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Evaluation of Current Automated Civil Engineer System Non-Appropriated Funds Project Programming Procedures

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EVALUATION OF CURRENT AUTOMATED CIVIL ENGINEER SYSTEM NON-APPROPRIATED FUNDS PROJECT PROGRAMMING PROCEDURES

THESIS

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AFIT/GEM/ENV/04M-12

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ABSTRACT

It is essential that businesses continually improve their automated information systems (AIS) to support the changing needs of the organization. The Air Force civil engineering organization is no exception, and they have drastically improved their Automated Civil Engineer System (ACES) since its implementation in 2000. However, there are many problems associated with the non-appropriated funds (NAF) project programming business rules within ACES. These problem areas were not addressed until recently when an integrated process team (IPT) met and proposed numerous changes to how NAF programming is accomplished in ACES. This research effort, through a web-based survey, focuses on the perceived benefits of these proposed changes from a base-level programming perspective. It also investigated current programming procedures that might affect how well the proposed changes are implemented along with NAF and ACES training issues. Descriptive statistics were used to answer the research questions using survey responses from a sample size of 35 base-level programmers.

The results indicated that programmers “agree” or “strongly agree” that the majority of changes proposed by the IPT will be beneficial in improving NAF programming in ACES. However, several potential problems areas might surface, due to current programming procedures at base-level, when these changes are implemented into ACES. Automatic email notifications on project status, electronic attachments to the project file, and use of non ACES templates are all areas of concern brought up in this research effort.

ACKNOWLEDGEMENTS

I searched for a research topic that would help improve Civil Engineering in the Air Force, along with one that I had experience in. I wanted to concentrate on programming issues, and more specifically ACES-PM issues, since I realized that many programmers out in the field were not satisfied with the new automated information system. When I was a programmer, I also felt powerless in my position to directly help in the improvement of ACES-PM. Even though the results were not as significant as I had hoped, I feel that I did provide some positive information for NAF programmers and the organizations responsible for ACES-PM. The results of this research effort could not be reached alone, and I would like to thank those individuals who help me.

First, I would like to thank my thesis advisor, Lt Col Alfred Thal who meticulously edited the final product and provided direction to pertinent research issues. Maj Teri French provided a wealth of NAF programming knowledge and resources. She assisted me in trying to obtain more responses to my survey and provided the necessary TDY funds that allowed me to collect important NAF programming information. Mr. William Marsh, the ACES-PM IPT chairmen, originally came up with the thesis topic and suggested that I attend the ACES-PM NAF users meeting in Langley, VA, where I received the information needed for the majority of my survey questions.

Finally, I would like to thank my lovely wife for her patience and support during this effort. It was an interesting time of our lives as we both attended graduate school, and we are thankful for the opportunities we received.

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1. INTRODUCTION

The advance in computer technology and information systems has altered the processes and activities of all businesses and organizations (45:1). Modern businesses must consider their information technology and automated information systems (AISs) as crucial factors in obtaining a sustainable competitive advantage (45:1). With greater dependence on technology, companies are constantly pressured to update and improve their AISs to better match their business processes (45:1). Thus, it is essential that businesses continually update and improve their AISs to better meet the changing needs of the organization. However, many problems arise as organizations try to modify their existing AISs or implement new ones. Restructuring of organizational requirements, new training demands, and system inefficiency due to user resistance are several problems areas that are encountered by organizations when they implement a new AIS. To help alleviate these potential headaches, businesses must create sound AIS development and execution plans that help ensure an easy transition. The technological changes and increasing reliance on AISs facing businesses are also causing the Air Force to redefine

its structure and interactions as an organization (6:i). Thus, the Air Force is facing implementation problems as it develops new AISs to better match its business processes.

1.1 Automated Information Systems

In order to manage AISs more efficiently, and reduce the amount of transitional problems encountered, it is essential that organizations have a plan on how to implement their existing and new AISs. Proper and efficient implementation and maintenance of AISs are crucial for organizations to manage data and secure a competitive advantage (45:1). The most widely accepted methodology, which has evolved over several decades, for analyzing and designing information systems, is the systems development life cycle (SDLC) (41:7; 45:22). The SDLC is an iterative process that generally adheres to the following phases: preliminary investigation, analysis, logical design, physical design, implementation, and maintenance (45:23). However, whenever an organization implements a new system, it is inevitable that they will encounter problems (45:53). The system's end users typically help make these problems known to the development team during the maintenance phase of the SDLC (45:53). End users are considered to be anyone who interacts with the AIS in the context of his or her work within the organization (41:5). Regardless of how well the SDLC process is followed, problems with the system will occur in the maintenance phase since many issues are not apparent until the system is in full use (45:53).

Business rules are one of the main aspects of AISs that are periodically revised after a system has been implemented in an organization, which usually occurs during the SDLC maintenance phase (25:744). Business rules, which are interaction constraints

between data and the appropriate fields, help prevent user error and create more accurate and consistent data for an organization (25:744). Therefore, is it essential that business rules be reviewed frequently to ensure that they still mirror the way an organization operates in its real environment.

The Air Force has many AISs that facilitate the completion of its various organizational missions. One of the more recently implemented systems is the Automated Civil Engineer System (ACES). ACES will eventually support all Civil Engineering (CE) requirements and be utilized by the whole Air Force Civil Engineering community, to include officers, enlisted members, civilians, and contractors.

1.2 Automated Civil Engineer System (ACES)

ACES is a new AIS that was first introduced into CE operations in 2000 (49:43). All levels of CE, to include installations, Major Commands (MAJCOMs), and Headquarters Air Force (Air Staff), use ACES to conduct daily and strategic management of CE functions. ACES is CE's next generation AIS that will provide the "best tools for us to plan, program, design, construct, operate, maintain, and dispose of our installations and to perform our agile combat support tasks in both peace and war" (6:i). The technological advances in AIS will allow CE to effectively execute all these tasks with ACES.

ACES was created to replace and centralize former CE management information systems to include the Work Information Management System (WIMS) and the Interim Work Information Management System (IWIMS); it was also intended to convert Disk Operating System (DOS) programs into a relational database system (27:1). The

window based ACES system links all base CE squadron functions to the Air Force wide network via an internet connection through a central database located at Gunter Annex, Maxwell Air Force Base, Alabama (27:1). The Oracle-based relational database meets the new standards for Air Force database management systems (40:2). Oracle is the database software that is used to retrieve and analyze the data within ACES.

The ACES system will eventually have eight separate working modules to support all CE operations. Five of the modules have already been implemented and have shown that there are areas requiring improvement. These modules are currently in the SDLC maintenance phase where end users are recommending changes to the existing business rules to improve the effectiveness of the system. One of the modules, the ACES Project Management Module (ACES-PM), has encountered numerous problems since it transitioned from the out-dated IWIMS. The other three modules are still being developed and tested prior to implementation.

The ACES-PM module is used for the programming, design, and construction of Air Force projects. When CE transitioned to the use of ACES-PM in 2001, the business rules associated with the preceding IWIMS were carried over to the new system. However, these business rules were designed to support specific kinds of projects to include Military Construction (MILCON) and Operations & Maintenance (O&M). The corresponding business rules did not support non-appropriated funds (NAF) projects, which are essential in supporting Morale, Welfare, Recreation, and Services (MWRS) facilities.

1.3 Non-Appropriated Funds (NAF)

Non-appropriated funds (NAF) are self-generating funds received from Air Force personnel through their patronage of Army and Air Force Exchange Service (AAFES) outlets and activities along with the profit created from commissary surcharges and other service activities (23:2). Appropriated funds (APF), on the other hand, are funds appropriated from Congress for each fiscal year. NAF represent the main funding source used to support facilities that house MWRS activities (22:1). Air Force policy mandates that all revenue-generating MWRS activities fund their facility projects partly with NAF, unless APF are authorized to provide the funding (22:1; 26:1). NAF projects provide both economic and MWRS returns for service members, making it essential that these facilities be maintained and upgraded when needed (23:2). Air Force installations realize the importance of building, renovating, and maintaining MWRS related facilities and annually submit numerous NAF projects to their MAJCOM to compete for funds to improve and build MWRS facilities. In fiscal year 2002 alone, a total of $123 million construction dollars were reported to Congress for NAF related facilities (3:6).

Getting NAF construction projects funded entails many separate steps before achieving approval from the final authorization level. The first step in the programming process is to determine whether the project can actually use NAF for funding. NAF programs are broken into five separate facility and function categories to help determine whether NAF, APF, or a combination of the two can be used when programming for different types of work (23:6). The five categories are: Category A-Mission Sustaining Activities, Category B-Basic Community Support Programs, Category C-Revenue Generating programs, Lodging Fund Facilities, and other activities (23:6-13).

After it is determined that a project is funded with NAF, the approval and funding process is initiated. Many unique documents and approval steps are required before the project can be approved for funding. Part of the process requires installations to submit an Internal Needs Validation Study (INVS) along with the DD Form 1391 which is created within the ACES-PM system (3:32; 23:38-39). The project package is then sent to the MAJCOM who selects projects for funding, and forwards it to the Air Force Services Agency (AFSVA) Facilities Panel. The panel selects projects to partake in a formal Needs Assessment Study (NAS) (3; 36). Based on the NAS, the panel recommends projects for 35 percent design and requests a design instruction (DI) from CE at the Air Staff level (3:5; 23:22; 36). After projects reach the 35 percent design point, they are prioritized, and forwarded to Services at the Air Staff level for recommended funding (5; 36). The selected projects are returned to CE at Air Staff with a request to issue the 100 percent design instruction (5; 23:22). Once the project design is complete it is advertised and subsequently awarded for construction (5; 23:22).

The NAF programming process is very detailed and confusing since many of the funding sources and authorization levels depend on the scope of the project and the category within which it falls. However, all NAF projects are initiated when base level programmers enter the initial program requirement and supporting documents into ACES-PM. The use of ACES-PM is essential during this approval process to efficiently report project requirements and validate funding to the approval authorities. The efficiency and accuracy of programming initial NAF project requirements becomes important as both MAJCOM and higher headquarters, to include the Air Force Services Agency (AFSVA), define Air Force priorities and use NAF programming documents to

advocate project funding. To accomplish this effectively, ACES-PM business rules for NAF projects should match the actual funding process to the maximum extent possible.

The NAF programming process is extremely different than that required by MILCON and O&M projects. Therefore, the current ACES-PM business rules are not structured efficiently to support NAF programming. In fact, numerous base level and MAJCOM project programmers have reported problems and suggested more efficient methods for managing NAF projects. It is essential that ACES-PM business rules should be revised to better match the actual NAF programming process. However, the implementation of all ACES modules is not yet complete and the maintenance currently being performed on non-NAF ACES-PM problems is intense. Thus the organization responsible for the success of ACES, the Air Force Civil Engineer Support Agency (AFCESA), has not been able to focus enough resources on correcting ACES-PM's current business rules to better support the NAF programming process. In response, the ACES-PM leadership recently initiated an IPT meeting where numerous recommendations were made concerning how the current business rules could be changed to correspond better with NAF programming. However, as with most AISs in the SDLC maintenance phase, there is always room for improvement as end users figure out better ways to utilize the system. Furthermore, base-level programmers were not represented at the IPT meeting.

1.4 Research Questions

The purpose of this research is to determine whether the IPT's proposed changes to the current NAF ACES-PM programming procedures are efficient and complete. This

research will be used to give the ACES-PM IPT recommendations for both additions and deletions to the proposed changes, along with an idea of how well these changes will be accepted within the Air Force base-level programming community. The research will also determine whether any existing base-level programming procedures will hinder the implementation of the IPT's proposed business rule changes. Finally, the research looks at the current training situation for programmers regarding NAF programming in general and NAF programming in ACES-PM specifically. In doing so, this research effort attempted to answer the following questions:

1. How well accepted is each of the proposed ACES-PM NAF project programming business rule changes in terms of the Air Force base-level programming community?
2. How well does the current base-level ACES-PM programming process support the new ACES-PM NAF business rule changes?
3. How well trained are current base-level programmers in NAF programming and NAF programming in ACES-PM?

1.5 Research Methodology

A web-based survey was used to collect the data necessary for this research effort. In order to answer the research questions above, quantitative methods to include descriptive statistics were used to evaluate the survey responses. The survey was administered to base-level programmers who have had recent experience with programming NAF projects in ACES-PM. The survey consisted of 33 questions that measured several constructs: demographics (grade/rank and MAJCOM), the level of

training in regards to NAF programming and programming NAF projects in ACES-PM, programming procedures that could affect implementation of the proposed business rule changes, and the specific business rule changes proposed by the IPT.

The survey consists of the following types of questions: multiple choice, fill-in-the-blank, and Likert Scale. All questions pertaining to the proposed business rule changes and level of training were answered using the Likert Scale. The questions related to current programming procedures used both the Likert Scale and multiple choice questions. The demographics were determined with fill-in-the-blank questions.

1.6 Scope and Limitations of Research

This research concentrated solely on the ACES-PM module, which is used significantly to report NAF project requirements. The scope of this research included only the business rules associated with NAF project programming procedures within ACES-PM and the NAF programming process in general. All other problems with ACES, ACES-PM, or the NAF programming process brought up by the survey participants were not addressed. Additionally, the results of this research effort will be aimed towards a business management solution instead of an information technology solution. It involves finding out what changes to the current programming procedures and business rules should be included in programming NAF projects within ACES-PM, not the code and logic required to actually change the AIS.

This research only covered areas of ACES-PM that pertained to the research questions and subsequent survey questions. Base-level programmers with NAF programming experience were surveyed to determine appropriate ways to improve NAF

programming in ACES-PM, specifically in regards to the proposed changes made by the ACES-PM IPT. This sample selection was considered adequate for the research effort since most initial project programming occurs at base level as facility requirements arise. The sample will give each MAJCOM and higher headquarters agencies a better understanding of where base-level programmers stand on how to improve ACES-PM NAF programming.

1.7 Review of Chapters

Chapter 2 provides a summary of the appropriate literature pertaining to information systems, ACES, and NAF programming. It examines the history of ACES, its responsible organizations, end user changes, and current status. Chapter 2 also discusses the process and rules associated with NAF programming in ACES-PM. Chapter 3 examines the methodology used for answering the research questions along with explaining the data gathering and analysis. Chapter 4 provides the results of the research questions and details the responses to each of the survey questions. It also includes the statistical analysis results of the survey. In conclusion, Chapter 5 summarizes the results of the research, discusses limitations, covers future research areas, and makes recommendations on how to further improve NAF programming in ACES-PM.

2. BACKGROUND

This chapter summarizes the literature significant to this research effort. The information is organized into five main sections: 1) description of automated information systems (AIS) to include its development and role in the Air Force; 2) information about the Automated Civil Engineer System (ACES) and its current status; 3) the general background of non-appropriated funds (NAF) project programming and its funding process; and 4) the current NAF programming business rules within the Automated Civil Engineer System Project Management Module (ACES-PM). This literature review will allow for a better understanding of the AIS under research, the requirements for programming NAF projects, and how NAF projects are currently managed within ACES-PM. An understanding of these concepts helps create a general knowledge base for ACES and NAF information which allows for a better analysis of the survey responses and results.

2.1 Development and Importance of Automated Information Systems (AISs)

2.1.1 Background

The accelerating technological changes in automation software, communications, and information systems are changing how businesses structure their organizations, conduct business, and interact (6:1). The more efficiently companies can store, control, and retrieve data, the greater the advantage they will have over their competitors. To control information more efficiently, most management informational processes are becoming digital, thereby forcing organizations to become more dependent on their

information systems and the people who develop and maintain them (45:xvii). Therefore, the management of information systems should be approached with a clear and efficient process to minimize expenses and ensure that effective AISs are implemented within organizations.

2.1.2 The System Design Life Cycle (SDLC)

In order to acquire a consistent methodology for creating and maintaining the AIS required in today's business environment, organizations rely heavily on the System Design Life Cycle (SDLC). The SDLC, which is the most widely accepted approach to the analysis and design of AISs, solves an existing business problem by redesigning information systems and/or implementing new ones (45:23). The phases within the SDLC methodology vary, depending on the source; however, most include some combination of the phases described in Table 1. Each phase is an equally important activity that helps structure and guides the AIS development process (45:23). Although these phases are described in discrete phases, they are typically not accomplished as separate steps (41:7). The SDLC phases should be accomplished as simultaneously as possible to speed up the development process (41:7).

Table 1. The System Development Life Cycle (SDLC) (41:7-12; 45:49-56)

LIFE CYCLE PHASE	KEY ACTIVITIES	PRIMARY DELIVERABLES
Preliminary Investigation	Define problem, estimate scope and feasibility, determine "go/no go" decision	General problem statement and feasibility report
Analysis	Analyze the problem, business environment, and existing systems to determine requirements	Formal problem statement and requirements definition that meets all user requirements
Logical Design	Structure all requirements to reflect proposed solution to the problem and validate	Detailed performance specifications for entire information system
Physical Design	Determine hardware and software specifications, training and implementation guidelines, and preliminary system testing	Final feasibility report, program and database structures, and implementation schedule
Implementation	Install new system, verify it with end users, train end users, and convert all data to new system	Fully installed system, converted data files, and performance test metrics
Maintenance	Monitor performance and perform requested necessary changes to system	Fully functioning system with periodic auditing of system life cycle costs

It is always better to find mistakes with new AISs as early as possible in the SDLC process. The further along an organization is in the SDLC process, the more expensive it becomes to overcome a mistake (45:56). Some researchers believe that 60 percent or more of the total time spent on information systems is on the maintenance of the existing systems (41:11). This percentage, and the associated cost, increases even more when planning is inadequate during the early stages of the SDLC (45:25). Proper planning during the preliminary investigation, analysis, logical design, and physical design phases will help alleviate potential problems during implementation efforts. If problems with the system arise during any of the SDLC phases, the development team

must back track to find the problem and correct it (41:7). However, the relative cost to fix an error rises exponentially the further into the SDLC process that it takes to recognize the problem (45:25). In addition to high costs, poor planning can also lead to a large maintenance problem that will take more resources and time to fix. It is also important to ensure proper planning occurs so that the end users do not lose confidence in a new system and reject it.

However, no matter how much planning is put into a new management information system, problems always arise. It is impossible to foresee all the issues that arise when a new or updated AIS is implemented. One potential problem deals with bugs or "known anomalies" that creep into the system only after the system is implemented (41:11). For example, when anomalies are detected in software applications patches or new versions are released to correct the problem. Other problems might involve organizational needs, software or hardware, or the level of technological change within a company (41:11). A common example includes end users requiring additional features or changes to current business rules once they become familiar with new AISs (41:11). The AIS business rules need to match the actual organizational process to the maximum extent possible and the end users are in the best position to discover inconsistencies (45:24). Problems such as these are usually addressed in the SDLC maintenance phase, unless they are caught by the development team in an earlier phase. In the maintenance phase, once end users become familiar with a new AIS, they find more efficient ways to accomplish tasks that are not currently supported by the system (45:53). Overall, the amount of time devoted to making these necessary changes during the maintenance phase usually depends on the quality of work executed during the previous five phases (45:54).

2.1.3 AIS Importance to Civil Engineering

Air Force Civil Engineering is responsible for all the real property owned by the Air Force to include facilities, utilities, and land. The Air Force Civil Engineering's mission is "to provide the bases, infrastructure and facilities necessary to support the global engagement of air and space forces across the spectrum of conflict" (18). In order to support this mission, civil engineering (CE) performs a wide range of services that are organized under any of the squadron's eight flights shown in Table 2.

As Table 2 indicates, CE is responsible for a large number of functional areas, each of which demands many resources to accomplish its mission. With limited resources that compete against each other, CE must able to efficiently store and retrieve large amounts of data. Since this data supports all operations within CE and can be shared with other entities that affect or support CE operations, it is important that CE develop and maintain efficient and effective AISs (14:2). The requirement for standardized and shared information is applicable not only at a specific location but throughout the entire Air Force (6:i). Consequently, the CE leadership and the Air Force have realized the importance of updating its AISs. Specific to the CE community, ACES was developed with the goal being to meet all current and future CE information system requirements (6:i).

Table 2. CE Flight Structure (48:25)

FUNCTIONAL AREA	DESCRIPTION OF RESPONSIBILITIES
Command Section	Unit commander and unit administration duties
Engineering	Plans, designs, and executes facility construction and repair
Fire Protection	Protects from fire as well as manages hazardous material accident response
Operations and Maintenance	Maintains all facilities and infrastructure on the installation
Environmental Services	Ensures compliance with environmental policy as well as reducing pollution and cleaning contaminated sites
Military Housing	Manages installation housing assets
Explosive Ordinance Disposal	Provides explosive relief services to the installation and local area
Readiness and Disaster Preparedness	Trains personnel of military skills as well as disaster preparedness training and response
Resources	Manages base property assets as well as CE finances, manpower and equipment

2.2 Automated Civil Engineer System (ACES)

2.2.1 Background

The first AIS to be used throughout Air Force CE, the Base Engineer Automated System (BEAMS), was implemented in the early 1970s (1:9). BEAMS was not centralized, used only "dumb terminals, and required punch card data entry (1:9). BEAMS was eventually replaced by the Work Information Management System (WIMS) in the mid 1980s (1:9). WIMS operated using "dumb" terminals and personal computers, a closed architecture, and flat-file (non-relational) databases (1:9). Both BEAMS and WIMS operated with a closed non-relational system which resulted in slow data

responses within the CE field (1:9). The transition to open systems was initiated when WIMS migrated to the Interim-WIMS (IWIMS) in accordance with Defense Management Review Decision (DMRD) # 924, which mandated that all legacy systems migrate to open systems and consolidate resources at Defense Enterprise Computing Centers (DECCs) (1:6). Legacy systems, like BEAMS and WIMS, are information systems that have been used for a long time with a mainframe computer (1:54). As a result of DMRD # 924, WIMS was moved to the DECC at Gunter Annex and IWIMS was created to centralize the AIS development process. However, IWIMS still did not meet the open systems requirement outlined in DMRD # 924. Thus, the conversion to a true relational system, and the elimination of the outdated IWIMS, started with the development of ACES (1:9). ACES is now in the early stages of meeting the requirements set forth in DMRD # 924 as well as the goals and objectives articulated by Air Force leadership (1:9).

2.2.2 Purpose

The ACES program has a distinct vision and mission, along with specific goals and objectives to ensure all higher headquarters' requirements are met. The CE AIS Modernization Program's vision for ACES is to:

> Improve business processes through a transition of the IWIMS framework into a relational database linked to graphical application, supporting the full range of operational and contingency responsibilities. The envisioned system will be appropriately integrated and standardized to share data with other entities that affect or support Civil Engineer Operations (1:13).

ACES's mission is to "establish a user-friendly, flexible, and high performance On-Line Transactional Processing and On-Line Analytical Processing environment for Air Force warfighters" (1:13). The main goals and objectives of the ACES program are to (1:13):

1. Provide sustainment of existing fields,
2. Spiral development of ACES (conversion of non-relational IWIMS to relational database),
3. Insert new technology (web and AF portal), and
4. Comply with Air Force and Department of Defense (DoD) mandates.

The strategy of the ACES program is to eventually replace IWIMS to support all CE functions with an incremental approach while integrating the AF's evolving information technology architecture (1:14).

The ACES system provides direct CE information management support to all Air Force units during all types of operations (27:3). Its data entry and retrieval processes are accomplished through a web-based environment that utilizes existing infrastructure, operating systems, and computer systems (27:5). Oracle, NT web servers, and a UNIX platform support the ACES database on the web (27:4).

The ACES system integrates base-level CE functions and allows higher headquarters to view the information in real-time (27:3). It is designed to support base-level and higher headquarters CE functions in day-to-day operations (1:6). It also functions as an interoperable automated system that expedites civil engineering support during peacetime and contingency operations (1:6). ACES allows Civil Engineers to spend more time analyzing information in a user friendly, graphical format and less time inputting and searching for information (6:1). ACES will eventually be compatible with other Air Force personnel management AISs (27:6).

2.2.3 Implementation

The ACES system is being implemented in eight separate phases called modules, as shown in Table 3. Each module aligns with and supports one of the eight flights (i.e., primary functions) in a typical CE organization (1:7). Along with supporting the functional areas, ACES must also provide accountability for audit requirements and allow data to be obtained from other systems (1:7).

Table 3. ACES Modules Description (27:7-8; 43)

FLIGHT	FUNCTION
Engineering Flight	Project Management and Programming, Design, Construction, and Restoration and Cleanup (ACES-PM)
Housing Flight	Military Family Housing (ACES-HM)
Resources Flight	Real Property (ACES-RP)
Readiness Flight	Personnel Training and Readiness Equipment Management (ACES-PR)
Fire Flight	Incident Response Management (ACES-FD)
Operations Flight	Work Control and Financial Management, and the CE Material Acquisition System (CEMAS) (ACES-OPS)
Environmental Flight	Environmental Management (ACES-EM)
Explosive Ordinance Flight	Incident Response Management (ACES-EO)

2.2.4 Responsible Organizations

The primary organizations involved with ACES are the Air Force Civil Engineer Support Agency (AFCESA), located at Tyndall Air Force Base, Florida, and the Standard System Group (SSG), located at Gunter Annex, Maxwell Air Force Base, Alabama.

AFCESA is responsible for providing sufficient resources and professional support to help Air Force Civil Engineering succeed in base and contingency operations (12). One of its responsibilities includes the task of providing "the guidance for initiating, approving, and authorizing the implementation of operationally approved requirements/changes to hardware, software, firmware, and communication configuration items of ACES" (28). AFCESA also facilitates the organization of the Automated Steering Group (ASG), Configuration Control Board (CCB), and the Integrated Process Teams (IPTs) (14:2). To complement AFCESA, the mission of the SSG is to "provide and support secure combat support information systems and networks for the Air Force and DoD components" (17). The primary functions of these organizational units and the working relationship between them are shown in Figure 1 and will be explained in the following paragraphs.

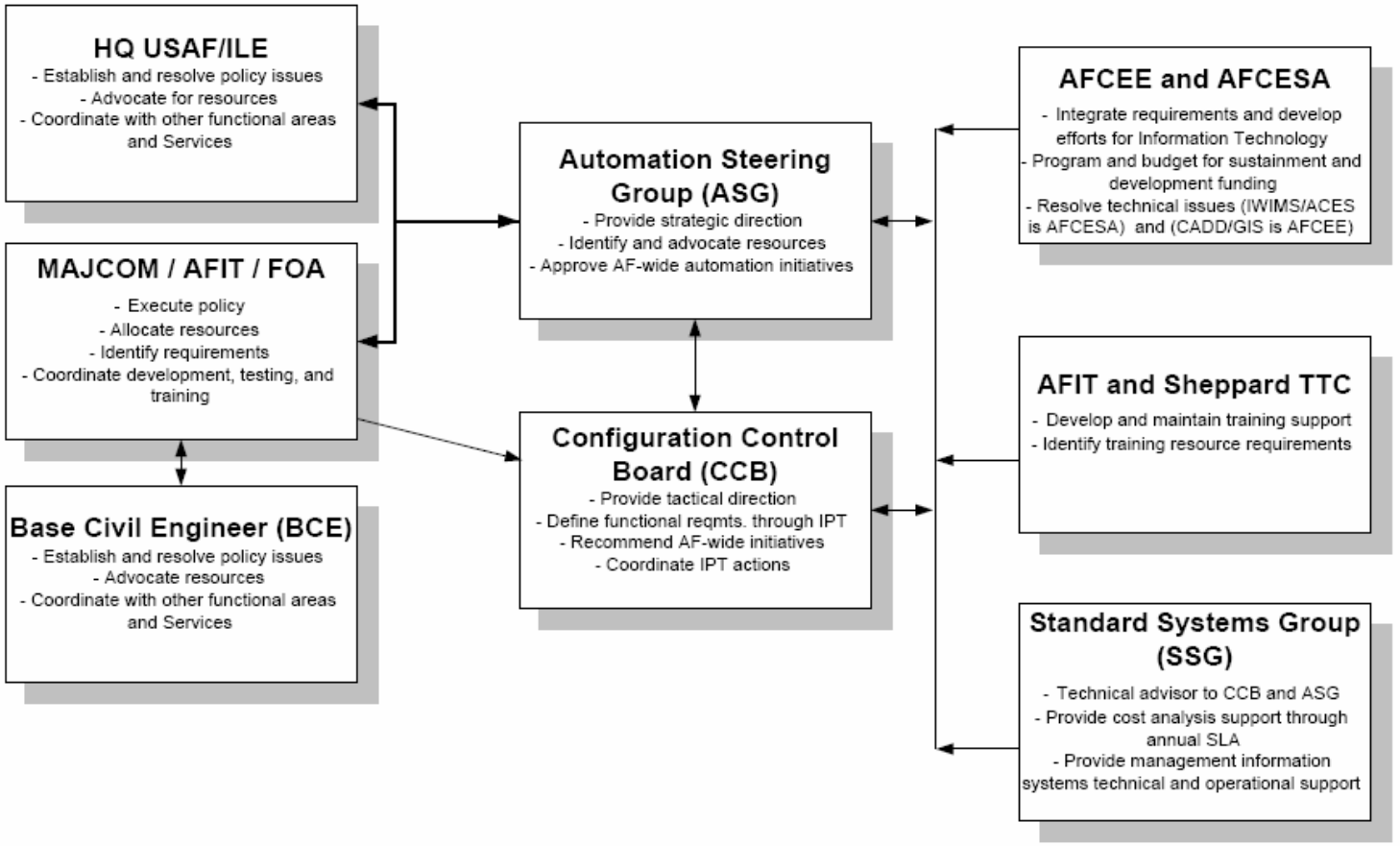

Figure 1. ACES Organizational Structure (6:5)

2.2.4.1 Air Force Civil Engineer Support Agency

The Technology Integration Division (TID) within AFCESA's Operations Support Directorate serves as the point of contact for all ACES development issues and is the ACES Program Management Office (1:6; 12). The TID is responsible for managing the sustainment and developmental funding of ACES, the strategic plan, and the interactions with stakeholders to ensure the AIS meets DoD and Air Force information technology directives (6:6). It also defines the procedures to implement a change to the AIS once a specific ACES module has been implemented.

2.2.4.2 Standard Systems Group

When the Air Force originally sought to replace WIMS with ACES, they awarded the contract to design and create the ACES program to Martin-Marietta (43). However, the contract failed to meet Air Force requirements, and the Standard Systems Group (SSG) is now completing the design of ACES (16). They are the System Program Office (SPO) for the completion of ACES (1:6). The SSG is responsible for writing the ACES program with AFCESA's direction along with being the technical advisor to the CCB and ASG (6:5). The SSG "designs, builds or buys, installs, integrates and supports information systems necessary to provide the warfighter the right combat support information in the right place at the right time" (17). Their vision is to eventually become DoD's center of choice for developing and maintaining information systems (17). The SSG also developed a version of the SDLC, called the Systems Engineering Process (SEP), which will be described further in Section 2.2.7.

2.2.4.3 Automated Steering Group

The Automated Steering Group (ASG), which is chaired by the Deputy Air Force Civil Engineer, acts as the liaison between senior leadership, system developers, and end users (6:5; 45:15). This group provides strategic direction and resolves conflict between the separate organizations (6:6). The ASG is also responsible for controlling ACES's budget (14:4). Members of the ASG include Air Force Institute of Technology (AFIT), MAJCOM, and Air Force C4 Information Command (AFCIC) representatives (14:4).

2.2.4.4 Configuration Control Board

Besides involvement in the AIS change approval process, the Configuration Control Board (CCB) provides tactical direction for ACES development and coordinates IPT actions (6:5). They are the technical arm of the ASG (14:4). The board approves all user initiated changes and prioritizes them for SSG implementation. The CCB also defines functional requirements and coordinates implementation and training issues with the other organizations (6:7). The CCB is chaired by AFCESA and has technical members representing AFIT, MAJCOMs and the SSG (28:13).

2.2.4.5 Integrated Process Teams

Each ACES module has a designated integrated process team (IPT) that defines functional business requirements and develops solutions to problems typically encountered during the SDLC maintenance phase. Their role is to serve as the functional working group representing the CE community's ACES requirements (14:5). The IPTs are empowered to "seek alternative automated solutions which may include redefining

existing business processes" or rules (14:5). They also recommend valid user initiated changes to the CCB (28:7).

2.2.4.6 Other Organizations

Base level Civil Engineering helps during the SDLC maintenance phase by participating in business rule improvement workshops and forwarding end user problems up to the IPTs for further examination. They help identify specific AIS initiatives to their respective MAJCOM (6:6). CE squadrons are also responsible for the purchase and maintenance of its ACES hardware and automation software (6:6).

Training and education fall under the responsibility of AFIT and Sheppard Tactical Training Center (TTC) (1:32; 14:4). AFIT along with the SSG is developing just-in-time training that will be implemented using a web-based training program (1:32). AFIT is also involved with the allocation of resources and identifying training requirements (6:5).

2.2.5 User Initiated Changes

The ASG, CCB, and IPTs are the main organizations that deal with user requests to add or change requirements within ACES. This change process, which is initiated by an AF Form 3215, the C4 Systems Requirements Document (CSRD), is shown in Figure 2 (28:7). C4 stands for Command, Control, Communications, and Computer. The change process begins when ACES users submit the CSRD to their MAJCOM CCB representative requesting a new requirement or change to the system (28:4). The CSRD is the reporting tool ACES end users utilize to voice their concerns and suggest further

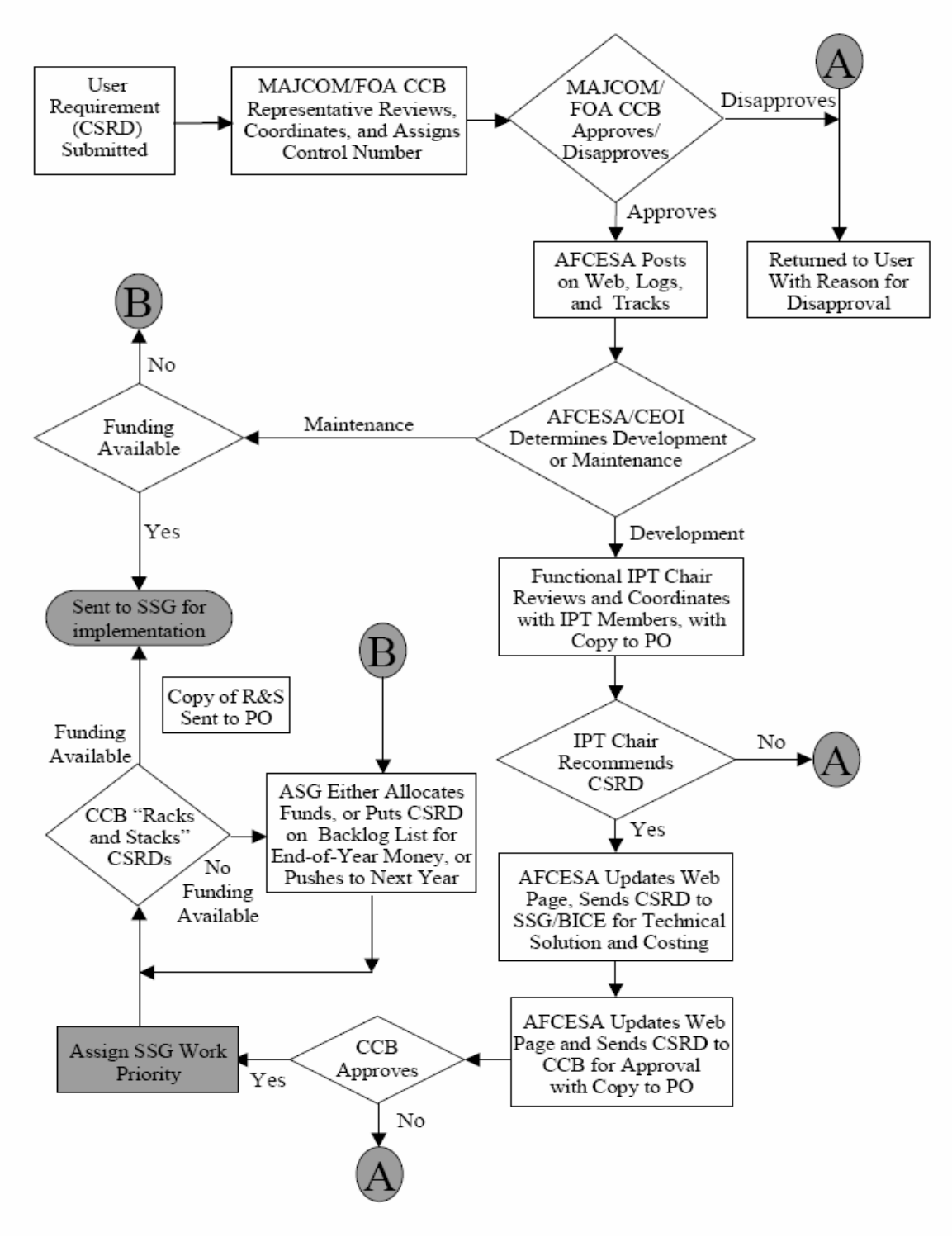

Figure 2. Civil Engineer Automated Request Approval Process (28:7)

improvements to the AIS. Any change that might impact the integrity or compatibility of ACES must be initiated with an AF Form 3215 (28:3). Any end user can submit an AF Form 3215, but that does not necessarily mean that the MAJCOM CCB will approve the request and forward it to AFCESA (28:6). To fill out the form, the end user or requesting agency has to describe and justify the new AIS requirement (28:4). Since the release of ACES-PM's new version in September 2003, the IPT, CCB, ASG, and SSG have incorporated numerous end user requirements using this change process (44). During that time period, the groups reviewed over 200 CSRDs (44). This AIS improvement, via user input, is completed in the maintenance phase of the SDLC, or the customer support step under the SEP.

2.2.6 Regulations, Guidance, and Standards

Air Force Instruction (AFI) 32-1019, *Automated Civil Engineer Information Management*, which is still in draft form, will be the main CE guidance dealing with the management of civil engineer automation procedures and regulations. It sets the standards for appropriately integrating ACES into CE operations and sharing data with other information systems (14:2). The draft AFI states that standard business rules must be incorporated into the AIS to provide flexibility in data collection and analysis (14:2). More specifically, AFI 32-1019 "establishes an organization and related responsibilities for providing overarching oversight, technical review, and functional area expertise for defining, fielding, and training the Civil Engineer data automation tools" (14:1). The AFI creates the ASG, CCB, and IPT for each module and defines their responsibilities and tasks (14.1). The ACES system will enable the standardized sharing of data with all

entities that affect or support CE operations, while reducing cost for maintenance and duplicated efforts (14:2).

AFI 32-1019 also requires compliance with DoD Manual 8320.1-M, *Data Administration*, and DoD Manual 8320.1-M-1, *Data Standardization Procedures*, when interfacing data into and from ACES (14:6). DoD Manual 8320.1-M outlines the goals of the DoD Data Administration Program as listed below (9:3-6):

1. Have a centrally controlled DoD wide data repository,
2. Standardize data,
3. Use of common procedures and automation tools,
4. Use quality data in all decision making,
5. Have education, training, and consultation services, and
6. Have effective infrastructure.

In addition to these broad-based goals, DoD Manual 8320.1-M-1 describes how AISs must standardize its data to accomplish the following objectives (10:2-3):

1. Improve data sharing across DoD functional areas,
2. Control Data redundancy,
3. Minimize data processing and storage in information systems,
4. Improve data accuracy and consistency throughout the DoD, and
5. Reduce resources required to develop, field, and maintain information systems.

The objectives and goals of the DoD are being implemented throughout the development of ACES and through the SDLC process. Compliance with these goals and objectives

ensures that the integrity of Air Force CE data is preserved under a single, logical, and relational database (14:6).

ACES also adheres to Executive Order 13011 by utilizing a fully automated information system for all CE functions (27:3). The Executive Order, approved by President Clinton in 1996, was established to meet requirements set forth in the Paper Reduction Act of 1995 and the Information Technology Management Reform Act of 1996 (7:1). The Executive Order provides an opportunity for the Federal Government to improve the way they acquire and manage information technology (7:1).

2.2.7 Process for ACES Development and User Initiated Changes

The SSG uses a version of the SDLC called the Systems Engineering Process (SEP) to design and maintain the ACES system. The SEP (see Figure 3) is a nine-step process broken down into three separate phases: predevelopment, development, and post-development (28:8). The SEP was developed by the SSG from extensive experience with a variety of software and system development efforts (29:2). The ACES-PM module is currently in the customer support step within the post-development phase where maintenance and enhancements occur to the system (28:8; 29:9).

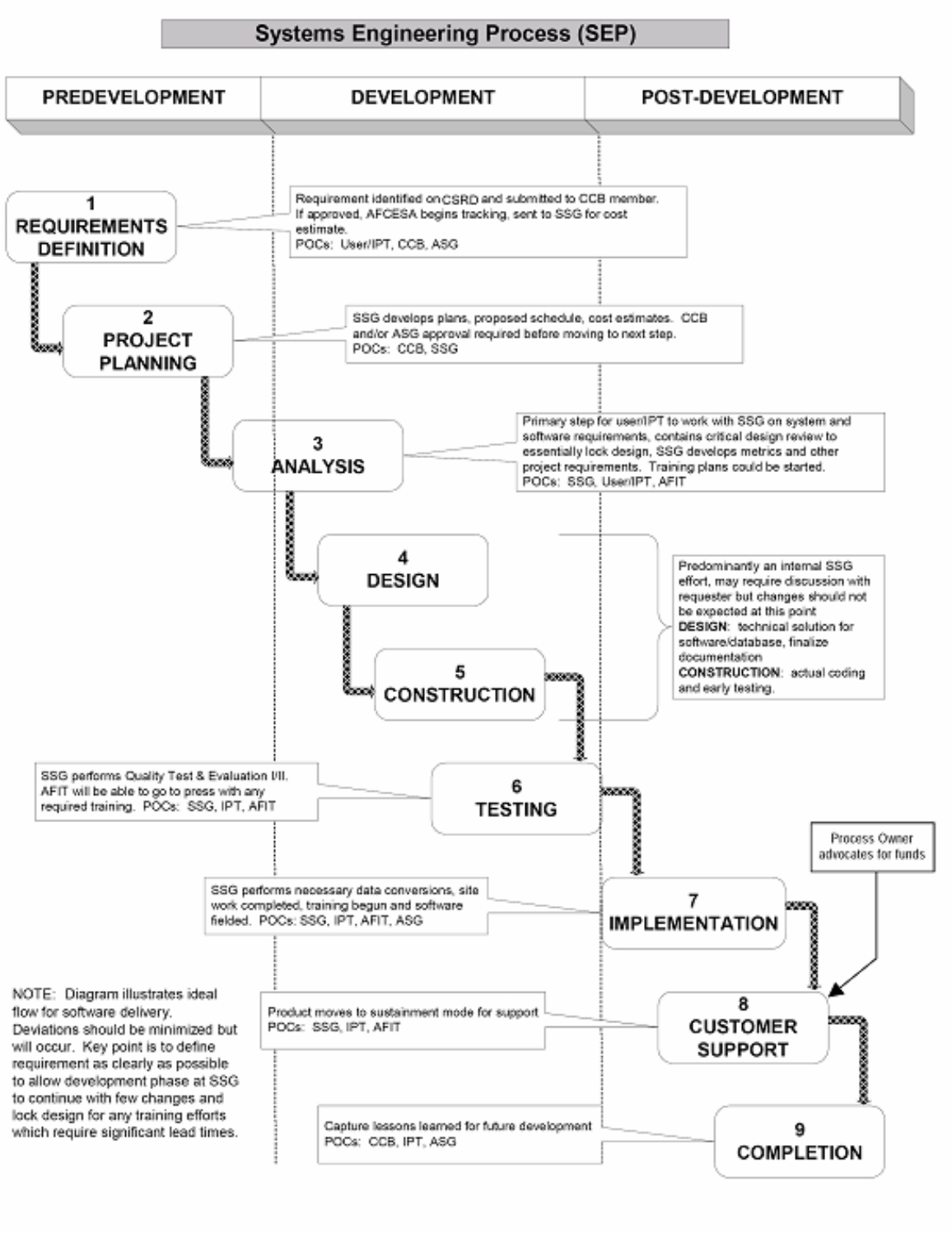

Figure 3. HQ SSG SEP Nine-step Process (28:8)

2.2.8 Current Status

Currently, five of the eight modules have entered the customer support phase of the SEP and are undergoing system enhancements (28:8; 49:53). The operations, environmental, and explosive ordinance modules are still in the development and testing phase. AFCESA's complete schedule and status of all eight modules, broken down by functionality, is shown in Figure 4 (current as of November 2003).

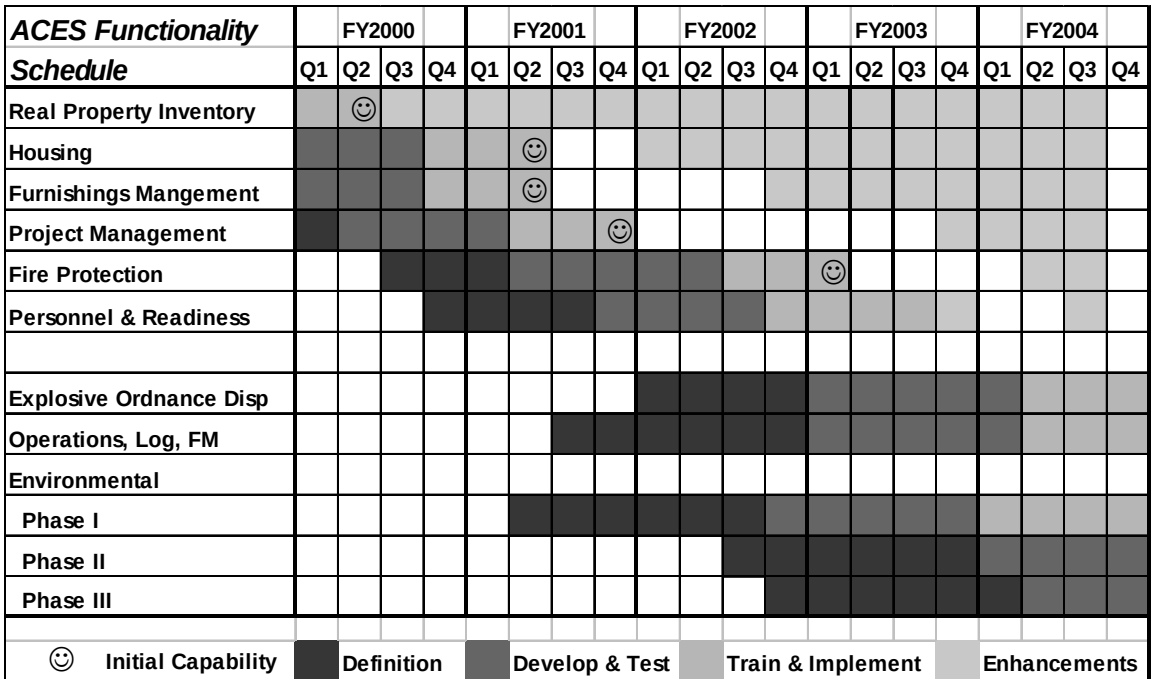

Figure 4. AFCESA's ACES Implementation Schedule (49:53)

2.3 Non-Appropriated Funds (NAF) Projects

The ACES-PM module is currently in the SDLC maintenance phase, where many user issues dealing with business rule problems have been brought to the ACES-PM IPT.

ACES-PM is extensively utilized in programming NAF related projects, and some of the issues brought forward specifically relate to NAF project programming business rules. The project programming process includes defining project requirements, creating priorities, and developing initial cost estimations.

2.3.1 Background

NAF project funding is a long and detailed process that involves many separate organizations. To understand how NAF programming is designed to work in ACES-PM, it is first important to be familiar with NAF programming in general. The following sections describe the programming and funding process, address the organizations and regulations responsible for funding NAF projects, illustrate how ACES-PM currently supports NAF project programming, and discuss business rule changes proposed by the ACES-PM IPT. The intent of this discussion is to stress the complexity of the NAF programming process and demonstrate how important it is to base ACES-PM on the business processes associated with NAF project programming.

2.3.2 Programming and Funding Process

The first and most important task of programming a NAF project is to determine what type of work will be performed. Work classification, along with facility type, is used to determine the fund source and program avenue (2:15-18; 23:6-13). Determining the funding source is not always obvious and AFI 32-1022, *Planning and Programming Nonappropriated Funds Facility Construction Projects*, provides a detailed summary of funding sources for all types of facilities and work classifications (23:6-13).

Programmers are required to review these fund sources to ensure that a project can be fully or partially funded using NAF before inputting it into ACES-PM as a NAF project. As a general rule, all NAF facility construction requires NAF funding and maintenance/repair projects depend on the facility category code (3:22; 23:6-13). After the fund source is determined, a record is created for the project in ACES-PM.

A NAF funding source depends on the type of non-appropriated fund instrumentality (NAFI) along with the total cost of the project (3:21). NAF are "cash and other assets that NAFIs generate and receive from sources other than Congressional Appropriations" (22:3). NAFIs are agencies of the government that provide Morale, Welfare, Recreation, and Services (MWRS) activities and programs (22:3). Revenue-generating NAFIs typically belong to the MWRS, or Services community, and AAFES (3:4). For review, NAFIs are generated from service members' patronage at AAFES outlets and other MWRS type activities (23:2). For Services-related NAF projects under $200,000, funds come from NAF dollars generated locally (3:21). If the project is over $200,000, the funds come from the Air Force Base Capital Improvement Program (3:21). For AAFES NAF projects, funds come from local revenues for projects under $500,000 and from the Long Range Capital Improvement Fund for projects over $500,000 (3:21). However, bases and MAJCOMs are expected to fund NAF projects that are less than $200K, and projects within their capability (34). Commissary projects are funded by surcharges and managed by the Defense Commissary Agency (DECA) (3:3).

The NAF project approval authority and funding source is based on the type of work and cost estimate. The cost estimate for approval purposes is at the 35 percent design point (23:29; 31:1). For all NAF maintenance projects, the MAJCOM has

unlimited approval authority (23:30). If it is a repair project, or a combination of repair and maintenance, the MAJCOM can approve the project up to $500,000 and CE at Air Staff for over $500,000 (23:30). If the project is construction, the MAJCOM approves projects up to $500,000 and Congress for over $500,000 (23:29). For each project, ACES-PM should adequately display the approval authority and the types of funds being used.

A NAF project cannot exceed 10 percent of the scope and 25 percent of the cost defined at the 35 percent design level (23:31; 31:1; 32; 34). When a project scope exceeds the 10 percent threshold, Congress must approve the increase before additional design or construction funds are committed (23:31). When a project exceeds its 35 percent design cost estimate, the base and MAJCOM are responsible for funding the cost increase arising from in-house scope changes (34) and are not required to seek any higher approval authority (23:31). However, if a project exceeds the cost estimate by either the 25 percent cost threshold or $500,000, approval must be granted from the Deputy Assistant Secretary of the Air Force (23:31). Whenever projects exceed the approval thresholds, all programming documents must be updated to reflect the new changes and forwarded to the appropriate approval authority. ACES-PM should be able to efficiently support this type of cost and scope change process.

2.3.3 Documentation Requirements

The amount and complexity of required supporting documentation depends on both the authority approval level and cost of the project (3:32; 23:38-39). All NAF projects, independent of cost and approval level, require at least an AF Form 332 (work

request) or DD Form 1391, and an Installation Commander's Certificate (CC) (23:38). These are the minimum programming documents that are required for all NAF projects. An AF Form 332 can only be used for projects within base-level approval, where DD Form 1391s are used for all other approval authorities (23:38). The Installation CC is used to help ensure that the project abides by all programming laws and policies; it is also used to establish a measure of accountability (23:38).

Projects within the installation commander's approval authority need the minimum programming documents (23:38). If the project is over $50,000 for construction or $100,000 for maintenance, it will also need an Internal Needs Validation Study (INVS) (24:4). Projects approved at the MAJCOM level that are between $200,000 and $500,000 require a DD Form 1391 and 1391c, INVS, detailed cost estimate, single line drawings, site plan, facility deficiency detail data sheet (D3), installation CC, and a Needs Assessment Study (NAS) (23:38-39). For projects greater than $500,000, three additional pieces of information are required: joint use certificate, patronage data, and Certificate of Environmental Compliance (23:38). All three of these requirements are included on the DD Form 1391c (23:38).

The INVS is an important preliminary document that must be accomplished at the installation level by CE, Services, and Financial Management personnel. The INVS is a critical document; it informs the base commander of the project need and is the baseline used to compete against other projects at the MAJCOM level (3; 37). The INVS consists of five sections (3; 38): Part 1, Project Definition/Existing Facility Analysis; Part 2, Existing Facility Operational Analysis; Part 3, Financial Considerations; Part 4, Marketing/Customer/Other Considerations; and Part 5, Summary. Parts one though four

are used to calculate a relative need score that is used to help justify the project to the installation commander and MAJCOM (3:11-12). The last part is a summary of the four section's calculations and requires the installation commander's signature (38).

Supporting documentation for the INVS includes a detailed cost estimate normally accomplished through the Air Force Parametric Cost Estimating System, Installation Commander's Certificate, and selected parts of the DD Form 1391 package (5; 23:38-39; 30:3). All these documents should also be included in the ACES-PM project file. They are all important preliminary documents that capture necessary facts about the project. They need to be filled out accurately and efficiently included with the rest of the ACES-PM project file.

A NAS must be completed for all projects that are over $200,000 (35). The NAS is used to validate the market demand and determine the most appropriate method to meet it (3:48). They are usually conducted by a civilian contractor if the project is over $500,000 or by AFSVA in-house personnel if the project cost is between $200,000 and $500,000 (3:49). A site visit is completed along with a detailed functional layout, cost estimate, and requirements documents. The NAS is used by the AFSVA Facilities Panel to prioritize projects for the 35 percent design selection.

2.3.4 Responsible Organizations and Approval Process

Many Air Force organizations are responsible for programming and funding NAF projects. After the initial NAF facility project requirements are determined by base-level personnel, programmers in the CE organization input and maintain the project information in ACES-PM. The project file, documents, and its user rights are then

transferred back and forth within ACES-PM between several responsible organizations before final design and funding is achieved (5). Responsible organizations include: base-level CE and Services personnel; MAJCOM CE and Services personnel; and higher headquarters Air Force (Air Staff) CE and Services personnel.

2.3.4.1 Base-Level Organizations

Since it is CE's responsibility to provide, operate, maintain, and restore the installations and facilities necessary to support the Air Force mission, base-level CE plays an important role in the NAF programming process (21:2). They identify NAF facility requirements, with help from functional experts, and enter the relevant information into the ACES-PM database. Base-level CE also completes their required part of the INVS, Part I. Base-level programmers constantly identify new requirements and update current project documentation to prepare for the annual NAF project call. CE also ensures that all projects are in conformance with the installation master development plan and gains approval through appropriate base-level decision-making processes (11:3).

Once a project is approved, personnel from base-level CE and the Services work closely with the architectural and engineering firm designing the project. During the design process, they review and provide comments on the draft NAS (5; 35). They also attend the 35, 65, and 95 percent project review meetings and provide comments. When the design effort is complete and the project is recommended for funding, CE coordinates the authority to advertise and award the construction of the project with its respective MAJCOM (5). Services personnel are also responsible for coordinating the completion of the INVS along with filling out parts II and IV of the document. Throughout this

process, it is essential that ACES-PM be designed to easily capture and show all initial project requirement information to include the INVS and base-level design review comments.

2.3.4.2 Major Command Organizations

Once the installation commander concurs with the NAF facility requirement, the project can be forwarded to the appropriate MAJCOM during the annual NAF project call, which is initiated each July (3; 5). It is the MAJCOM's responsibility to review each project folder and its accompanied documentation for accuracy and coordinate with base-level CE to correct any errors (5). MAJCOM CE personnel will review the existing facility information contained in the INVS, cost estimate, and DD Form 1391 package (5). The Services personnel will review the functional, operational, and marketing sections of the INVS (5). Once all supporting documentation is verified, the project is prioritized by the MAJCOM NAF council and submitted to the NAF Facilities Panel at the Air Force higher headquarters level (Air Staff) for review (5). The panel consists of one CE member and several Services representatives, mostly from the AFSVA (5). The MAJCOM NAF council also coordinates with MAJCOM CE personnel prior to submitting the prioritized list to compete for design funding from AFSVA (5).

Once projects are prioritized and sent to AFSVA, the MAJCOM does not get involved in the process again until the NAS has been completed (3; 5; 35). AFSVA provides primary oversight during the accomplishment of the NAS, but MAJCOM personnel from CE and Services are usually invited to participate (3; 5). When the draft NAS is complete, MAJCOM personnel have 14 days to review it and provide comments

to AFSVA (5; 30; 35). The NAS is finalized by the NAS contractor or AFSVA in-house representatives after all comments have been incorporated into the document (5).

The MAJCOM's role with the project starts again after AFSVA reviews the NAS and selects projects for 35 percent design. At this point, MAJCOM CE personnel will review the base's statement of work and assign a primary project manager, who will be responsible for chairing all design review meetings. They will also review the accuracy of the DD Form 1391 and change the programmed amount to match the NAS cost estimate (5). This step is important since the cost estimate at the 35 percent design stage will be locked in and used to fund the project if it is selected to go to 100 percent design (30; 31). The MAJCOM and base-level CE personnel will then coordinate with AFSVA to select the method of design and award the design to a NAF architect-engineer (AE) contractor (5; 33). MAJCOM CE personnel are also required to attend the 35, 65, and 95 percent project review meetings (5; 33).

During the project approval process described above, the ACES-PM project file is released to other using agencies multiple times. Therefore, CE personnel at the MAJCOM level must work hard to ensure the integrity of the information contained in the ACES-PM database stays intact. Having a more effective way to track the project in ACES-PM would tremendously help the MAJCOM personnel manage their NAF projects more efficiently.

2.3.4.3 Air Force Headquarters Organizations

There are several organizations responsible for NAF projects at the Air Staff level. On the civil engineering side, the Office of the Civil Engineer's Engineering

Division is responsible to "plan, program, advocate, distribute resources, and monitor execution for Air Force capital improvement programs" (19). In this capacity, they are the focal point for processing approval requests and reporting all NAF projects to higher authorities to include the Secretary of the Air Force (SAF), Office of the Secretary of Defense (OSD), and Congress (3:5; 25:2). They are directly involved in approving projects that exceed the allowed cost and scope variation limits (23:31). The Engineering Division issues design instructions (DI) for projects at four separate points: 35 percent design, 100 percent design, authority to advertise, and authority to award (5; 23:22). A DI is required to obtain the grants and loans necessary to start project design and construction (23:22). To track each DI in ACES-PM, the user rights are transferred back and forth between the MAJCOM and Air Staff level; therefore, it is imperative that the tracking system in ACES-PM allow the project status and location to be easily determined at any time during the funding process.

Within the Directorate of Services, the AFSVA provides, constructs, and maintains NAF facilities through policy, direction, and standards (20; 24:2). The mission of the Directorate of Services is to "contribute to readiness and improve productivity through programs promoting fitness, esprit de corps, and quality of like for Air Force People" (20). In addition to reviewing and approving the prioritized projects lists produced by the NAF Facilities Panel (3:5), the Directorate of Services also approves scope increases greater than 10 percent (23:31).

The mission of AFSVA is to "support Air Force and Services leadership, MAJCOMs, and base level Service Units to improve the quality of life for all personnel and their families" (15). AFSVA is heavily involved in the NAF project funding and

approval process. They initiate the annual call to the MAJCOMs for projects, review and prepare project submittal packages for NAF Facilities Panel action, certify the 100 percent design, issue the delivery order, approve all user requested changes, and financially close out projects after construction is complete (5).

The NAF Facilities Panel is also located at the Air Staff level. Chaired by the AFSVA Deputy Commander, the panel includes representatives from the CE and Services communities along with other organizations (3:47). This panel reviews and recommends projects for the NAS, 35 percent design, and funding (36).

Each of the responsible organizations described above is an important part in the overall programming and funding process for NAF projects. The full Air Force NAF project approval process is shown in Figure 5.

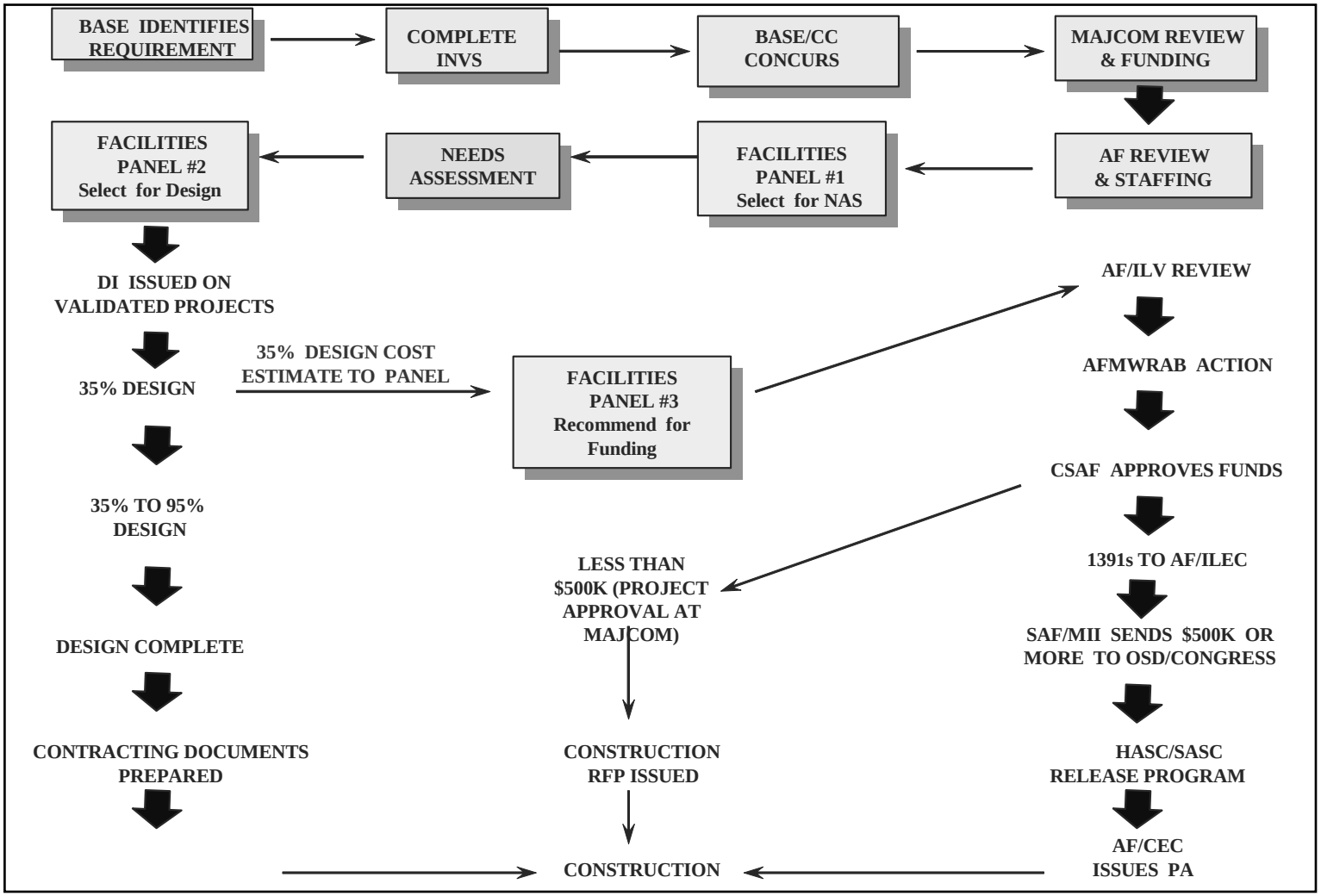

Figure 5. AF NAF Approval Process (39)

2.3.5 NAF Approval Timeline

The NAF programming process is initiated when the AFSVA leadership issues the annual project call down through the Air Staff to the MAJCOMs and to the installations (37). This annual project call specifies all the project information and documents that are required to compete for NAF funding (37). The actual time for a project that requires approval from Congress is around two years. Part of the reason why the approval process is so long is the fact that the AFSVA reviews and recommends NAF projects during three separate stages of the process. Another reason involves the long design schedule that must be completed in order for Congress to approve a project (5; 39). All projects that the NAF Facilities Panel does not recommend for funding, no matter where they are in the approval process, are released back to their MAJCOM and installation to compete again the next congressional reporting/approval cycle (5). The 2-year reporting/approval cycle timeline is shown in Figure 6.

In the summer of 2003, Services at Air Staff approved many changes that will eventually affect the timeline shown in Figure 6 along with other NAF issues (4:1). A couple of these changes include changing the project call from July to March, and having the packages due to AFSVA in September instead of December (4:2). All the proposed changes will eventually allow NAF projects to flow through the approval system more efficiently (4:1).

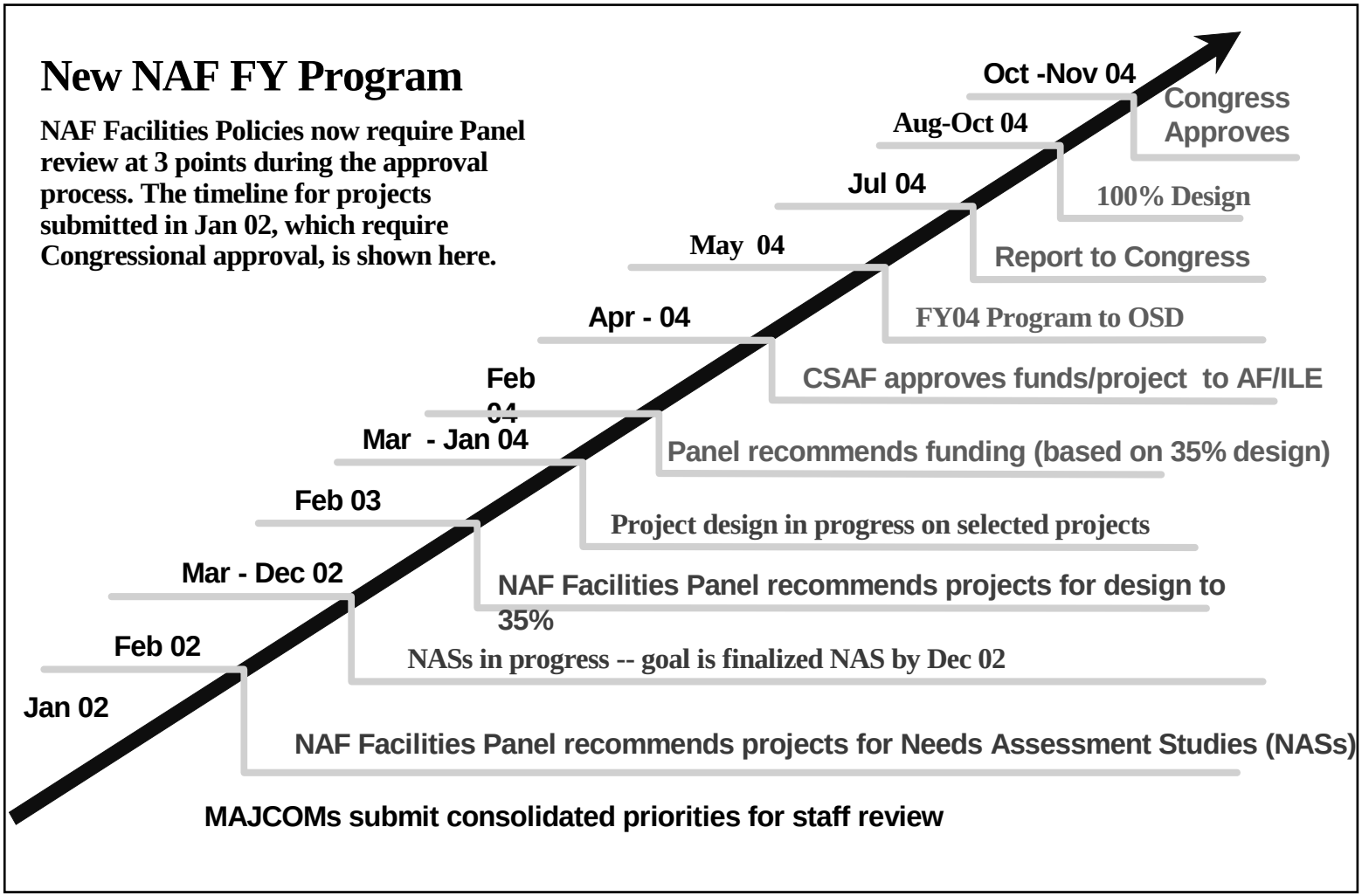

Figure 6. NAF Project Approval Timeline (39)

2.3.6 Regulations, Guidance, and Standards

Congress, the DoD, and the Air Force stipulate the NAF programming process in various instructions, regulations, and guidelines. AFI 32-1022, *Planning and Programming Nonappropriated Funds Facility Construction Projects,* is the main guidance for programming NAF projects. It describes how to "plan, develop, and submit non-appropriated fund (NAF) programs to approving authorities" (23:1). The guidance applies to the following agencies from the Air Force to the installation level that deal with NAF projects: Army and Air Force Exchange Service (AAFES), Air Force Services, Air Force Civil Engineering and construction managers, the guard and reserve, and all private organizations with NAF facility contracts (23:1). However, the instruction does not apply to commissary projects funded with surcharges since those fall directly under the DoD (23:1). The AFI specifically dictates what funding source, NAF or APF, is used for each type of facility by category code, funding level, and the work performed (3:3; 23). The guidance also identifies the project approval authority, the laws governing scope changes and cost variations, and the documents required for project approval and funding support (23:38).

In addition to AFI 32-1022, which applies primarily to the civil engineering community, there are four other key documents. AFI 65-106, *Appropriated Fund Support of MWR and Nonappropriated Fund Instrumentalities (NAFIs),* is the financial manager's guidance on NAF; it "provides financial guidance on using APF for Air Force Services programs and NAFIs" (13). The main instructions pertaining to the customer are AFI 34-2, *Managing Nonappropriated Funds*; AFI 34-105, *Programming for*

Nonappropriated Fund Facility Requirements; and AFI 34-201, *Use of Nonappropriated Funds*.

2.4 Current NAF Business Rules in ACES-PM

It is important that ACES-PM NAF business rules match the actual NAF programming and funding process described in Section 2.3. Development of the ACES modules and improvement to the system's existing interface is an on-going process. It has been acknowledged that many problem areas have arisen within the NAF programming business rules since the transition from IWIMS. The overarching problem is that NAF programming is forced to use the business rules that were designed to support operations/maintenance (O&M) and military construction (MILCON) projects (43). To address these problems, a users meeting was held with the goal being to ensure that ACES-PM mirrors the entire NAF process through the programming, design, project selection and awards process (5). The specific problem areas and recommendations identified at the IPT meeting are discussed in the remainder of this section, broken down by the individual programming tabs located in ACES-PM. A complete list of the proposed NAF business rule changes is shown in Appendix A. Until the proposed changes take place, NAF programming is being accomplished using inefficient business rules that were designed for other processes.

From the results of the IPT meeting, the Project Add, Managers, and Milestones screens require changes. The Project Add screen is the initial programming input that controls the way the rest of the project file and business rules act. It is essential that this screen adequately match how NAF programming is accomplished. Inserting NAF for

"program type" on the project add screen leads to "fund types" and "type of work" choices that are not related to NAF. Programmers are currently allowed to input "O&M" in the "program type" field and put "NAF" under the "fund subsource" field. This leads to data integrity problems when personnel at the headquarters and Air Force level try to sort and query projects in the database. This option needs to be eliminated since changing "program type" to NAF is the most efficient way to categorize the type of project. The only change required for the Managers screen is the addition of a AFSVA primary role. The Milestones screen requires several additional milestones to better support NAF programming; it does not include dates for INVS completion, selection for NAS, 35 percent design, or 100 percent design.

As for the various project tabs that are available, the Facility Investment Metric (FIM) and Environmental tabs do not have business rules that need to be changed. NAF projects are prioritized for funding consideration using the INVS and the NAS instead of the FIM. The Environmental tab is the same for O&M, MILCON, and NAF projects. Other tabs are applicable but need changes to improve their usefulness.

The Programming tab has many features that do not support NAF programming. The option to check the "environmental" or "MILCON" box is not applicable to NAF projects. The "category code," "CE/PBD," and "Group" data fields are also not applicable and only confuse the initial project input process. The tab does not allow for the input of the "Total NAF Investment," which is an important figure in determining funding and cost thresholds, and does not allow the INVS status to be easily displayed. Finally, the programming tab does not allow for designating if there is an APF companion project or identifying the approval and funding authority.

The Supplemental tab requires several revisions to better assist NAF projects. The "Base," "MAJCOM," and "Air Staff" Program check boxes do not have a date box to indicate when the NAF project was approved by the indicated organization. Also, AFSVA does not have a check box to indicate when a project is approved by them and sent to Air Staff.

The Design, Contract Management, and Funding tabs require minor changes. On the Design tab, the "Date of Original USAF DI" is limiting in that it only allows for one date. There should be options to also include a DI date for the initial project selection for design, at the 35 percent design stage, and at the 100 percent design stage. The Contract Management tab does not support the 25 percent cost and 10 percent scope thresholds. It does not contain a safety feature that prevents modifications exceeding these thresholds and forces the programmer to obtain new approval authority. The Funding tab needs more appropriate options for the "Fund Indicator" field, which should match the responsible organizations and force the project user rights to transfer between them. For all three tabs, the "Total NAF Investment" field is not present.

The current DD Form 1391 must be changed to accurately reflect NAF programming requirements. "Unfunded Furnishings, Fixtures, and Equipment (FFE)" and "Other Appropriations (Non-add)" are critical to NAF funding and should be included in Block 9 of the form. The "Total NAF Investment" should also be included in Block 9. Companion projects should be identified on the form with their project title, project number, and estimated cost.

There are general areas of ACES-PM that also need to be changed to better support NAF projects. Since the project file changes user rights many times during the

funding process, a system needs to be put in place that easily notifies responsible organizations that project rights have been transferred to them and an action is required on their part. The INVS and other NAF-specific documents should be able to be electronically attached within the project file. When the DD Form 1391 gets updated to reflect the changes from the NAS, a method has to be developed to efficiently allow personnel at all levels to provide their input and approval.

2.5 Chapter Summary

The literature review was crucial in understanding the basic concepts of ACES and NAF programming. The background on ACES PM, its responsible organizations, and status helped comprehend how the AIS works in general and how to implement changes to the system. The review of NAF programming was required to gain more knowledge in how the funding process is supposed to be completed. Finally, a look at the current ACES-PM business rules illustrated how the current ACES-PM module does not support the NAF programming process.

3. METHODOLOGY

This chapter explains the methodology used to answer the questions proposed in this research effort. It not only outlines the overall research design, but also discusses the reliability and validity of the survey-based research. After explaining how the survey was constructed and administered, the chapter briefly discusses the descriptive statistics used to answer the research questions. Descriptive statistics were used to generalize the responses to Likert Scale questions pertaining to proposed changes to the Automated Civil Engineer System Project Management module (ACES-PM) non-appropriated funds (NAF) business rules. The survey questions also addressed current programming processes that might hinder implementation of the proposed changes and training issues.

3.1 Survey Design and Administration

3.1.1 Survey Design

A cross-sectional, quantitative web-based survey was created as the instrument to answer the research questions (42:155). Since the survey addressed precise questions related only to NAF programming in ACES-PM, it was specifically designed for this research. A survey was chosen as the research instrument because it provided a quantitative description of the opinions, attitudes, and ideas of the sample under investigation (8:153). The Likert Scale portion of the survey allowed the data to be analyzed quantitatively.

The survey was developed to address specific changes to the ACES-PM NAF business rules, current NAF programming procedures, and NAF training issues. The

questions were broken into three sections based on the type of question. Demographic (D) questions were fill in the blank, General (G) questions used a 7-point Likert Scale, and Multi (M) questions were multiple-choice/fill in the blank. For the Likert Scale questions, "1" represented "Completely Disagree" and "7" represented "Completely Agree." The Likert Scale also allowed each participant to answer "NA" if they did not have an opinion for the question. The complete Likert Scale is shown in Appendix B at the beginning of the G section.

The majority of the survey questions, G6 through G23, were created from the results of an integrated process team (IPT) meeting held on 7-9 October 2003. During this IPT, ACES-PM experts met to determine ways the current NAF business rules can be improved to better match the NAF programming process. The first day was spent mapping out the existing NAF programming process for all the responsible organizations. The last two days were used to review the existing ACES-PM business rules and identify how they currently supported the NAF programming process. For each ACES-PM programming tab and screen, recommendations for specific changes to the automated information system (AIS) were made to better support NAF programming. The results of the meeting are the set of proposed programming business rule changes that are listed in section G of the survey. Questions G8, 9, 10, 11, and 17 address potential implementation problems due to current programming procedures. These questions were also created from the results of the IPT meeting.

Recall that the complete list of the proposed NAF business rule changes is shown in Appendix A. Note that the recommended changes with an asterisk (*) are changes or issues that are specifically addressed in the survey questions. These proposed changes

were concentrated on since they were the most important in terms of getting a base level perspective on their effectiveness.

The questions that were not developed directly from the IPT dealt with NAF training issues. Questions G1 through G5 were created to measure the knowledge and training level of personnel regarding NAF programming and ACES-PM. They also investigated programmers' access to the proper resources to get questions answered.

The majority of questions provided a limited comment section in which respondents could address issues that were not contained in the actual survey question. Likert Scale questions had a comment section that could accommodate up to 250 characters, while the final question, M33, was unlimited since it addressed the whole process in general. The comment sections were optional for all questions. Unfortunately, none of the comment sections were used by the respondents, thereby making content analysis impossible for this research.

The research questions that were introduced in Chapter 1, along with their purpose, method of statistical analysis, and corresponding survey questions are explained in Table 4. It is often useful to show how each research question is related to the specific questions on the instrument (8:159). The survey and informational cover letter are shown in Appendix B.

Table 4. **Research Questions (Purpose, Survey Questions, and Analysis)**

RESEARCH QUESTION	PURPOSE	SURVEY QUESTIONS	ANALYSIS
1. How well accepted is each of the proposed ACES-PM NAF project programming business rule changes in terms of the Air Force base level programming community?	This tested how programmers rank each of the proposed changes to ACES-PM. The ratings gave the IPT a measure of how well accepted the changes will be.	G6, G7, G12, G13, G14, G15, G16, G18, G19, G20, G21, G22, G23	Descriptive Statistics using Likert Scale questions that pertain to actual changes.
2. How well does the current base level ACES-PM programming process support the new ACES-PM NAF business rule changes?	This gives the IPT insight into whether the proposed changes might not be as efficient as predicted because of current base level programming procedures.	G8, G9, G10, G11, G17, M1, M2, M3, M4	Descriptive Statistics of Likert Scale questions that pertain to training, knowledge, and resources.
3. How well trained are current base level programmers in NAF programming and NAF programming in ACES-PM?	This gives the IPT insight into how well trained current programmers are with respect to NAF programming and NAF programming in ACES-PM.	G1, G2, G3, G4, G5	Descriptive Statistics of Likert Scale questions that pertain to current programming procedures.

Standard demographic information about the respondents was collected with survey questions D1, D2, and D3. Although these questions did not directly contribute to the objectives of this research, they were useful in identifying trends. The fourth demographic question (D4) was used to filter out participants who have not had any NAF programming experience in ACES-PM. Question M5 was an opened-ended question that allowed respondents to identify and discuss NAF programming issues that were not included in the survey questions. However, none of the respondents answered this question.

3.1.2 Survey Population and Sample

The majority of the survey questions come from the recommendations made by members of the IPT. Since the IPT was comprised of personnel from of the headquarters and Air Force levels, the questions are biased towards their point of view. To obtain the opinions and recommendations of base-level personnel, the population for this survey was considered to be all base-level programmers. However, since ACES-PM was first implemented less than 3 years ago, the survey population was further limited to base-level CE programmers who had recent experience in programming NAF projects in ACES-PM. Question D4 of the survey (Do you have experience inputting NAF projects into ACES-PM?) attempted to filter out individuals with no recent experience; if respondents answer "No" to the question, the web site automatically finished the survey. When a sample is chosen for a particular purpose in this manner, it is called purposive sampling (42:219).

In addition to identifying the survey population, it is also important to determine the approximate size of the population and ensure an adequate sample size for purposes of analysis (8:157; 46:316). The larger the sample the better; however, this may not always be practical (42:221). One advantage of having a distinct and homogenous population, like base-level programmers with ACES-PM NAF programming experience, is that is cuts down on the required sample size and allows for a more precise calculation of the population (42:221). In order to come up with a rough number of base-level programmers that should be sampled, and the desired number of responses, a rough estimate of the total population needs to be determined.

ACES-PM was fully implemented in late 2001, thereby providing two years worth of NAF project programming experience in ACES-PM (49:53). Assuming that there is an average of two programmers assigned to a base-level programming office, and they only spend about a year in the office, there would be about four programmers from each base that have had recent ACES-PM NAF programming experience. Since there are 84 bases with CE organizations, it was estimated that the population size was 336. This is a conservative number since some base level programmers spend more than one year in that office, and some bases have less than two people in their programming offices. For a population in the range of 400 to 600, at least 50 percent of the population should be sampled (42:221). Thus, the goal is to have 168 survey responses for the statistical analysis. This is an optimistic number considering the survey will have to achieve a 50 percent response rate assuming it reaches the whole population.

3.1.3 Survey Administration

The survey was administered through the web for three primary reasons. First, in-house expertise was available to support the development of a web-based survey. Second, the speed of delivering the survey to the sample population and obtaining responses was very quick. Third, a web-based survey allowed for automatic compilation of the data; this eliminated both the time required for and the human errors associated with manually transferring survey responses to Excel spreadsheets. The definition of the population and the method for delivering the survey also eliminated the chance of sampling bias, which is a bias that interferes with how the sample population is selected (42:222).

The web-based survey could not be distributed to base-level programmers before a Survey Control Number (SCN) was issued from the Chief of the Air Force Survey Branch at the Air Force Personnel Center. The survey also had to be approved by the local Institutional Review Board before being disseminated to the participants. Since the survey guaranteed total anonymity of each participant and the responses did not put them at risk, the survey was granted an exemption under the Code of Federal Regulations, title 32, part 219, section 101, paragraph (b) (2). The Institutional Review Board exemption letter is shown in Appendix C.

Once the SCN was received, the web survey link was emailed to all programming offices at the headquarters level on 10 December 2003 with an explanation of the survey's purpose and instructions to distribute it to base-level personnel (see Appendix D for a copy of the email). By asking the headquarters organizations to distribute the survey, it was hoped that more credibility would be provided to the survey. However,

only eight responses to the survey were received within the first month of distributing the survey in this manner. At that point, the following alternatives were used. The researcher sent the survey directly to base-level programmers using the Air Force global address list. Additionally, about 80 programmers taking a satellite course in the Civil Engineering and Services School (CESS) were administered the survey; they were also provided the web survey link with instructions to forward it to fellow programmers. The research sponsor and IPT chairpersons also resent the survey to all headquarters units stressing the importance of the research goals. The alternate distribution methods helped improve the response rate, which led to a more rigorous statistical analysis of the data.

3.2 Research Reliability and Validity

3.2.1 Measurement Instrument Reliability

Reliability is the extent to which a survey instrument consistently yields results when the characteristic or items being evaluated have not changed (42:99). The more reliable the instrument, the better the chance to draw appropriate conclusions from the survey data collected (42:100). There are four forms of reliability: Interrater reliability, equivalent forms reliability, test-retest reliability, and internal consistency reliability (42:99). Interrater reliability is the extent to which the responses of two or more people yield the same results (42:99). Equivalent forms reliability is the degree that two different versions of the instrument produce similar outcomes (42:99). Test-retest reliability is the extent the instrument produces the identical results on two different occasions (42:99). These three forms of reliability measure the external reliability, or consistency of an instrument. However, due to the nature of the instrument being

constructed solely for this research, and time constraints, these three forms of external reliability could not be measured. The internal consistency form of reliability is the extent to which all the items yield similar results (42:99). Internal consistency of Likert Scale survey questions can efficiently be measured using Cronbach's Alpha. However, to use Cronbach's Alpha, multiple items need to exist for each construct under investigation. Since each survey question involved a separate construct, or a specific change to ACES-PM NAF project programming, the internal consistency reliability of each construct could not be determined.

3.2.2 Measurement Instrument Validity

It is important to have validity in the measurement instrument, which is defined as "the extent to which the instrument measures what it is supposed to measure" (42: 98). There are four forms of measurement instrument validity: Face, Content, Criterion, and Construct validity (42:98). Face validity is the extent to which an instrument looks like it is measuring the correct characteristics (42: 98). Face validity helps ensure the cooperation of the survey participants, but it is not an exact measure of validity (42:98). Participants will be more obliged to partake in the survey if, on the surface, they trust what it is asking (42:98). Each of the survey questions was reviewed to ensure that they appeared to be measuring the specific ACES-PM NAF programming issue in question.

Content Validity is the extent to which an instrument is an accurate representation of the content area being measured (42: 98). One way to measure content validity is to have the instrument measured by experts in the field with a pilot or field test (8:158; 42: 98). To meet this requirement, the survey was sent to the Civil Engineering School's

NAF Programming Instructor before being released to base-level programmers. Most of her comments and recommendations were incorporated into the final instrument revisions. The survey was also sent to fellow classmates who have had NAF programming experience within ACES-PM during the previous assignment. The feedback received from both sources helped ensure that the instrument was indeed measuring the specified content area. Along with establishing content validity, this step also helped improve the questions, scales, and format of the web-based survey. It also helped improve the accuracy and usability of the instrument. Additionally, it helped correct many functional problems and errors associated with web-based surveys that could have affected the validity and quantity of the survey responses.

Criterion validity is the extent that the results of the instrument compare with related instruments that measure the same principle (42:98). Since the survey was constructed from issues specifically related to proposed NAF business rule changes, and there are no other instruments to measure this, criterion validity cannot be determined.

Construct validity is the extent that the instrument reflects the characteristics, or constructs, that cannot be directly measured (42:98). Each question pertaining to the proposed NAF changes or current programming procedures deals with a specific construct. These questions were individually reviewed to ensure they focused directly on the proposed construct. The training related questions were reviewed to make certain they only measured constructs related to NAF training issues. Careful and precise definition of all the constructs helped ensure that construct validity was met.

3.2.3 Research Validity

Internal and external validity are used to measure the validity of a research project as a whole (42:103). Internal validity is the extent to which the research study can draw accurate conclusions about the relationships within the data (42: 103-104); it must be confirmed before external validity is investigated (42:103). It is important that the researcher has confidence that correct conclusions can be drawn from the data where the results can be explained by known causes (42:105). In order to check for internal validity, the researcher must eliminate all other possible explanations for the observed results (42:104). Even though this research does not have cause-effect relationships, internal validity is still important (42:105). The survey questions were reviewed to ensure that each construct being measured could not be confused with other constructs. For example, the survey questions regarding the proposed NAF programming changes were investigated to make sure that they did not cover other ACES-PM issues that did not involve NAF programming.

External validity is the extent to which the research results can be generalized to other situations beyond the actual research (42:105). Since this research is only specific to NAF programming within ACES-PM, and cannot be applied to other situations, external validity is not required. The results of this research will only pertain to base-level programmers who have experience with NAF projects in ACES-PM.

3.3 Statistical Analysis

Descriptive statistics measure what data look like in general to include their central tendency, frequency, and variation (42:259). Descriptive statistics will be used

on the Likert Scale and multiple choice questions to describe the results of the research questions. Since Likert Scale data are ordinal in nature, the median instead of the mean will be used to describe the central tendency for each question and the inter quartile range (IQR) will be used in lieu of the standard deviation (47). The IQR is a measure of the data spread and is calculated by taking the difference between the 75^{th} percentile and the 25^{th} percentile of the data set.

3.4 Chapter Summary

This chapter established the procedures of how the research instrument was selected along with how the survey was develop, administered, and analyzed. The results of the survey responses were used to answer all three research questions.

4. RESEARCH RESULTS

This chapter summarizes the results of the descriptive statistics of the survey responses. The survey results are shown first to include the sample size and demographic information for the respondents. Descriptive statistics were then used to answer the research questions posed in Chapter 1.

4.1 Survey Response Results

The survey was sent electronically using the several different techniques discussed in Chapter 3. There were only 35 responses to the survey. Using the estimated population size of 336, this represents a 10 percent response rate, much less than the original goal of 50 percent. The lack of participation in the survey resulted in the elimination of three research questions that would have been based on inferential statistics and content analysis. The implications of the low response rate are addressed in Chapter 5. The demographics pertaining to the survey respondents are shown in Tables 5 and 6.

Table 5. Survey Responses by MAJCOM

MAJCOM	ACC	AETC	AFMC	AFSOC	AFSPC	AMC	PACAF	USAFE	TOTAL
# RESPONSES	13	5	9	0	1	1	3	3	35
PERCENT	37.1%	14.3%	25.7%	0.0%	2.9%	2.9%	8.6%	8.6%	100.0%

Table 6. Survey Responses by Rank/Grade

RANK/GRADE	2LT	1LT	CAPT	GS	OTHER	TOTAL
# RESPONSES	4	6	3	16	6	35
PERCENT	11.4%	17.1%	8.6%	45.7%	17.1%	100.0%
AVERAGE PROGRAMMING EXPERIENCE (yrs)	0.9	1.8	1.7	7.3	9.8	5.6
AVERAGE NAF PROJECTS PROGRAMMED	5.8	12.7	9.0	42.8	16.0	25.9

As shown in Table 5, the majority of responses came from two major commands (MAJCOMs): Air Combat Command and Air Force Materiel Command. Three MAJCOMs had only one or no responses each: Air Force Special Operations Command, Air Mobility Command, and Air Force Space Command. It can be assumed that some MAJCOMs did not put a lot of emphasis on having their base-level programming offices participate in the survey. The subsequent methods used to disseminate the survey also could have affected the amount of responses from each MAJCOM since the survey link was forwarded to personnel by means other than MAJCOM affiliation.

Table 6 shows that almost half the respondents were general schedule (GS) civilian employees. The higher amount of GS responses might be because they are the most involved in non-appropriated funds (NAF) programming in the Automated Civil Engineer System Project Management Module (ACES-PM) and hold permanent programming positions. The table also demonstrates that most of the NAF programming experience resides in the GS and Other employee categories. It is assumed that most of the respondents in the "Other" category represented independent contractors. The

amount of projects programmed is also heavily weighted towards the GS employees for the reason mentioned earlier. A student t-test of independent samples was attempted to determine whether there was a significant difference of the means of projects programmed between civilians and military. However, the distribution of projects programmed was not normal and the independent samples did not have a common variance which has to be met before a t-test can be performed.

4.2 Research Question 1

Recall that the first research question was: "How well accepted is each of the proposed ACES-PM NAF project programming business rule changes in terms of the Air Force base-level programming community?" The list of the integrated process team's (IPT's) proposed business rule changes is shown in Appendix A. Note that only the proposed changes labeled with an asterisk (*) were addressed in the survey questions pertaining to research question 1. There were 15 survey questions used to answer this question. Each question addressed a specific change to the NAF programming procedures that was recommended by the ACES-PM IPT. The median and interquartile range (IQR) for each of the Likert Scale questions pertaining to research question 1 were calculated and are shown in Table 7. For the specific content of each question, the reader is referred to Appendix B.

Table 7. Descriptive Statistics for Likert Scale Questions (Research Question 1)

SURVEY QUESTION	MEDIAN	IQR
G6	5	2
G7	5	2
G12	6	1
G13	6	1
G14	5	1.5
G15	5	1.5
G16	5	2.0
G18	5	2
G19	4	2.5
G20	6	2
G21A	5	1.5
G21B	5	1
G21C	5	2
G22	5	1.5
G23	5	2

Every survey question shown in Table 7 except G19 yielded a median score of 5 or 6, which indicated base level programmers "agree" or "strongly agree" that the proposed changes will be beneficial in improving NAF programming in ACES-PM. The three most agreed upon questions were G12, G13, and G20, all with a median score of 6. Questions G12 and G13 suggested mandatory check boxes for companion projects and a field to enter the associated project number and cost estimate (or programmed amount). Both questions had an IQR of 1, indicating that most programmers strongly agree to some degree that companion projects have to be better supported within ACES-PM. Question G20 suggested that a mandatory check box should be added to ensure the project has been approved by the installation Facility Board before being input as a valid

project. The IQR of 2 indicates that most programmers agree to some amount that mandating Facility Board approval should be incorporated in ACES-PM.

The only question that yielded a median score of 4 was question G19. This result indicates that base-level programmers are generally "undecided" on whether projects that are not approved for the next part of the approval process (Needs Assessment Study (NAS), 35 & 95 percent designs) should be released back to the base. However, the question also had the largest IQR, indicating that responses were dramatically split on whether this option would be beneficial to NAF programming.

The remaining questions had median scores of 5, which meant that the respondents "agreed" with the proposed changes. Questions G6 and G7 were concerned with effective tracking of a project's status. Question G6 suggested the use of automated email notifications to notify users of changes in project status and/or that an action is required by the using agency. Question G7 discussed the use of a history scroll down field in the programming tab that lets users review the history of a project. Both questions had an IQR of 2, signifying that the majority of programmers do not disagree to any extent with these new processes being beneficial to NAF programming.

The survey respondents "agreed" that the proposed changes outlined in questions G14, G15, and G16 would be beneficial to ACES-PM. All three questions address the addition of more Internal Needs Validation Study (INVS) information to the project file. Question G14 recommended adding a "pre-INVS" status block that lets users know whether a project is important enough to warrant the start of an INVS. Question G15 covered the addition of a data field that allows programmers to know the INVS start and finish dates. Question G16 addressed the possibility of making it mandatory to attach the

entire INVS document electronically to the project file. The IQR for the questions was 1.5, 1.5, and 2, respectively. These numbers indicate that the majority of responses were spread between "undecided" and "strongly agree."

Question G18 asked the programmers if they think it would be beneficial to allow Services personnel to have read-only rights to ACES-PM to view NAF projects. The survey respondents "agree" that Services personnel should have access to the ACES-PM program. According to the IQR, the majority of programmer thought is was a good idea to grant this read-only option to Services.

Question G21 addressed the actual choices programmers can use when entering a NAF project. The survey respondents "agree" with all three parts of the question and that the new choices for "Program Type," "Fund Type," and "Type of Work" would benefit NAF programming. Since no additional comments were provided, it can be assumed that most programmers agree that no changes should be made to the proposed list.

The recommended changes shown in questions G22 and G23 dealt with modifying the DD Form 1391 to improve NAF programming. Base-level programmers "agree" that these changes will enhance the NAF documentation process. Question G22 addressed the addition of two line items related to NAF programming and question G23 covered change to the order of the line items in the DD Form 1391 Detailed Cost Tab.

4.3 Research Question 2

Recall that the second research question was: "How well does the current base level ACES-PM programming process support the new ACES-PM NAF business rule changes?" Nine survey questions were used to answer this research question. These

questions were developed to forecast whether there would be potential problems to the proposed changes due to current base-level programming procedures. The five Likert Scale questions shown in Table 8 were used to measure how often certain procedures are done at base level. For the specific content of each question, the reader is referred to Appendix B.

Table 8. Descriptive Statistics for Likert Scale Questions (Research Question 2)

SURVEY QUESTION	MEDIAN	IRQ
G8	4	2
G9	3	1.5
G10	4	2
G11	6	2
G17	4	2.5

Questions G8 and G9 involved updating the project manager information and roles within the ACES-PM "managers" screen. The programmers were "undecided" about Question G8, which indicates that programmers often do not update their project manager information. The IQR of 2 indicates that an equal number of programmers "agree" and "disagree" with the question; in fact, 17 out of 35 respondents "disagree" to some extent that they complete the manager information for new projects. For question G9, the median score of the responses was 3, meaning that the respondents "disagree" with the statement that they update the project manager information when they release the project to another programmer. This result demonstrates there is a potential problem if the manager information is used to send the automatic email notifications discussed in earlier questions.

Question G10 had a median score of 4, thereby showing that programmers are "undecided" about using the milestone tab once it is updated to better fit the NAF programming process. The IQR of 2 also indicates the amount of spread in the responses; many respondents either "strongly agree" or "strongly disagree" with the utilization of the milestone tab after it is modified.

Question G11 had median score of 6 and an IQR of 2. Most programmers believe it is important to determine if a NAF project has a companion project and to document it. Only 2 programmers felt it was somewhat unnecessary to document whether companion projects exist when inputting NAF projects into ACES-PM.

Question G17 had the most spread in its answers out of all the Likert Scale questions. It is also one of the more controversial issues since it could create more work for project programmers. It had a median score of 4 with an IRQ of 2.5. Thus, many programmers either "strongly agree" or "strongly disagree" that they should be responsible for attaching INVS electronic documents to the ACES-PM NAF project file.

The descriptive statistics for the multiple choice questions supporting research question 2 are shown in Table 9. The results from question M1 help solidify the idea that many programmers are not satisfied with the existing DD Form 1391 template. For one reason or another, only 29 percent of the respondents solely use the ACES-PM template. Over 34 percent admit that they only use a Microsoft Word template. Question M2 examined the frequency with which programmers check the status and accuracy of existing NAF projects. The results indicate that only 14 percent of the respondents stated they check the status of NAF projects more than once a month. Question M3 considered the frequency with which non-CE users wanted to see the status of installation projects.

Almost 85 percent of the respondents stated that other users ask to see projects only once a month or longer. Question M4 yielded some interesting results. Seventeen percent of the respondents stated that they would not use the ACES-PM template even if it were updated to better support the NAF programming process; they would continue to use the non ACES-PM option currently being used to complete the DD Form 1391.

Table 9. Descriptive Statistics for Multiple Choice Questions (Research Question 2)

M1	I currently fill out NAF DD Form 1391's for NAF projects using:					
CHOICES	ACES-PM Template	MS Word Template	Both	Other		
NUMBER	10	12	11	2		
FREQUENCY	29%	34%	31%	6%		
M2	How often do you check the status and accuracy of your installation's NAF projects in ACES-PM?					
CHOICES	> Once a Week	Once a Week	> Once a Month	Once a Month	< Once a Month	Never
NUMBER	0	1	4	18	9	3
FREQUENCY	0%	3%	11%	51%	26%	9%
M3	How often do other users ask you about the status and accuracy of your installations NAF projects in ACES-PM?					
CHOICES	> Once a Week	Once a Week	> Once a Month	Once a Month	< Once a Month	Never
NUMBER	0	2	3	19	7	4
FREQUENCY	0%	6%	9%	54%	20%	11%
M4	If the current template is revised to better fit the NAF process, will you use the new template to input the initial DD Form 1391 information?					
CHOICES	Yes	No				
NUMBER	29	6				
FREQUENCY	83%	17%				

4.4 Research Question 3

Recall that the third research question was, "How well trained are current base-level programmers in NAF programming and NAF programming in ACES-PM?" The

first five Likert Scale Questions, G1 through G5, were used to answer this research question. The main purpose of this research question was to determine the current status of programming knowledge at the base level. The question examined NAF programming in general and NAF programming within ACES-PM specifically. Besides measuring the training aspect, the five questions also helped establish the experience and knowledge of the data sample. Table 10 shows the median scores and IQR values for the survey questions. For the specific content of each question, the reader is referred to Appendix B.

Table 10. Descriptive Statistics for Likert Scale Questions (Research Question 3)

SURVEY QUESTION	MEDIAN	IQR
G1	5	2
G2	4	2
G3	5	1
G4	5	1
G5	5	0.5

All of the questions except G2 had a median score of 5, indicating that the respondents "agree" with the statement. Question G2 had a median score of 4, meaning that programmers were "undecided" about whether they had formal training in programming NAF projects in ACES-PM. However, question G2 also had a large IQR. This indicates that there were a number of programmers who "completely disagree" that they had adequate formal training with respect to NAF project programming in ACES-PM. Question G1 showed that programmers "agree" that they have had adequate formal training in NAF project programming. The results of questions G3 and G4 showed that regardless of formal training, programmers know how to properly program NAF projects

in ACES-PM. Question G5 has an IQR of only 0.5, which means that the majority of programmers agree that they have the resources available to answer their ACES-PM programming questions.

4.5 Chapter Summary

The proposed NAF programming fields seem to be accepted by the majority of ACES-PM users. The results of a few of the questions need to be investigated further to determine if further action is needed. Some of the answers received from several of the questions regarding current base-level programming procedures could present some problems when the changes are implemented. These issues will be addressed in Chapter 5, where a summary of the findings is presented along with recommendations for the ACES-PM IPT.

5. CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a summary of the research findings and conclusions to each of the research questions. The limitations of the research are addressed along with recommendations for further research. Finally, a closing summary is presented about the research in general.

5.1 Research Findings and Conclusions

5.1.1 Research Question 1

Research question 1 investigated whether specific Automated Civil Engineer System Project Management Module (ACES-PM) non-appropriated funds (NAF) business rule changes, proposed by the integrated process team (IPT), would be beneficial to NAF programming. The list of the IPT's proposed changes is shown in Appendix A. Note again that only the proposed changes labeled with an asterisk (*) are addressed in the survey questions pertaining to research question 1. Overall, 13 out of 14 changes addressed by the survey questions are "agreed" or "strongly agreed" to be beneficial to NAF programming in ACES-PM. These results are promising since it shows the IPT concentrated only on those business rules that are the most important in terms of improving NAF programming. However, a thorough analysis of each survey question coupled with some of the results from research question 2 yielded some interesting issues that should be further looked into by the IPT.

There is a concern that NAF projects get held up during the funding process due to confusion and inefficiency that is created as project user rights switch numerous times

between responsible organizations (6). To help address this problem, the IPT suggested the use of automated emails to alert program managers of the existing project status and if an action is required to further the funding process. Programmers "agree" that email notifications would be beneficial to the NAF programming process. The results of the survey also revealed that most programmers view the status of NAF projects at an average less than once a month. Since the frequency in which NAF projects are checked is so low, an email notification is a great idea. Besides a resourceful method to provide instant project updates to project managers, an automatic email system could notify a given agency that an action is required on their part to further the funding process. This notification becomes even more crucial as deadlines draw near and the project is still not approved for current fiscal year funding.

The use of emails might not be the best way to notify programmers when the status of a project has changed. The success of this concept depends on whether the project mangers update their personal information in the manager's role tab. Most programmers are "undecided" as to whether they input the required PM information when taking over a new project, and "disagree" that they help ensure the new PM information is updated when they leave a project. These results strongly indicate that there is potential for incorrect information, more specifically email addresses, to exist in the PM tab. If the correct email is not inputted at the beginning of the project, or the project manager changes and the email address is not updated, the notification will be lost. The current ACES system can only send a notification email once. If the recipient's address is not current and valid, the email is lost. However, at best, most programmers are only checking projects on a monthly basis.

The best way to ensure that project approval does not get held up is to use a combination of both notification methods. The idea to implement a history scroll down data field that shows all project status changes, completion dates, and who accomplished the change will allow programmers to easily catch up on the status of a project. This tool would also be very helpful for project managers who take over a project in the middle of the funding process. For those programmers who are managing numerous projects, an email can also be sent out to help ensure that the project does not get stalled in one of the approval phases. Email notification should only be used to tell a project manager that an action is required on his or her part. Instruction and guidance must be incorporated into the web-based training that stresses the importance of updating the PM tab information for each project. Supervisors must also be involved in the updating process since there is a great potential to lose information when the PM is changed. Finally, for last resort, project managers at all approval levels can help facilitate the funding process by forwarding emails and making telephone calls.

ACES-PM has the ability to attach different types of electronic files to the project file (6). The use of paperless methods to report all NAF project information is a future goal that is only obtainable one step at a time (6). Attaching the INVS to the NAF project folder is a great way to start taking advantage of the automated information system (AIS) features available to CE programmers. Since most programmers "agree" that the INVS should be attached electronically, the responsibility of attaching it needs to be specified at the Major Command (MAJCOM) level and consistently delegated down to the base-level. Even though programmers feel that it would be beneficial to attach the INVS, they are "undecided" as to whether programmers should be required to accomplish

the task within ACES-PM. If the ACES-PM IPT truly wants this option to be utilized by the programming community, new guidelines and training need to be implemented. Since the Services community responsible for the INVS, they should be delegated the job of scanning in the documents, and programmers should be required to attach them. If this relationship can be accepted and executed properly with the INVS, consideration should be brought up in regards to also having other documents like the Commander's Certificate (CC) and Needs Assessment Study (NAS) attached to the project folder. The procedure to attach documents to the project folder must be covered in the web-based training curriculum.

Programmers believe it would be beneficial to allow Services to have read-rights to all NAF projects. This is obvious since programmers have more work to accomplish when Services personnel call and ask for updates. However, Services only inquire about projects on a month-to-month basis. It would not be worth the cost and time to fully equip Services with access to ACES. Therefore, it would be less expensive to keep the current system where Services calls or emails the programming office once a month to ask for updates. It is part of the programming office's responsibility to give project updates to other base organizations on a need-to-know basis. This interaction will also keep the using organizations on the same page by promoting better communication and continuity with project planning.

Most programmers do not feel it is necessary for MAJCOMs to release project rights back to base level when projects are not selected for the next step in the approval process. Thus, most MAJCOMs should hold onto the user rights to the project files. This will allow MAJCOMs to more effectively manage their multitude of NAF projects,

and cut down on the amount of project transferring that is required. However, MAJCOMs will eventually have to give installations rights to unfunded projects to ensure that they are updated for the project call the following year.

It is crucial that there is no confusion in how a NAF project is determined to have a "program type" of NAF. All the business rules associated with NAF programming will be initiated once the programmer specifies on the project add screen that the "program type" is NAF. Base-level programmers "agreed" that determining the "program type" along with the "fund type" and "type of work" are a lot easier with the new categories proposed by the IPT. Having specific, concise selections for these three groups of data will help ensure that the projects are inputted correctly from the beginning. The integrity of the NAF project data will subsequently improve making queries for certain types of NAF projects more efficient and accurate for all using agencies involved.

5.1.2 Research Question 2

Research question 2 examined whether the current programming processes exhibited by base-level programmers would partially impede the successful implementation of the proposed business rule changes. The results to this research question produced some interesting observations and brought up many potential problems areas that will need to be dealt with by the IPT. In general, most programmers do not pay enough attention to the status of their respective projects, and do not constantly update information in the PM screen and the Milestone tab. The results also show signs of end user resistance to using ACES since 17 percent of programmers stated they will continue to use non-ACES-PM templates to fill out DD Form 1391 information. Many of the

potential problems associated with current programming procedures were addressed in conjunction with the proposed changes shown in the previous section. However, the results obtained in this research question presented some additional concerns and recommendations for the IPT.

The consistent use of the ACES-PM Milestone Tab would dramatically help in the effective management of NAF projects. However, programmers are "undecided" as to whether they would even use the tab even if it was modified to better fit the NAF programming process. The Air Force Civil Engineer Support Agency (AFCESA) is determining what types of milestones should be added and deleted to create a NAF Milestone Tab. If more consistent use of the tab is required for future programming requirements, AFCESA should ensure that is it updated to the best extent possible. The Milestone Tab can also be an effective way to view the status of projects as long as it is consistently updated by the PM.

The ability to identify and program appropriated funds (APF) companion projects while inputting a NAF project's initial requirements would be very beneficial to the programming process. Programmers put forth a thorough effort in trying to determine if an APF companion project exists. Thus, creating a section that allows programmers to state whether an APF companion project exists, along with a project number and programmed amount would greatly help eliminate problems in the NAF funding process. A mandatory check box will force the programmers to determine whether an APF companion project needs to be programmed in conjunction with the NAF project. If the ability to link the related project files does not exist, the addition of APF companion project number and PA data fields would greatly assist in the funding process.

Programmers show a great effort in determining APF companion projects; the more information they can provide during initial project input, the less of a chance the project will be held up during later approval levels.

Guidance and instruction are required from the Air Staff level to help enforce that all base-level programmers use the ACES-PM template to input DD Form 1391 NAF project information, especially once it is revised to better reflect NAF programming requirements. The results of the survey suggested that programmers would continue to use other templates for completing DD Form 1391s. This presents a problem with data compatibility and integrity issues, along with work inefficiency, as the information will need to be re-created in ACES-PM before the project can be sent to the MAJCOM. Besides making the template better mirror the NAF programming process, the Standard Systems Group (SSG) has to investigate the other potential reasons that are making programmers hesitate to use the ACES-PM template. It should be a mandatory requirement that all CE programmers, from base level to Air Staff, solely use the ACES-PM DD Form 1391 template. Air Staff and MAJCOMs have to develop guidelines and enforce them throughout the programming community. Once these actions are taken, the problem of trying to get different DD Form 1391s to match up, or wondering what the most current and correct form is, will be eliminated. The IPT's goal should be to eventually have all DD Form 1391s produced from one system where user rights will guarantee consistency and accuracy of the data.

5.1.3 Research Question 3

Research Question 3 investigated the training aspects of ACES-PM and NAF programming. The results of the survey showed that most programmers are confident in their NAF programming knowledge and ability to input information into ACES-PM. However, they were "undecided" as to whether they have had formal training on NAF programming in ACES-PM. Nonetheless, programmers "agree" that they properly know how to manage NAF projects in ACES-PM. AFCESA and the SSG are currently implementing a new web-based program that will become the formal training for ACES-PM. Hopefully, the ease and accessibility of the training program will allow all programmers to feel they have had the proper training with ACES-PM and NAF projects.

When the web-based program becomes operational it is essential that it be advertised and promoted within the programming community. Endorsement by MAJCOM programmers will help increase the amount of programmers who use the training system. Even though most programmers "agree" there are adequate resources available to get questions answered, having a web-based learning system will significantly improve the ACES training issue. Additionally, when changes are made within the ACES module, the training site should be updated to reflect the changes. For instance, the changes to the NAF programming business rules need to be reflected in the first version of the ACES-PM training site. Once the proposed changes are implemented, it will be important that the ACES-IPT incorporate the new NAF procedures into the web-based training program. If the training program becomes outdated, it will not be utilized to its full potential. Also, since NAF programming business rules are extremely different from other project types, NAF specific training should created within the web-

based training program. A stand-alone NAF training section will allow programmers to become current on the all business rule changes more efficiently.

5.2 Limitations of the Research

This research has several areas of limitations. The most influential is the lack of data. The final data set only contained 35 responses from base-level programmers. This number is well below the recommended sample size of 168, which had an optimistic 50 percent response rate. The lack of data brings more error and uncertainty into the data analysis. Additionally, the low sample size may have contributed to not receiving any comments from the survey questions and the inability to perform content analysis. Despite the statistical limitations, from an operational standpoint, the 35 responses represented more feedback on potential ACES-PM business rule changes than ever received before by the IPT (43). Since the inception of ACES-PM, the IPT has had a significant problem trying to obtain feedback from the programming community on their proposed business rule changes.

There are three reasons for the low response rate. First, the survey was sent out in early December, allowing only one and a half months of data collection. Second, with the timing of the survey administration being right before the holidays, many potential respondents could have been out of the office. Finally, the process used to distribute the survey was not efficient. It was assumed that MAJCOMs would quickly forward the survey link to their base-level program offices and stress the importance of the survey to the CE programming community. Each MAJCOM had the directions to reply to the email stating that they did indeed forward the link to their bases, yet only two of the eight

accomplished the task. The lack of email responses raised the question as to whether or not the survey link was even forwarded to some of the installations.

The method in which the data was collected also presents a limitation. The approximate number of programmers who had recent NAF programming experience in ACES-PM could not be calculated and contact information for each could not be found easily. The method of sending the survey link to all MAJCOMs made a lot of sense, but it created a sample that was not random. The unbalanced weighting in terms of MAJCOMs shows this limitation. When responses were not being achieved using the original method of distribution, other methods were created. These methods also led to biased responses since the email was directly emailed to all known CE programmers, instead of randomly selected. If this type of research is to be accomplished again, a well thought out process for getting the survey to a sufficient amount of programmers in a random manner should be determined at the start of the research. The ACES-PM IPT, AFCESA, or the SSG might have a list of all active ACES-PM users, which could be used to ensure a random result is achieved.

The construction of the survey was also a limitation. Since it was created specifically for this research effort, reliability of the instrument was not previously known. The manner in which the questions were developed, coupled with a time constraint, also inhibited the ability to measure the external reliability of the instrument. The questions also could have been shorter and more concise in order to promote the respondent to give comments on the survey questions.

The last limitation involves the actual research instrument. Even though a survey guarantees more data is collected, performing a few in-depth case studies could provide

other forms of information. This concept might explain the lack of comments with each of the survey questions. The lack of time to get the survey distributed also decreased the amount of time that was spent testing it with a pilot study. Furthermore, the literature could have been reviewed in more detail to determine if there are proven formats for writing survey questions that deal with improving existing AIS.

5.3 Areas of Further Research

The improvement of AISs is a continual process that goes on for the whole duration of a system's life cycle (41:12). No AIS is perfect since the needs of the organization are always changing. Improving NAF programming in ACES-PM can be re-investigated when the requirements of the system's end users change or when new ideas regarding the programming of NAF projects are developed.

From the results of this research, it might be useful to survey all ACES-PM users to determine reasons for end user resistance. Some programmers are hesitant to use ACES-PM for all programming tasks and do not have confidence the system will increase work efficiency. The six respondents who stated they would continue to use other non-ACES-PM templates reflects the current situation that some programmers do not want to change their way of doing business. Potential reasons could be collected from an unbiased source to produce useful results for the ACES-PM IPT to research further.

With the limitations in mind, another way to explore improvement to ACES-PM and other modules could include a multi-case study approach that covers one base-level

programming office for each MAJCOM. This method might allow for more specific issues to be addressed and enable the respondents to talk about their specific concerns. All ACES modules, no matter what method is used, should be investigated from an unbiased viewpoint. All eight modules will have problems, and many end users have the knowledge and experience to correct the situation, but think they are not in the position to make a difference.

This research has provided further recommendations on improving NAF programming in ACES-PM. However, there are many other areas of ACES-PM that can be investigated at the base-level to find ways to further improve the module. For example, the operations and maintenance (O&M) and Military Construction (MILCON) project business rules and their related project tabs can be analyzed for areas of further improvement using the same type of survey method. Questionnaires can be created based on the current business rule problems and administered to all base-level programmers. This process would give the IPT more recommendations on how to improve programming for all types of projects in ACES-PM.

5.4 Final Summary

It is important that the organizations responsible for the ultimate success of ACES, to include NAF programming within ACES-PM, continue to improve the current AIS structure and business rules. In order to ensure NAF programming in ACES-PM remains effective and efficient, the requirements and recommendations of the AIS end user will have to continually be addressed and supported by the IPT. This research provided a new approach to evaluating AIS changes once implemented within an

organization. In conclusion, this research attempted to improve NAF programming within ACES and created another method to how business rule problems can be solved via end user input.

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ACRONYMS & ABBREVIATIONS

AAFES- Army and Air Force Exchange Service

ACES- Automated Civil Engineering System

ACES-EM- Automated Civil Engineer System Environmental Management Module

ACES-EO- Automated Civil Engineer System Explosive Ordinance Module

ACES-FD- Automated Civil Engineer System Fire Department Module

ACES-HM- Automated Civil Engineer System Housing Module

ACES-OPS- Automated Civil Engineer System Operations Module

ACES-PM – Automated Civil Engineering System Project Management Module

ACES-PR- Automated Civil Engineer System Personnel Readiness Module

ACES-RP- Automated Civil Engineer System Real Property Module

ADAL- Add/Alter

AE- Architect-Engineer

AFCESA- Air Force Civil Engineer Support Agency

AFCIC- Air Force C4 Information Command

AFI- Air Force Instruction

AF/ILEC- Office of the Civil Engineer, Engineering Division

AFIT- Air Force Institute of Technology

AFSVA- Air Force Services Agency

AIS- Automated Information System

APF- Appropriated Funds

ASG- Automated Steering Group

BEAMS- Base Engineer Automated System

C4- Command, Control, Communications, and Computer

CC- Commander's Certificate

CCB- Configuration Control Board

CE- Civil Engineering

CRSD- C4 Systems Requirements Document

D3 - Deficiency Detail Data

DECA- Defense Commissary Agency

DECC- Defense Enterprise Computing System

DI- Design Instruction

DMRD- Defense Management Review Decision

DoD- Department of Defense

DOS- Disk Operating System

FFE- Furnishings, Fixtures, and Equipment

FIM- Facility Investment Metric

GS- General Schedule

HQ- Headquarters

INVS- Internal Needs Validation Study

IPT- Integrated Process Team

IQR- Inter Quartile Range

IS- Information System

IWIMS- Interim Work Information Management System

MAJCOM- Major Command

MILCON- Military Construction

MWRS- Morale, Welfare, Recreation, and Services

NAF- Nonappropriated Fund

NAFI- Nonappropriated Fund Instrumentality

NAS- Needs Assessment Study

O&M- Operations and Maintenance

OSD- Office of the Secretary of Defense

PA- Program Amount

SAF- Secretary of the Air Force

SCN- Survey Control Number

SDLC – System Development Life Cycle

SEP – Systems Engineering Process

SIOH- Supervision, Inspection, and Overhead

SSG- Standard Systems Group

TID- Technology Integration Division

TTC- Tactical Training Center

WIMS- Work Information Management System

APPENDIX A. PROPOSED ACES-PM NAF BUSINESS RULE CHANGES
(* means proposed change addressed in research question 1)

Item #	ACES-PM Location	Description of Proposed Change
1	Programming Tab	Approval authority (Local, MAJCOM, AF) shown by checking one of the three respective boxes
*2	Programming Tab	A "Pre-INVS" status box will be added to show projects whose importance does not warrant the start of the INVS. This box will also state when the INVS was initiated and completed.
*3	Program Pull Down Menu	The INVS document will be electronically attached to the project file with digital signatures for FM, CE, and SV Commanders.
*4	Programming Tab	A status field will be added so programmers can quickly see the status of a project to include who has user rights and what is the next required action in the funding process
*5	Programming Tab	Project selection for the next step in the funding process, i.e., being selected for the INVS, NAS, or design will be accomplished by adding "not selected/selected" boxes to be check by MAJCOM and AFSVA. If the project is a "non-select", for the NAS, it automatically transfers back to the MAJCOM and to base if desired.
*6	Project Add Screen	Add a field that show if there is a companion project, and if so, the project # and PA can be filled in. The programmer cannot create the project without checking "yes" or "no".
7	Design Tab	The four DI's will be listed along with their approval dates. Once the Office of the Civil Engineer, Engineering Division (AF/ILEC) checks a DI off, the user rights transfer back to the MAJCOM
8	Design Tab	When the method of design is Design-Bid-Build, the default design % is 35%. When it Design-Build, it only 15% when AFSVA racks and stacks the projects.
9	Design Tab	When the project is at %35 design and selected for 100% design, a comments page and an "approve/not approve" screen should be added to allow AFSVA and MAJCOM to agree on the final official DD Form 1391. This will make final approval and signatures from MAJCOM more efficient. A validation screen will be added to allow MAJCOM and AFSVA to easily discuss issues with the final 1391.

*10	General	Email notifications will be utilized to give users notification when a project requires an action on their part. The Milestone Screen can automatically send these once a milestone is complete. Email addresses will have to be updated on the Managers Screen for this option to work.
*11	Programming Tab	Add a "current status" field that allows users to easily scroll through the history of events that have happened with a project. Information will include the dates the event took place, and who was the user responsible for the event.
12	Funding Tab	Add a "funds issued" field along with the "date" field that is filled in by AFSVA so MAJCOM and base know project is just awaiting bid selection
*13	Programming Tab	Add a check box asking if the facilities board approved the project.
*14	Project Add Screen	Change "Program Type to "NAF"
*15	Project Add Screen	Change "Fund Type" to one of the following choices: AAFES, DECA, MWR, Private, Lodging, Multi. Inserting "NAF' as the "Program Type" sets this business rule.
*16	Project Add Screen	Change "Type of Work" to one of the following choices: ADAL (add/alter), Construction, Maintenance/Repair, Minor Construction, O & M. Inserting "NAF' as the "Program Type" sets this business rule.
17	Programming Tab	Grey out (make non-active field) the "PE", "CE/PBD" and "Group" data fields.
18	Programming Tab	Change to "Environmental" and "MILCON" check blocks to "Local", MAJCOM/AF", and "AF".
19	Programming Tab	Add "Design" and "FFE" as subcategories of the "Unfunded Amount" field
20	Programming Tab	Change "Excluded Amount" data field to "APF Projects"
21	Programming Tab	Change "Total Amount" data field to "Total NAF Investment".
22	Project Managers Screen	Add AFSVA project Manager as one of the primary roles.
23	Supplemental Tab	Add AFSVA as part of the "Base/MAJCOM/ and Air Staff" program checklist. When these boxes are checked, the user rights transfer to the next organization in the funding process. Include a date box.
24	Supplemental Tab	Add "AFSVA" to the "PM" field to assist in transferring user rights.

*25	Design Tab	Add a "Total NAF Investment" field which includes the FFE and design cost. "PA" covers the construction/contingency and Supervision, Inspection, and Overhead (SIOH) cost. This should also be shown on the DD Form 1391
26	Design Tab	Add dates for when each DI was issues by AF/ILEC.
27	Construction Tab	Change business rules so that when a mod is entered, which will break the 125% cost or 110% scope threshold, ACES will not allow the mod to go through until the project is sent to AF/ILEC.
28	Construction Tab	Add an alert notification when a project hits the 10 and 20 % over cost figure.
*29	Construction Tab	Add business rule that asks the MAJCOM if they want to transfer user rights back to base that allows them to update construction complete figures and input modifications.
30	Funding Tab	Under "Fund Indicator" Tab, change choices to: Local, MAJCOM, AF, and Mulit
31	Funding Tab	Add "Total NAF Investment Field"
*32	Detail Cost Sheet (used to fill out Block 9 of DD Form 1391.) These data fields will be put into the Funding Tab.	Change the sheet to the following setup: Contract Amount at Award + Modifications = Current Contract Amount + Contingency Amount = Subtotal + SIOH (% of subtotal) = Subtotal (PA amount used for thresholds) + NAF design cost + FFE costs = Total NAF investment Unfunded Amount (APF non-add) Last line Blank
33	DD Form 1391	In block 11 add an "additional" slot to list companion projects, their titles, cost, etc.
*34	Milestone Tab	AFSVA will create a whole new milestone screen for NAF projects. New entries will include INVS complete, NAS complete, selected for 35% design, 35% design complete, DI's issues, 100% design, etc.
35	General	Base level services should be granted read-only rights to view NAF projects

APPENDIX B. SURVEY QUESTIONS

EVALUATION OF CURRENT AUTOMATED CIVIL ENGINEERING SYSTEM (ACES)
NON-APPROPRIATED FUNDS (NAF) PROJECT PROGRAMMING PROCEDURES

USAF SCN 03-124

Purpose: The purpose of this study is to determine whether the proposed changes to the current NAF ACES-PM programming procedures and business rules, recently proposed by the ACES-PM IPT, are efficient and complete. The results of this research effort will be used to give the ACES-PM IPT recommendations for both additions and deletions to the proposed changes, along with an idea of how well these changes will be accepted within the Air Force programming community. The feedback you provide in this questionnaire will directly aid in the improvement of NAF project programming throughout the USAF.

Participation: We would greatly appreciate your completing this survey. Your participation is COMPLETELY VOLUNTARY. You may withdraw from this study at any time without penalty, and any data that has been collected from you, as long as that data is identifiable, can be withdrawn by contacting Captain Joshua Ligday. Your decision to participate or withdraw will not jeopardize your relationship with your organization, the Air Force Institute of Technology, the Air Force, or the Department of Defense.

Confidentiality: ALL ANSWERS ARE **STRICTLY CONFIDENTIAL.** No one other than Lt Col Alfred Thal (research advisor at the Air Force Institute of Technology which is an organization independent of your organization), or Captain Joshua Ligday, will ever see your questionnaire. Findings will be reported without specific ties to individual names or Squadrons. We ask for some demographic and unit information (rank/grade and MAJCOM) in order to interpret results more accurately, and in order to link responses for an entire Command. Reports summarizing trends in large groups (such as MAJCOMs) may be published.

Because this is a web-based questionnaire, certain precautions have been built into the database to ensure that your confidentiality is protected. First, the questionnaire and database are not stored on your organization's server; instead, the questionnaire and database will be stored on the Air Force Institute of Technology's secure server. This makes it impossible for your leaders to circumvent the surveyors and access any identifiable data without their knowledge. Second, only you will have access to your responses. Finally, the database is protected by a password that is known only by the aforementioned surveyors making it impossible for anyone else to access your data. Still, if you don't feel comfortable completing the on-line version of the questionnaire you may print a paper version of the questionnaire, complete it, and return it directly to Capt Joshua Ligday at the address listed below.

Contact information: If you have any questions or comments about the survey, contact Captain Josh Ligday at the number, fax, mailing address, or e-mail address listed below.

Captain Joshua Ligday

AFIT/ENV BLDG 640
2950 Hobson Way
Wright-Patterson AFB OH 45433-7765
Email: joshua.ligday@afit.edu
Phone: DSN 785-3636 X 6225, commercial (937) 427-4362

Privacy Notice

The following information is provided as required by the Privacy Act of 1974:

Purpose: The purpose of this study is to determine whether the proposed changes to the current NAF ACES-PM programming procedures and business rules, recently proposed by the ACES-PM IPT, are efficient and complete.

Routine Use: The survey results will be used to provide the ACES-PM IPT additional insight into how the NAF programming process can be further improved in ACES-PM. No analysis of individual responses will be conducted and only members of the Air Force Institute of Technology research team will be permitted access to the raw data.

Participation: Participation is VOLUNTARY. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of the survey.

INSTRUCTIONS

- Base your answers on your own thoughts & experiences
- Please feel free to provide comments after each question

Demographic Questions (Multiple Choice & Short Answer)

D1) What is your grade/rank?

D2) What is your MAJCOM or Direct Reporting Unit?

D3) How many years experience do you have in programming?

D4) Do you have experience inputting NAF projects into ACES-PM?

A) If yes, approximately how many projects have you inputted?
(go onto question 7)

B) If no, please explain why you have not.
(you have completed the survey.)

For questions G1 through G23, please **CIRCLE A NUMBER** from 1 to 7 that **BEST DESCRIBES** your opinion on the proposed ACES-PM NAF programming changes. If no opinion, please circle N/A. Each G questions allows the participant to optional information in the comment section.

Completely Disagree	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Completely Agree
1	2	3	4	5	6	7

G1) I have had adequate formal training in NAF project programming.

G2) I have had adequate formal training in programming NAF projects in ACES-PM.

G3) I know the differences between the O & M/MILCON and NAF project programming procedures.

G4) I know how to properly program a NAF project into ACES-PM.

G5) If a question arises concerning the input of NAF projects into ACES-PM, I have access to the resources (user guides/field experts) to get the question answered.

The following questions specifically address proposed changes to the current ACES-PM NAF programming procedures or issues that will affect these changes.

G6) It would be beneficial to use automated emails via ACES-PM to notify Base Level, MAJCOM, and Air Staff project managers that the status of a particular project has changed and/or an action is required to move the project further in the funding process? An example would be sending an email to the MAJCOM programmer stating that the Air Force Services Agency has selected their project for 35% design.

G7) It would be beneficial to add a history scroll down field and current status field to the programming tab so all users can easily see all actions that have taken place with the project, who initiated them, and on what date? An example could be the date the Design Instruction was issued, and who approved the project up to the 35% design.

G8) When inputting a new project, I always complete my project manager information under the manager's button to include all my contact information (phone #, email, etc.).

G9) When the project manager roles change for a given project I check to ensure that the project manager information is updated under the "managers" button.

G10) I would always use the ACES-PM milestone tab and update it consistently for NAF projects if the milestones tab was modified to better follow the NAF programming process.

G11) When programming a new NAF project, I make an effort to determine if there are any companion projects (projects needed to complete the NAF project but use appropriated funds (APF)), and document it.

G12) It would be beneficial to add a mandatory "yes" and "no" check box on the project programming tab to identify if a companion project(s) accompanies the NAF project. This would ensure a project could not be entered without identifying whether a companion APF project exists.

G13) If the companion project "yes' box is checked, it would be beneficial to allow the programmer to enter the project number(s) and PA(s) if known.

G14) It would be beneficial to add a 'pre-INVS' status block to the programming tab for projects that currently do not warrant the start of an Internal Needs Validation Study (INVS).

G15) It would be beneficial to add a data field to the programming tab for the INVS start and completion date.

G16) It would be beneficial to allow the entire (INVS) document to be attached electronically to the ACES-PM project file instead of only being sent to the MAJCOM via a paper copy.

G17) I would not have any complaints if Civil Engineer Programmers were tasked to attach all INVS electronic documents into the ACES-PM NAF project file.

G18) It would be beneficial to give base level Services representatives read-only rights into ACES-PM to be able to view all NAF projects.

G19) For those projects not selected for the Needs Assessment Study (NAS), 35% design, or 100% design, it would be beneficial if the MAJCOM released the rights back to the base and send them an email notification.

G20) It would be beneficial to add a check box and to the programming tab that shows if a NAF project has been approved at the facilities board and a data field for the approval date.

G21) It would be beneficial to revise the initial NAF programming fields with the following choices:

Part A: Program Type: NAF

Part B: Fund Type:
AAFES
DECA
MWR
Private
Lodging
Multi (will have pull down menu to select options)

Part C: Type of Work:
ADAL
Construction
Maintenance/Repair
Minor Construction
O & M

G22) It would be beneficial to add the following line items to Block 9 of the DD Form 1391:

Unfunded Furnishings, Fixtures, and Equipment (FFE) (under the line item "Total Request Rounded"
Other Appropriations (APF) (as the very last line item)

G23) It would be beneficial to revise the Detailed Costs Tab as follows:

Contract Amount at Award
+ Modifications
= Current Contract Amount
+ Contingency Amount
= Subtotal
+ SIOH (% of subtotal)
= Subtotal (the PA, which will be used in calculating the 125% threshhold)
+ NAF Design Costs
+ Furnishings, Fixtures, and Equipment (FFE)
= Total NAF Investment
Unfunded Amount (APF)

Multiple Choice Questions

M1) I currently fill out your DD Form 1391's for NAF projects using:

A) The ACES-PM template
B) A Microsoft Word template
C) Both
D) Other

(If you do not use ACES to generate the 1391, please explain why)

M2) How often do you check the status and accuracy of your installation's NAF projects in ACES-PM?

A) More than once a week
B) Once a week
C) More than once a month
D) Once a month
E) Less than once a month
F) Never

M3) How often do other users (Services, wing/group level leadership) ask you about the status of your installation's NAF projects?

A) More than once a week
B) Once a week
C) More than once a month
D) Once a month
E) Less than once a month
F) Never

M4) If the current template is revised to better fit the NAF process, will you use the new template to input the initial DD Form 1391 information?

A) Yes

B) No (If no, please explain)

M5) Do you have any other suggestions on how the ACES-PM system could be changed in order to better support the NAF project programming process?

THANK YOU FOR PARTICIPATING
ALL INFORMATION IS STRICTLY CONFIDENTIAL

APPENDIX C. EXEMPTION LETTER

5 Nov 2003

MEMORANDUM FOR AFIT/ENV
AFIT/ENR
AFRL/HEH
IN TURN

FROM: AFIT/ENV/GEM04

SUBJECT: Request for Exemption from Human Experimentation Requirements (AFI 40-402): Thesis Research, AFIT/ENV/GEM, Evaluation of Current Automated Civil Engineering System Project Management Module (ACES-PM) Non-Appropriated Funds (NAF) Project Programming Procedures.

1. Request exemption from Human Experimentation Requirements of AFI 40-402 for the proposed questionnaire of Base Level and Civil Engineering Programmers to evaluate current NAF business rules within ACES in conjunction with thesis research at the Air Force Institute of Technology. The purpose of this study is to determine whether the proposed changes to the current NAF ACES-PM programming procedures and business rules, recently proposed by the ACES-PM IPT, are efficient and complete in terms of the whole Air Force wide programming perspective. The results of this research effort will be used to give the ACES-PM IPT recommendations for both additions and deletions to the proposed changes, along with an idea of how well these changes are accepted within the Air Force programming community.

2. This request is based on the Code of Federal Regulations, title 32, part 219, section 101, paragraph (b) (2); Research activities that involve human subjects will be exempt when the research involves the use of survey procedures provided (i) information obtained cannot be directly or through identifiers linked to the subjects, and (ii) disclosure of subjects' responses does not place the subjects at risk of criminal or civil liability, financial strain, employability or reputation ruin. The following information is provided to show cause for such an exemption:

2.1. Equipment and facilities. No special equipment or facilities will be used.

2.2. Subjects. Subjects will be officer or GS members currently assigned to various Air Force Civil Engineering Squadron programming elements. All programmers who have experience inputting NAF projects into ACES-PM within all Squadron programming elements will complete the entire questionnaire

2.3. Timeframe. Data will be collected in between November 2003 and March 2004.

2.4. Description of the Questionnaire. Members of programming elements will be questioned at one point in time. The questionnaire consists of 33 questions and takes approximately 15-20 minutes to complete. It measures personal opinions of the proposed ACES-PM business rule changes IAW NAF project programming procedures. The questionnaire asks participants to rate expected changes to the project inputting process and gives them a chance to add comments for or against the changes. The questionnaire will allow the ACES-PM IPT to view how well their proposed changes are accepted in the entire project programming community and give foresight into possible problem areas that they overlooked. Each question will have a comment section to allow the participant to justify each answer and to ensure that new ideas are captured with the questionnaire.

Data are collected via a web-based survey that will be sent out to each MAJCOM Civil Engineering program office, and distributed to each base programming office. Programmers will be given advance notice of the questionnaire and data collection from their supervisors.

To ensure the anonymity of the participants, certain precautions are built into the database used to collect the data with the web-based questionnaire. First, the questionnaire and database are not stored on any of the participating organizations' servers; instead, the questionnaire and database are stored on the Air Force Institute of Technology's secure server. This makes it impossible for leaders from participating organizations to circumvent the researcher and try to access any identifiable data without the researcher's knowledge. Second, participants' access to the questionnaire is limited to only their responses. Finally, the database is protected by a password that is known only by the researcher making it impossible to access data. Still, organizational members that do not feel comfortable completing an on-line version of the questionnaire will offered the option to print a traditional paper version of the questionnaire so that they can complete it and return it directly to the researcher by mail.
In addition, all participants will be thoroughly briefed on the project's objective and their role prior to any participation. In addition, there is no deception involved in this study. Participants are told that the researcher is interested in exactly what is being asked and only that. Thus, the researcher does not try to "read between the lines" of any information provided by participants.

2.5. Data collected. No identifying information is obtained through the survey.

2.6. Informed consent: All subjects are self-selected to volunteer to participate in the questionnaire. No adverse action is taken against those who choose not to participate. Subjects are made aware of the nature and purpose of the research, sponsors of the research, and disposition of the survey results. A copy of the Privacy Act Statement of 1974 is presented for their review.

Because the message inviting participation comes from the member's supervisor, there may be some risk of coercion. However, the letter inviting participation stresses the decision to participate is voluntary. In addition, the questionnaire's instruction states, "Your participation is COMPLETELY VOLUNTARY. However, your input is important for us to understand the pattern of voluntary turnover. You may withdraw from this study at any time. Your decision to participate or withdraw will not jeopardize your relationship with your organization, the Air Force Institute of Technology, the Air Force, or the Department of Defense."

2.7. Risks to Subjects: Individual responses of the subjects will not be disclosed. Answers will only be grouped according to MAJCOMs, which will keep the anonymity of the participants intact. This eliminates any risks to the subjects as noted in paragraph 2. There are no anticipated medical risks associated with this study.

3. If you have any questions about this request, please contact Captain Josh Ligday - Phone 255-3636, ext. 4225; E-mail – Joshua.Ligday@afit.edu or Lieutenant Colonel Alfred E. Thal Jr. who will serve as the Faculty Advisor (primary investigator) – Phone 255-3636, ext. 4798; E-mail – Alfred.Thal@afit.edu.

//signed//
JOSHUA C. LIGDAY, Capt, USAF
Graduate Student, AFIT/ENV/GEM04

//signed//
ALRED E.THAL, JR., Lt Col, USAF
Assistant Professor of Management
Faculty Advisor, AFIT/ENV/GEM

APPENDIX D. SURVEY DISSEMINATION EMAIL

FROM: LIGDAY JOSHUA C CAPT/ENV

TO: MAJCOM CEP CORP BOXES

SUBJECT: Request for Dissemination of AFIT Thesis Survey

MAJCOMs:

I am a graduate student at AFIT doing my thesis on improving the NAF programming process in ACES-PM. I am surveying all Base Level programmers to determine if the proposed NAF changes to ACES-PM, recently proposed by a sub ACES-PM IPT NAF users meeting in Oct 03, are efficient and complete. The sub IPT met to come up with new business rules that improve NAF programming in ACES-PM. The results of this research effort will be used to give to the ACES-PM IPT recommendations for both additions and deletions to the proposed changes, along with an idea of how well these changes will be accepted within the Air Force programming community. The 33 question survey addresses the following issues: NAF programming knowledge and training, knowledge and training of NAF programming in ACES-PM, specific proposed changes to the NAF programming process in ACES-PM, and current programming practices that might affect how well the proposed changes work**. The feedback that is provided in this questionnaire will directly aid in the improvement of NAF project programming throughout the USAF.**

The sponsor for this research is Mr. William Marsh, HQ AFMC/CEPD, the chairman of the ACES-PM IPT.

I need your help in forwarding this survey (see survey link below) to your installation's programming offices. The survey only takes about 15-20 minutes at most to complete, guarantees anonymity, and is completely voluntary for the participants. Feel free to pass the survey on to those you know who have had recent base level ACES-PM NAF programming experience.

Please let me or my thesis advisor know if you have any questions, comments, or concerns about this survey and its intended purpose.

Also, please send me an email once you have forwarded the link to the required offices.

Thanks for your time and help in this research effort. The results will directly help the ACES PM IPT make the NAF programming experience better for everyone!

http://en.afit.edu/Surveys/Ligday/

Capt Joshua C. Ligday
Graduate Student, AFIT/ENV/GEM04
joshua.ligday@afit.edu (more preferred)
Phone 255-3636, ext. 4225

Lt Col Alfred E Thal, Jr
Thesis Advisor, AFIT/ENV/GEM
alfred.thal@afit.edu
Phone 255-3636, ext. 4798

VITA

Josh Ligday was born in St. Paul, Minnesota and attended Stillwater Senior High School. He studied at the University of Saint Thomas Minnesota for his first three years of college, and transferred to the University of Minnesota-Twin Cities for his last two years. Upon completion of his studies he earned a Bachelor of Arts in General Studies from the University of Saint Thomas, and a Bachelor of Science in Civil Engineering from the University of Minnesota. After commissioning, Lieutenant Ligday was assigned to the 5th Civil Engineer Squadron at Minot AFB, North Dakota. While at Minot he worked as a Pavements Engineer, Programmer, and Chief of Construction Management. Lieutenant Ligday was then assigned to the Air Force Institute of Technology to earn of Masters of Science in Engineering Management. He was also promoted to Captain while attending graduate school. His next assignment after graduation will be the Chief of Maintenance Engineering, 60th Civil Engineer Squadron, Travis AFB, California.

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Ligday, Joshua, C., Captain, USAF

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7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)
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8. PERFORMING ORGANIZATION REPORT NUMBER

AFIT/GEM/ENV/04M-12

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
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14. ABSTRACT

It is essential that businesses continually improve their automated information systems (AIS) to support the changing needs of the organization. The Air Force civil engineering organization is no exception since they have drastically improved their Automated Civil Engineer System (ACES) through end user support since its implementation in 2000. However, there are many problems associated with the non-appropriated funds (NAF) project programming business rules within ACES. These problem areas were not addressed until recently when an integrated process team met and proposed numerous changes to how NAF programming is accomplished in ACES. This research effort, through a web-based survey, focuses on the perceived benefits of these proposed changes from a base-level programming perspective. It also investigated current programming procedures that might affect how well the proposed changes are implemented along with NAF and ACES training issues. Descriptive statistics were used to answer the research questions using survey responses from a sample size of 35 base-level programmers.

The results indicated that programmers "agree" or "strongly agree" that the majority of proposed changes will be beneficial in improving NAF programming in ACES. However, several potential problems areas might surface, due to current programming procedures at base-level, when these changes are implemented into ACES. Automatic email notifications on project status, electronic attachments to the project file, and use of non ACES-PM templates are all areas of concern brought up in this research effort.

15. SUBJECT TERMS
Automated Civil Engineer System (ACES), Non-appropriated Funds (NAF), business rules, end user changes, automated information systems (AIS), information systems, Civil Engineering, project programming

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
REPORT	**ABSTRACT**	**c. THIS PAGE**			Alfred E. Thal, Jr., Lt Col , USAF (ENV)
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