Business Research Methods (Third Edition). New York: Richard D. Irwin, Inc., 1985.

15. Fawcett, R. P. and C. B. Tatum. "Organizational Alternatives For Large Projects," Journal of Construction Engineering and Management, 112 (No. 1): 49-61 (March 1986).

16. Hall, Hadlai C. and Norman H. Nie. SPSS Update 7-9: New Procedures and Facilities for Releases 7-9. New York: McGraw-Hill Book Co., 1981.

17. Hardyck, Curtis D. and Lewis F. Petinovich. Introduction to Statistics for the Behavioral Sciences (Second Edition). Philadelphia: W. B. Saunders Company, 1976.

18. Headquarters Air Force Engineering and Services Center. Project IMAGE: Innovative Management Achieves Greater Effectiveness. Contract No. F-08635-85-C-0252. Tyndall AFB FL, October 86.

19. Jarvis, Barbara C. Program Manager for the Model Installation Program. Personal Interview. HQ USAF/LEEM, Pentagon, Washington DC, 24 June 1987.

20. Kettle, K. A. "Project Delivery Systems for Construction Projects," Journal of the Construction Division, ASCE, 102 (CO4): 575-585 (December 1976).

21. Kern, D. R. "Relationships and Responsibilities of Project Parties Under the Construction Management Approach," Engineering and Construction Projects: The Emerging Management Roles, ASCE: 88-106 (1982).

22. Poe, General Bryce and Lt General Devol Brett. "Observations on United States Air Force Construction Programs With Emphasis on U.S. Army Corps of Engineers Involvement." Special Report for the U.S. Army Corps of Engineers. HQ USA, Washington DC, 6 August 1985.

23. Rogers, C.R., and F. J. Roethlisberger. "Barriers and Gateways to Communication," Harvard Bu iness Review, 30: 46-52 (July-August, 1952).

24. Roscoe, John T. Fundamental Research Statistics for the Behavioral Sciences. New York: Holt, Rinehart and Winston, Inc., 1969.

25. Schmidt, W. H., and R. Tannenbaum. "Management of Differences," Harvard Business Review, 38: 107-115 (November-December 1960).

26. Sliwoski, Richard F. Construction Management Activities of Governmental Agencies in the New England Area During the Construction Phase. MS Thesis, Worchester Polytechnic Institute, Alexandria VA, February 1980 (AD-A087 949).

27. SPSS, Inc. SPSS-X User's Guide (Second Edition). New York: McGraw-Hill Book Company, 1986.

28. Steel, Robert P. et al. Lecture Notes from ORSC 561, Making Sense of Research Data. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, February 1987.

29. Subcommittee on Construction Management Organization and Evaluation of the Committee on Professional Construction Management of the Construction Division. "Professional Construction Management Services," Journal of the Construction Division, ASCE, 105 (CO2): 139-155 (June 1979).

30. Tatum, C. B. "Evaluating PCM Firm Potential and Performance," Journal of the Construction Division, ASCE, 105 (No.CO3): 239-251 (September 1979).

31. Tatum, Clyde B. "Issues in Professional Construction Management," Journal of Construction Engineering and Management, 109 (No. 1): 112-117 (March 1983).

32. U.S. Congress. Military Construction Authorization Act, 1977. Public Law No. 94-431, 94th Congress, 2nd Session. Washington: Government Printing Office, 1976.

33. Weaver, Robert. Class Lecture and Notes From COMM 630, Research Methods. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, October-December 1986.

VITA

Bernard Marcos, Jr. was born on 15 December 1952 in Waipahu, Hawaii. He attended Loyola University of Los Angeles in Los Angeles, California, where in 1974 he received the degree of Bachelor of Science in Civil Engineering. Upon graduation, he was hired by Long Beach Naval Shipyard in Long Beach, California, as a general engineer. In March 1977, he transferred to the Department of the Army, Corps of Engineers, Los Angeles District as a civil engineer for South Pacific Division and as a project engineer for the Space Shuttle Facilities at Vandenburg AFB, California. This was followed by a transfer in 1982 to the Department of the Air Force, Site Activation Task Force for the Space Shuttle ground support operations at Vandenburg AFB, California. He was transferred into Space Division, at Vandenburg AFB, California, in 1984. In 1986, Mr. Marcos entered the School of Systems and Logistics, Air Force Institute of Technology, at Wright-Patterson AFB, Ohio.

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