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IMPROVING THE SIMPLIFIED ACQUISITION OF BASE ENGINEERING REQUIREMENTS (SABER) DELIVERY ORDER AWARD PROCESS: RESULTS OF A PROCESS IMPROVEMENT PLAN

THESIS

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THESIS

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and Logistics of the Air Force Institute of Technology
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Preface

The motivation behind this research was my desire to provide useful information to the dedicated cadre of operational contracting support personnel. Although my thesis focuses on SABER contract operations, managers of all functions may find some utility in examining my efforts.

Readers of this thesis will quickly see that it involved civil engineering personnel as well as operational contracting personnel. Coordinating with both organizations made sense since SABER is a civil engineering concern as much as it is an operational contracting concern.

Much applause goes to the managers of the Wright-Patterson Contracting Center's Operational Contracting Division. Always dedicated to quality improvement, these managers were willing to accept some constructive process criticism in order to raise their level of customer service.

I would like to thank God for all my human talents. I would also like to thank my wife, [redacted] for sacrificing much of her life so that I may "fill these squares." In addition, I would like to thank my advisor, Dr. William C. Pursch, a true professional, in every sense of the word.

This thesis is dedicated to my sister, [redacted]

Tom Armiak

Table of Contents

Page

List of Figures

Figure		Page

List of Tables

Abstract

This study sought to identify an improved process that could be used by the U.S. Air Force to award delivery orders under Simplified Acquisition of Base Engineering Requirements (SABER) construction contracts. To do this, the researcher applied a 12-step customized process improvement plan to the SABER delivery order award process at Wright-Patterson AFB. Telephone interviews were then conducted to determine if problem-related process activities at Wright-Patterson AFB existed at other operational contracting units within five Air Force major commands.

Interviews revealed 18 different SABER delivery order award processes being used at 45 bases. None of the processes matched Wright-Patterson AFB's process. In addition, each of the nine problem-related process activities identified at Wright-Patterson AFB was being used by 4% to 76% of the 45 interviewed bases.

Managers considering improving their SABER delivery order award processes can benefit from the researcher's documented process improvement efforts and from the flowcharts depicting the 18 reported SABER delivery order award processes. Managers can also examine Wright-Patterson AFB's SABER process problem-related activities to see if the potential exists for those same activities to cause problems in their own SABER processes.

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I. Introduction

Overview

This chapter provides an explanation of this study's general issue, purpose, objectives, scope, limitations, and assumptions.

General Issue

The U.S. Air Force has developed the Simplified Acquisition of Base Engineering Requirements (SABER) contract in an effort to improve methods for awarding Air Force construction contracts. SABER contracts are designed to reduce the lead time associated with purchasing minor construction and maintenance work by simplifying required contracting and engineering procedures. The history and distinguishing features of SABER contracts are reviewed in Chapter II.

Delivery Order Award Process. The Air Force Engineering and Services Center has published its SABER Execution Guide, prescribing procedures to be used jointly by contracting and engineering managers to award SABER delivery orders (13:29). The delivery order award process includes actions taken by contracting and engineering managers to fund the construction requirement, define the requirement with the contractor, develop an official Government estimate, and agree to cost and performance terms with the contractor. The processes used by contracting and engineering managers are based partly, if not solely, on the procedures outlined in the SABER Execution Guide.

SABER Survey Results. Results of a 1991 questionnaire survey of Base Contracting Officers and Base Civil Engineers assigned to operational U.S. Air Force bases indicate the most important result these managers need from their SABER programs as opposed to non-SABER construction contracting is a "quicker start of actual construction" (7).

When asked how good or bad their current SABER programs satisfy their needs, survey results show 73% of the responding managers feel their SABER programs do a good job of satisfying their needs (7).

Finally, results also show 92% of the responding contracting and engineering managers believe the SABER delivery order award process can be improved (7).

SABER construction requirements must go through the delivery order award process prior to start of construction. These preliminary survey results show contracting and engineering SABER managers feel SABER contracts (and the delivery order award process) do a good job of meeting their need for a quick start of actual construction. However, these same managers believe the process used to award SABER delivery orders can be improved.

Need for an Improved Process. The Air Force Engineering and Services Center has teamed with the Air Force Logistics Management Center to create a new policy guide that will provide SABER contract instructions to Air Force bases. The new policy guide will address several areas of SABER contracting, including a recommended process for awarding SABER delivery orders. With most SABER managers believing the current delivery order award process can be improved, the new SABER policy should include an improved process for awarding SABER delivery orders. This thesis study sought to develop an improved process that could be included in this new policy guide.

Purpose

The purpose of this research was to answer the following question: What improved process can be used by the U.S. Air Force to award delivery orders under SABER construction contracts?

Objectives

The following objectives guided the researcher's actions:

1. Locate an existing SABER delivery order award process.
2. Create a customized process improvement plan.
3. Apply the customized plan to the SABER process.

Scope

This thesis examined most actions required to award a SABER delivery order. However, engineering actions prior to first contact with either the contractor or contracting were not examined. In addition, actions after the contracting decision on whether or not to negotiate the requirement were beyond the scope of this research (except the decision whether or not to conduct a prenegotiation meeting, if necessary).

Limitations

Resource limitations did not allow development and testing of the "perfect" process for awarding SABER delivery orders. A more realistic approach of improving an existing process was used in this research.

Real people managed the existing process and were accountable for process results. Therefore, any process improvement efforts had to be agreed to by these "process owners" prior to implementation.

No reliable measurement system existed to determine how long it took the existing SABER delivery order award process to be run from start to finish. Several factors accounted for this limitation. First, the measurement system was to be applied to an existing SABER process. The process selected did not have standardized procedures. It would not have been sensible to compare measurements of delivery orders that are executed under different techniques. Second, people execute the SABER process. People are not machines and cannot be expected to perform in random behavior. The attitudes, health, perceptions of people within the process may dictate how the process is performed on any given day. Third, people within the process have changed. With different people executing the process, it is difficult to compare measurements of how the process was performed each time. Finally, each SABER project is unique. Critical factors such as project complexity and dollar magnitude may vary greatly from project to project. These varying factors impacted the pace at which the persons within the process performed process activities. All of these varying factors contributed to the nonavailability of credible, accurate measurements of the existing SABER delivery order award process under study.

Finally, the approach used by the researcher involved group dynamics. Along with the advantages of using groups comes some limitations. For example, within the group, most decisions were made by consensus, requiring the support of all group members. This decision making approach required more time than if a single person made decisions. However, the researcher did act as the initial group leader. He directed the pace and focus of group activity, but he did not have complete group control.

Other group limitations existed, including generating alternatives and ideas (for use as potential process corrections) that were usually based solely on group member experience. Hence, many feasible alternatives and viewpoints were not considered due to limitations in group member experiences.

Assumptions

This thesis focused on the process used to produce a SABER delivery order. Improvement efforts were applied to the process steps and activities. The end product, the delivery order, was assumed to have material characteristics that conformed to customer requirements. Therefore, there was no intentional focus on improving the material qualities of the end product.

Organization of Thesis

Chapter I contained an introduction to the study which included its general issue, purpose, objectives, scope, limitations, and assumptions.

The first part of Chapter II reviews the history and distinguishing features of SABER contracts. The second part of Chapter II contains a literature review concerning process improvement concepts.

Chapter III discusses the methodology used to achieve the objectives outlined in Chapter I.

Chapter IV shows the results of the process improvement plan applied to an existing SABER delivery order award process. Chapter V presents the researcher's conclusions and recommendations.

II. Literature Review

Overview

This chapter reviews literature concerning SABER contracts and process improvement concepts.

First, this chapter presents the history and distinguishing features of SABER contracts. Specifically the SABER contract's Army origins and implementation into the Air Force are reviewed. In addition, the features that distinguish SABER contracts from most non-SABER construction contracts are reviewed.

Second, this chapter reviews literature concerning process improvement concepts. Specifically, it shows how to define a process, explains what is meant by process improvement, tells why processes ought to be improved, shows process improvement opportunities, presents a summary of four different process improvement plans, and explains the process improvement tools of flowcharts and Process Action Teams.

SABER History

This section reviews the history of SABER contracting. An explanation of SABER's Army origins is followed by a look at how the Air Force implemented SABER.

Army Origins. The Facilities Engineering Office at Supreme Headquarters, Allied Powers Europe (SHAPE) awarded its first Job Order Contract in 1980. This indefinite quantity type construction contract was intended to strengthen the Army's military construction program.

> Historically, there had been a severe time lag of twelve to fourteen months from the time a minor construction project was conceived and designed until it was ultimately awarded under a contract. In addition, there were numerous problems with quality

of performance, contractor responsiveness to changes in requirements, high costs for excessively detailed design, and overly complex specifications. (13:7)

The Job Order Contract was designed to reduce the "planning, engineering, and contracting time required for all sizes of minor construction work by using simplified engineering and procurement procedures" (33:12).

For three years the Army tested the Job Order Contract concept for small dollar ($2,000 to $100,000) construction projects. Over one thousand Job Order Contract delivery orders were executed in each of the three years (13:7). At the end of this initial test, the Army was convinced that Job Order Contracts were effective.

The Job Order Contract's European success persuaded the U.S. Army Corps of Engineers to test the Job Order Contract at five locations within the continental United States. Test contracts were awarded in early 1986 at the following five locations: Fort Sill, Oklahoma, Fort Monroe, Virginia, Fort Ord, California, Aberdeen Proving Ground, Maryland, and Fort Bragg, North Carolina (13:7).

In 1988, the U.S. Army Corps of Engineers concluded their stateside Job Order Contract testing resulted in improved contractor support for facility managers and the elimination of many cost control, quality, and administrative problems (33:12). The Logistics Management Institute confirmed the Army's test results when it independently found the Job Order Contract brought the test sites: enhanced facility manager support, high construction quality, no negative impact on small and small disadvantaged businesses, and procurement cost savings (33:12-15).

Adding credibility to the Army's new construction contracting method, the General Accounting Office issued a July 22, 1986 opinion stating the Army's Job Order Contracts were consistent with applicable laws, regulations, and policy, to include: sealed bidding requirements, competition requirements, small and small disadvantaged business programs, architect/engineer selection procedures, and the balancing of risk between the Government and contractor (41).

Air Force Implementation. Soon after the Army began it's 1986 continental United States Job Order Contract test, the United States Air Force created its Work Order Contract, patterned after the Army's Job Order Contract.

In February 1986, Air Force Headquarters (HQ USAF/LEE) approved the implementation of the Work Order Contract at selected Air Force Logistics Command bases (13:7). McClellan AFB, California and Hill AFB, Utah were the initial Air Force Work Order Contract sites.

In May 1986, The United States Engineering and Services Center published the Work Order Contract Execution Guide for the benefit of Air Force bases which were testing or implementing a Work Order Contract (14:iii). This guide stated the Work Order Contract was "expressly intended for workloads too large in total volume to be supported by the base civil engineering shops, but requiring very little to no engineering design" (14:iii). The Work Order Contract was intended to provide a responsive mechanism for reducing the civil engineering work order backlog that existed at many Air Force bases.

In 1987, the Work Order Contract took on a new name: the Simplified Acquisition of Base Engineering Requirements (SABER) contract. The Simplified Acquisition of Base Engineering Requirements

Execution Guide was published to accommodate new SABER bases with the lessons learned from the earlier Air Force Logistics Command implementation (13).

Also in 1987, SABER was approved for voluntary, Air Force wide implementation as a result of favorable test results at the Air Force Logistics Command bases. Paving the way for further SABER use was the August 12, 1987 Comptroller General Decision denying a protestor's claim that SABER's indefinite quantity provisions prevented small businesses from competing on minor construction projects (18).

The Air Force SABER program gained momentum in 1988 when a Functional Management Inspection of the civil engineering-contracting base level interface recommended the "use of SABER techniques" to "reduce the time required to award contracts" (11:4).

In November, 1989, the Assistant Secretary for Acquisition, Director, Contracting and Manufacturing Policy (SAF/AQC) and the Headquarters United States Air Force, Director, Engineering and Services (HQ AFESC/DEM) jointly released a SABER policy guidance memorandum (10). This was the first formal Air Force policy issued on SABER since its 1986 introduction as a test program at McClellan AFB. Top leadership support of SABER was evident in the memorandum's opening paragraph:

> Since its introduction in 1986 as a test program, over $30 million in work has been accomplished with SABER. Our lead bases have fully explored its capabilities and found, without exception, that SABER is an outstanding tool that greatly improves Contracting and Civil Engineering responsiveness. (10)

In addition, this memorandum made it clear that the Base Civil Engineer "has full authority to use SABER at his discretion on projects that fully meet the definition of SABER" (10).

As of June 14, 1991, the Air Force Engineering and Services Center reported 67 Air Force bases with SABER contracts and 28 Air Force bases developing SABER contracts (12). Cumulative reported Air Force SABER dollars totalled nearly $240 million (12).

Distinguishing SABER Features

Distinguishing SABER construction contracts from most non-SABER construction contracts are their basis for award, contract type, option year provisions, drawings, Unit Price Book, specifications, and pricing coefficients.

Basis for Award. Air Force construction contracts have generally been awarded to the lowest price, responsible, responsive bidder. Sealed bid procedures are used to make award based solely on price and other price-related factors.

Most SABER contracts are competitively negotiated using streamlined source selection procedures, allowing the Government to evaluate each offeror's proposal based on price and other nonprice-related factors. Criteria for evaluating each offeror are developed by civil engineering and allow consideration of factors such as each contractor's past performance and construction management approach.

Contract Type. Traditional, non-SABER construction contracts are awarded for a specific project, at a specific time, place, and price. Because all contract requirements are project specific, an individual contract is awarded for each project, resulting in long lead times.

In contrast, an indefinite quantity contract allows for an indefinite amount of construction (within limits) to be furnished during a specified performance period, with deliveries scheduled by placing orders with the contractor (5:16.504). SABER contracts are normally firm fixed-price, indefinite quantity type contracts. Individual delivery orders for construction may be issued against the indefinite quantity contract throughout the contract term, eliminating the long lead time required for awarding an individual contract for each separate construction project.

To balance the Government's benefit of not specifying the exact amount of construction to be "ordered" under this type of contract, the contractor is guaranteed a minimum amount of work. The minimum quantity "must be more than a nominal quantity, but it should not exceed the amount that the Government is fairly certain to order" (5:16.504).

Option Year Provisions. Whereas construction contract performance periods normally span only the time required to complete one specific project, the option year provisions found in SABER contracts allow the Government to unilaterally extend the contract's performance period over several years. These option year provisions eliminate time and effort required to award a new SABER contract every year.

Drawings. Engineering design effort is reduced as compared to non-SABER construction contracts. Most SABER construction projects require simple drawings. Generally, Government engineers provide the contractor a rough sketch of the proposed construction. If more detailed drawings are required, the contractor normally provides them to the Government. However, drawings rarely reach the level of professional architect/engineer drawings because SABER projects are minimum design projects. "The decision as to what constitutes minimum design is the responsibility of the Base Civil Engineer" (10).

Unit Price Book. The Unit Price Book is a book containing thousands of prepriced construction materials. The book is developed by civil engineering and represents most materials expected to be used on SABER construction projects. The contractor's delivery order proposal and the Government's delivery order estimate are based on items selected from the Unit Price Book.

Each line item of material has a corresponding unit of measurement and price per unit of measurement. The Unit Price Book prices set the material and labor cost associated with each line item. The prices are determined by the Government and generally reflect the prices of materials in the area of performance.

Unit Price Book prices are fixed throughout the term of the contract. Typically, when developing a proposal for contract award, each offeror evaluates whether or not the Unit Price Book materials can be obtained at the listed price. Results of this evaluation are reflected in the offeror's pricing coefficient.

Materials listed in the Unit Price Book are referred to as "prepriced" items. Items not found in the Unit Price Book are known as "nonpriced" or "non-prepriced" items. Since no price book could feasibly contain every construction material used in projects not yet determined (as SABER allows), SABER projects generally contain a mix of prepriced and non-prepriced items.

During delivery order negotiations, prepriced item discussions are concerned with the quantity or actual need of these items. Since no time is spent negotiating the price of each item (price is set by the Unit Price Book), the lead time for each project is reduced. However, non-prepriced item discussions focus on the quantity, actual need, and price of each non-prepriced item. Consequently, a large amount of non-prepriced items will directly result in a longer lead time.

As a contract document, the Unit Price Book conveys to each offeror an "expectation" of what materials (and corresponding prices) are to be used under the SABER contract. In order to keep actual work performed (after contract award) in agreement with the work the parties bargained for at contract award, the Air Force and major commands have imposed limitations on the percentage of non-prepriced items that can be used on SABER projects.

Specifications. SABER contracts normally contain a "blanket" specification covering generalized work found in typical construction projects (carpet, concrete, roofing, etc). Specifications that are project-unique are written into each delivery order. Again, lead time is reduced since a separate specification is not developed for each construction project.

Pricing Coefficients. Included in SABER offeror's proposal is a "pricing coefficient." After contract award, this coefficient is multiplied times the summation of construction material line item dollars (prepriced and non-prepriced) in order to determine the delivery order price. For example, if the sum total of agreed upon line item dollars equals $48,000 and the contractor's pricing coefficient is 1.5, the resultant delivery order price is $72,000 ($48,000 times 1.5).

This multiplier effect of the pricing coefficient generally compensates the contractor for profit, overhead, subcontractor costs, and mobilization costs. The coefficient may also include other areas such as bonding costs and an adjustment factor for the difference between the Unit Price Book line item prices and the prices at which the contractor reasonably expects to obtain the same line items. The contractor may also include a price escalation factor if adequate indexing is not found elsewhere in the contract. What the coefficient includes depends on the specific provisions of each SABER contract. As with other SABER features, this pricing coefficient saves project lead time by forward pricing areas such as contractor overhead and profit.

The types of pricing coefficients vary among SABER contracts. Some contracts use different coefficients for prepriced and non-prepriced line items. Separate coefficients have also been applied to standard hours work and nonstandard hours work. Finally, some SABER contracts have pricing coefficients for each option year while other SABER contracts have coefficients for the base year only and apply a predetermined index to that basic coefficient in the option years.

This concludes the literature review concerning SABER contract history and distinguishing features. Because so much of this thesis concerns improving the SABER delivery order award "process," the remaining portion of this literature is dedicated to process improvement concepts.

Defining a Process

An essential element to process improvement is understanding what a process is. One formal definition of a process is "the transformation of a set of inputs which can include actions, methods and operations, into desired outputs, in the form of products, information, services or, generally results" (35:9). Here, the focus is on a transformation of inputs into some desired output. Figure 1 depicts this relationship.

Figure 1. Process as a Transformation of Inputs into Outputs

This input-output view of a process is "a cornerstone of systems theory" where "any operation comprises a series of interrelated steps or activities," each converting "inputs such as information and material into an output or work product" (30:27). The output then becomes the input for the next step. Systems theory says this series of steps is called a process and a "system" consists of several interrelated processes (30:27).

More simply put, a process can be defined as a series of related events. The process is shown by putting all tasks directed towards achieving an outcome in sequence. The tasks can be viewed as steps in the process (39:2.3). Using this explanation, the "process" of performing a construction site labor check might look something like Figure 2.

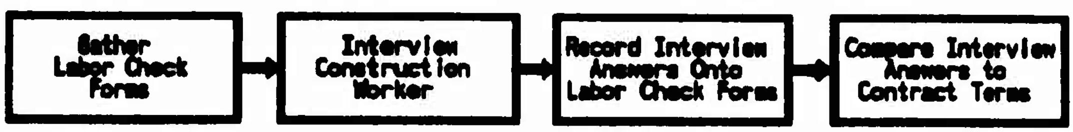

Figure 2. The Process of a Construction Site Labor Check

William J. McCabe, author of "Examining Processes Improves Operations," defines three generic categories of processes (28:26). The first category of processes includes activities performed by people within a department. For example, the process of "construction contracting" might consist of preaward construction activities and postaward construction activities, both performed by a single construction contracting department. The second category includes functional processes where all major process groups report to one middle manager. For example, the functional process of "contracting" might include service contracting, construction contracting, and commodities contracting, all of which report directly to the chief of contracting. Finally, business processes have major elements horizontally spread across an organization. The interaction of engineering, purchasing, and finance could be an example of a business process.

Bruce K. McGill, in his article "Return to Chaos," explains how a process should be viewed as "a collection of relationships" as opposed to a collection of items or events (29:55-57). He contends that you cannot fully understand how a process works until the elements of that process are pieced together. "When we put the components together, their interaction causes behavior that can't be predicted by looking at the components individually" (29:55). Because of this unpredictable behavior, the relationship between the process elements is essential to process definition.

What is Process Improvement?

Process improvement may be viewed as the elimination of process waste, the improvement of customer satisfaction, or the introduction of positive change.

Elimination of Process Waste. Process improvement can be viewed as the "elimination of waste" within the process (6). Waste is any process activity that does not add value to the product.

Improvement of Customer Satisfaction. Process improvement may also be defined as "the continuous endeavor to learn about the cause-and-effect mechanisms in a process to change the process to reduce variation and complexity and improve customer satisfactions" (32:64). Here, process improvement means making the process better in order to increase customer satisfaction.

Introduction of Positive Change. Put another way, process improvement means bringing positive change to the process (27:5.12). Any action that positively effects a process can be considered improvement.

Why Improve a Process?

As an essential part of a manager's job, process improvement can bring cost effectiveness, worker confidence, smart technology investment, and improved customer service. These points are explained below.

Part of Manager's Job. Managers must see process improvement as an essential part of their job. "Many managers come to their positions with the idea that their job is to assure that work is accomplished in accordance with established processes" (27:3.14). Instead of viewing their office structure and work processes as being fixed, managers should consistently study and reform their work processes (27:3.14). Process improvement contributes to overall organization improvement and is expected from performance-oriented managers.

Cost Effectiveness. As processes are improved, they are executed more effectively. "Productivity goes up as waste and inefficiency go down. Customers get products and services of increasingly higher value at increasingly lower costs" (39:1.9).

Worker Confidence. Process improvement also brings confidence to those working in the process. That worker confidence will positively influence customer satisfaction. Armand Feigenbaum notes that emphasis on "processes that people throughout the organization believe in and are part of, and that provide genuine help to individuals" are essential to creating a work environment where the main focus is on satisfying the customer's needs (19:17).

Technology Investment. Processes should be free of inefficiencies, waste, and other non-value items before an organization invests in new technology to accommodate that process. Otherwise, new technology investment would only reinforce the bad work practices within the process, "institutionalizing old problems in the new systems" (27:4.58). If no technology upgrade is anticipated, process improvement will allow an organization to make the best use of its existing technologies (27:4.59).

Customer Service. W. Edwards Deming sees organizations as "systems designed to serve customers" (39:2.3). These systems are made up of processes. "To excel at meeting customer needs, an organization must constantly improve these systems" (39:2.3). Bottom line: Process improvement brings increased customer satisfaction.

Process Improvement Opportunities

Defining a process, understanding what process improvement is, and realizing why a process is improved are not enough to ensure process improvement. Specific targets or "process improvement opportunities" must be identified. Listed below are some of the more common ways a process can be improved.

Reduce the Number of Process Steps. Many processes have too many steps. Eliminating unnecessary steps in a process may result in cost savings due to fewer expended resources. In addition to cost savings, elimination of unnecessary steps will reduce the number of possible interactions between process elements, thus reducing unwanted process complexity (29:57).

Eliminate Redundant Steps. Steps that perform the same operation should be combined or eliminated.

Eliminate Non-Value Steps. "Over time, reorganizations, moves, quick fixes, poor design, management control techniques, and numerous other sources introduce non-value-added steps into processes" (27:4.37). These steps should be eliminated.

Eliminate Quick-Fix Steps. As noted above, resources are often committed to a process in order to cover up a problem or to provide a temporary fix to a problem. Focus on eliminating the source of the problem as well as eliminating these "quick-fix" steps.

Strengthen Upstream Processes. In his book, An Introduction to the Continuous Improvement Process, Brian E. Mansir emphasizes that upstream processes, processes that happen early in a system, significantly effect the performance of later processes (27:4.80). The concept can be also be applied to elements within the same process. It is possible to "minimize downstream problems, disruptions, and product changes" by intensively managing elements that occur early in the process (27:4.80).

Mistake-Proof the Process. Author Joseph R. Tunner advocates "installing practices and/or devices that make it difficult or impossible to do a task incorrectly" (40:49). He terms this practice "mistake-proofing." Tunner uses the example of a "sales clerk circling the expiration date on a credit card form as a positive reminder that it was checked" (40:49).

Fail-Safe the Process. The Department of Defense's Total Quality Management Guide promotes fail-safing as a way to improve a process (15:9). Fail-safing a process means making it "impossible for the operation to continue if things are not done exactly right" (40:49). Mansir uses the term "One-Stop, All-Stop Flow Control" to describe his fail-safing method where if "one stage of the process has a major problem and must shut down for correction, all other stages of the process will automatically stop after reaching a predetermined quantity of completed work in its holding area" (27:4.95). This, as Mansir explains, is important if a downstream problem is caused by something upstream in the process. Since the entire process will stop until the problem is fixed, the amount of errors can be kept low, regardless of which element in the process caused the problem.

Ensure Quality Documents. Many processes involve some paperwork. In addition, many of the actions performed within the processes are dependent on the information presented in the paperwork. In order to avoid confusion stemming from poorly written documents, documents should be explicit, unambiguous, and "written at the level of the person receiving it, not of the person who wrote it" (37:60).

Reduce Environmental Influence. Environmental influences such as external reviews and regulations can impact process performance. Processes should be designed to operate effectively, regardless of the magnitude of environmental influence being exerted on that process (29:57). In addition, a process should be designed to maximize the amount of "flow" it possesses. Flow is the process's ability to operate without environmental influence for a long time (29:57). One way to increase the amount of process flow is to reduce the amount of required process supervision.

Remove Sociocultural Barriers. "Sociocultural barriers are real or perceived inhibitors of communication, association, or equality among groups" (15:4). Process improvement is difficult when these types of barriers exist within an organization. An example of a sociocultural barrier is where two groups interact to perform a process and one group feels it is superior to the other.

Increase Trust. Process improvement requires trust among personnel within that process as well as trust between those performing the process and those supervising the process. Within the process, distrust may bring lengthy document reviews and other improvement roadblocks. Supervisors or regulators who do not trust those within the process will impose a large amount of supervision and process controls. Either increase the trust with the people you currently have, or find personnel with whom trust is possible.

Eliminate Special Causes of Variation. "Special causes of variation are not typically present in a process. They occur because of special or unique circumstances" (38:8.5). A process will be unstable as long as it is subject to special causes of variation. An example of a special cause bringing variation to a process is where a person critical to process execution is given the additional duty of planning the company picnic, causing delay within the process. That special cause of variation could be eliminated by exempting that person from additional duties or by replacing that person with someone who is less likely to be assigned an interfering task.

Eliminate Common Causes of Variation. Common causes of variation are "process inputs and conditions that regularly contribute to the variability of process outputs" (38:8.6). This type of variation is frequently resultant from a large number of small sources of variation. "The sum of these small causes may result in a high level of variation or a large number of defects or mistakes" (39:2.13). An example of a common cause of variation is where a process shares a single printer with another process. Here, printer time varies with the number of items in the print queue. Another example would be where a purchasing department must complete certain paperwork only when the dollar amount of the purchase exceeds a given threshold. In these cases, the common causes of variation may be eliminated by dedicating a single printer to each process or by restricting purchases to a certain dollar threshold.

Commercialize Process Activities. Many times, military equipment or military process activities have commercial substitutes. Replacement of the military item or activity with acceptable commercial substitutes may lead to cost or time savings. For example, the time spent designing and pricing a construction project that has unique military requirements might be reduced if an acceptable commercial design and price was readily available. Another example is the use of acceptable commercial computer software instead of military unique software. Here, several experienced civilian software support companies could provide swift repair service if software problems were causing a process delay. The time to troubleshoot the problem might be longer if military unique software was used.

Other Improvement Opportunities. Several other improvement opportunities exist. These include: standardizing forms, improving equipment, enhancing materials, eliminating rework, minimizing inspection, minimizing checking/clarifying, minimizing inefficient meetings, using modular designs, reducing work in progress, enhancing safety, and increasing worker incentives (15:9)(30:30)(38:1.8).

Process Improvement Plans

A systematic process improvement plan will help identify process improvement opportunities and provide a framework for continuing improvement actions. Presented below is a summary of four different process improvement plans.

Department of Defense Plan. The Department of Defense's Total Quality Management Guide introduces a process improvement plan as part of an overall total quality management strategy (15:38-43). The basic steps of this plan are shown in Figure 3.

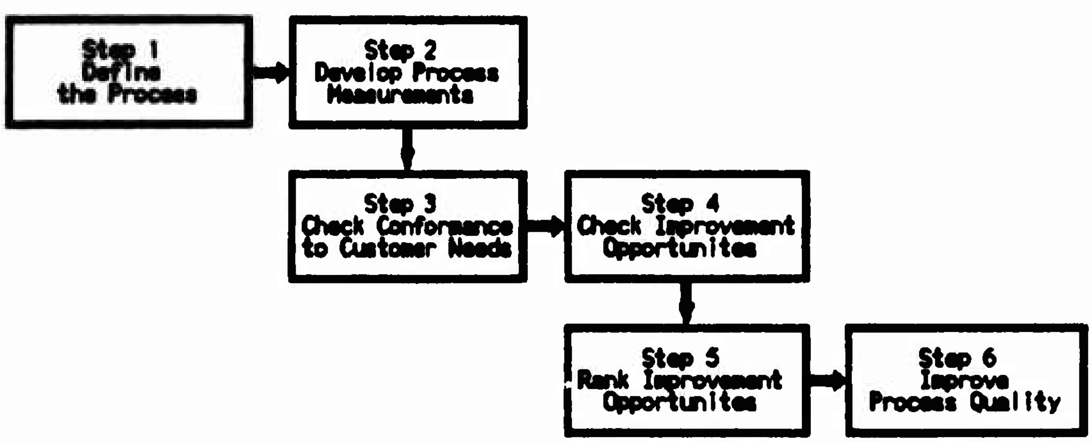

Figure 3. Department of Defense Process Improvement Plan

Step 1. Define the Process. Here, the objectives are to understand the process, identify process owners, and identify the role of process members. This includes defining process boundaries, inputs and suppliers, outputs and customers, and major processes and flows.

Step 2. Develop Process Measurements. The objective of this step is to determine what performance measurements are critical to the process and how to establish measurements with respect to customer requirements. Actual performance measurements are taken once measurement criteria are established.

Step 3. Check Conformance to Customer Needs. This next step focuses on assessing customer and supplier requirements and on the separation of special causes of variation from common causes of variation. Special causes of variation are removed and common causes of variation are highlighted.

Step 4. Check Improvement Opportunities. The objectives of this step are to analyze process improvement opportunities and to eliminate non-value-added steps. Other process steps are simplified.

Step 5. Rank Improvement Opportunities. Here, the remaining process improvement opportunities are identified and ranked in order of importance.

Step 6. Improve Process Quality. Finally, the highest priority improvement opportunity is investigated. A plan is developed, root causes are identified, and solutions are tested and implemented. The process is standardized once all improvement opportunities are investigated.

Mansir's Plan Continuous Improvement Process Plan. Brian Mansir's Continuous Improvement Process "is a means by which an organization creates and sustains a culture of continuous improvement" (27:v). Part of this Continuous Improvement Process is a plan for improving specific work processes. Figure 4 shows the key steps in this plan (27:5.12-5.19).

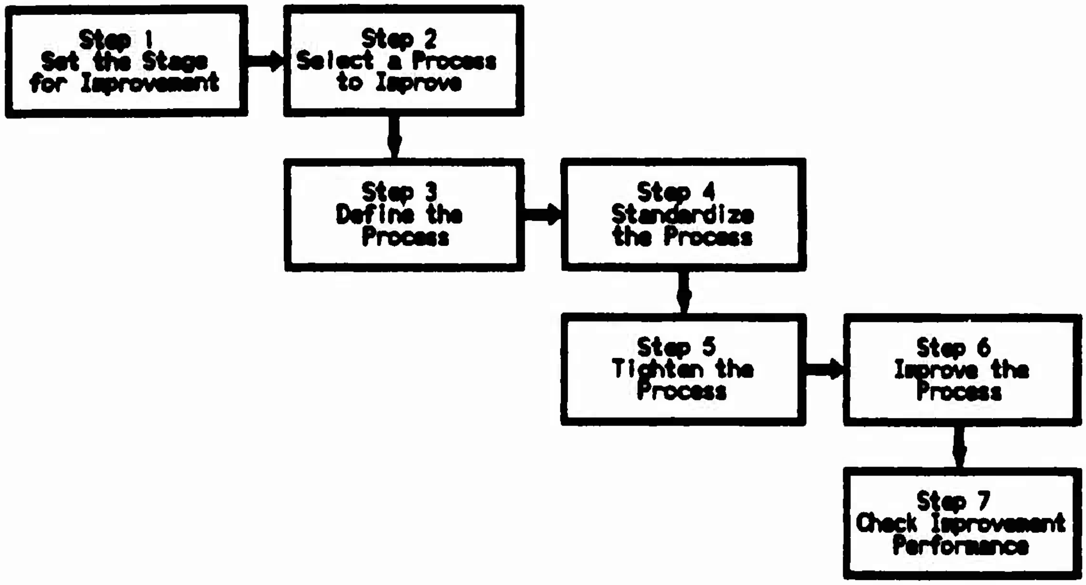

Figure 4. Mansir's Continuous Improvement Process Plan

<u>Step 1. Set the Stage for Improvement</u>. This first step includes things the organization does to get ready for process improvement. Efforts focus on the improvement environment. Specific activities include team formation and training, ensuring management commitment, and goal setting.

<u>Step 2. Select a Process to Improve</u>. Here, the improvement team selects one process to improve. The team then identifies major process problems and their root causes. An improvement plan is developed and measurement points are identified.

<u>Step 3. Define the Process</u>. Now the team determines who the process customers and suppliers are. A flowchart is then developed to show how the process is currently performed. Measures of process performance are identified.

<u>Step 4. Standardize the Process</u>. In this step the current method of performing the process is identified and documented. This

becomes the standard. Management ensures workers are trained and work towards that standard. Deviations from the standard are investigated and the causes of deviation are removed. The standard always shows the best current way of performing the process.

Step 5. Tighten the Process. This part of the improvement plan cleans up the process to ensure step 6 is implemented as easily as possible. Typical tightening actions are: cleaning/straightening the work areas, eliminating unnecessary equipment, and establishing reliable data collection systems.

Step 6. Improve the Process. Now the improvement team will use their improvement plan to implement proposed process improvement solutions, check for actual improvement, and integrate the successful improvements into the process.

Step 7. Check Improvement Performance. Finally, the team will document the improved performance and record the efforts that generated the improvement. The process definition will be updated and the improvement will be incorporated into process standards. Follow-up actions are devised to ensure the implemented improvement sustains its success.

Reliability Analysis Center's Continuous Improvement Strategy Plan. The Reliability Analysis Center, under contract to the Rome Air Development Center, has developed the book entitled A Guide For Implementing Total Quality Management. Within this book is a process improvement plan the Reliability Analysis Center calls the "Continuous Improvement Strategy" (38:8.11). Figure 5 shows the eight steps that make up this plan (38:8.11).

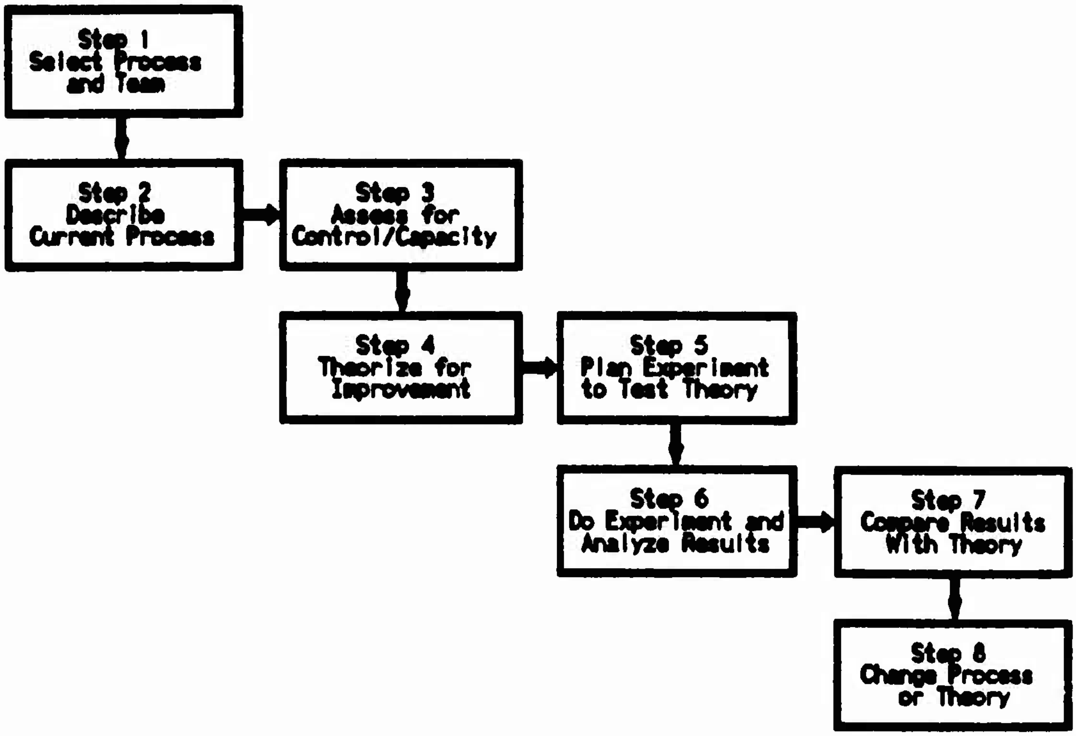

Figure 5. Reliability Analysis Center's Continuous Improvement Strategy

<u>Step 1. Select Process and Team</u>. This first step involves selecting a process to improve, forming a Process Action Team to work the process improvement, and identifying process suppliers and customers. Ideally, the Process Action Team should be include members who work within the process as well as supplier and customer representatives.

<u>Step 2. Describe Current Process</u>. Next, the Process Action Team will define customer-supplier relationships and determine if the customer's quality requirements are being met. The customer and supplier must agree on the performance specifications and how quality will be measured. In addition, a flowchart is constructed showing how the process is actually being done. A Cause and Effect Diagram is used to identify possible causes of process variation.

Step 3. Assess for Control/Capability. Now the team will assess the process's current measurement system to see if the data in existence is worthy of contributing to the team's efforts. If not, new baseline values for output and input measures are established. Statistics are then used to construct control charts for the quality characteristics that are important to the customer. Items not within the thresholds established on the control charts are investigated and ideally, their root causes of variation are eliminated.

Step 4. Theorize for Improvement. In this step, the team will brainstorm possible improvement opportunities. Improvement opportunities are prioritized and initial thoughts on how to test the improvement are generated.

Step 5. Plan Experiment to Test Theory. Now the team will devise a specific plan for testing the improvement theory identified in the previous step. The team decides on what information needs to be gathered, how they plan on getting that information, and what they plan on doing with the information once they get it.

Step 6. Do Experiment and Analyze Results. This step implements the plan devised in the previous step. Data is collected to measure the effect of the tested improvement. That data is then analyzed using statistical tools.

Step 7. Compare Results With Theory. Results of the experiment are now compared with the theorized results. The team decides on whether or not the process has been improved.

Step 8. Change Process or Theory. If the experiment results were not positive, a new improvement theory is developed and the team goes back to step 4. If the results of the experiment brought improvement, the change is implemented into the process and the team returns to step 2 to update process documentation. The team will decide if further improvement is necessary.

<u>Scholtes' Five-Stage Plan</u>. Peter Scholtes' <u>Team Handbook</u> presents the "Five-Stage Plan for Process Improvement" (39:5.18-5.25). This plan is shown in Figure 6 (39:5.19).

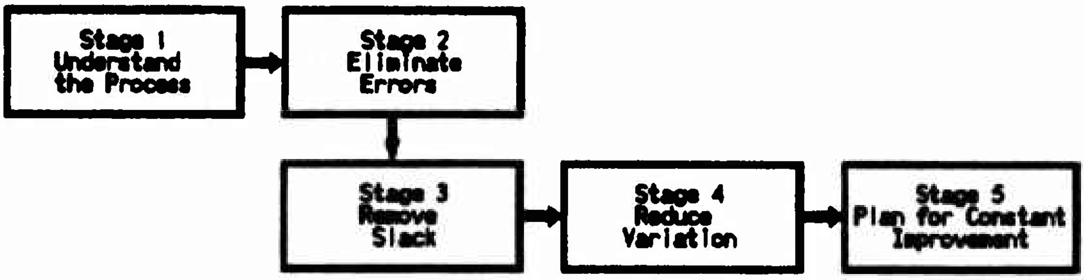

Figure 6. Scholtes' Five-Stage Plan for Process Improvement

<u>Stage 1. Understand the Process</u>. Initially, a process improvement team is formed. The team will determine how the process currently works, what the process is supposed to accomplish, and what is the best known way of executing the process. The team will flowchart the process and set process boundaries in order to describe the process. In addition, customer needs and concerns are documented. Finally, a standard process is developed in order to get everyone to consistently use the same procedures. This must be done before further process study. Obvious errors in the process may become evident in this step. Efforts are made to eliminate these obvious errors.

<u>Stage 2. Eliminate Errors</u>. Now the team will error-proof the process. First, mistakes that occur at each process step are identified. Next, the team assesses potential changes that would reduce errors. Examples of potential changes are changing an error-prone form

and introducing a checklist. New procedures might even be introduced at this point.

Stage 3. Remove Slack. This stage calls for the critical examination of each step in the process. Steps that do not add value to the end product are eliminated. Inventory levels and lot sizes at each step are reduced. In addition, the time it takes the product or form to get through the entire process, or cycle time, is reduced. As these changes are made, the improvements are monitored.

Stage 4. Reduce Variation. In this stage the team will eliminate common causes of variation and special causes of variation. The team first ensures the measurement processes have no variation. Once the measurement processes are reliable, the team looks at the process steps. Control charts are used to identify items or events that are not within specification. Root causes of the problems are identified and removed. In addition, the team will look for places in the process where different conditions or procedures may lead to different process results. Every effort will be made to eliminate or reduce these sources of variation. Finally, control charts will be used to ensure the process is within customer requirement thresholds.

Stage 5. Plan for Constant Improvement. With most obvious sources of problems eliminated from the process, the team will now look for ways to continually improve the process. Process changes are planned, implemented, checked, refined, and standardized. For each process change test, lessons learned are documented.

Flowcharting the Process

Each of the four process improvement plans described earlier calls for a descriptive examination of the process under study. When examining any process, it is essential to record the elements of the process in a form that can be easily understood. This recording of the process "will provide the basis of any critical examination necessary for the development of improvements" (35:69). A common way to depict a process is through use of a flowchart. A flowchart is a "step-by-step schematic picture used to plan stages of a project or describe a process being studied" (39:2.18).

Flowchart Types. Peter R. Scholtes, in his book entitled The Team Handbook, explains several types of flowcharts (39:2.18-2.24). His description of the top-down flowchart and the detailed flowchart will be explained in this section.

Top-down Flowcharts. In a top-down flowchart, the major steps of a process are depicted and major elements within each step are listed directly below. Figure 7 is an example of a top-down flowchart.

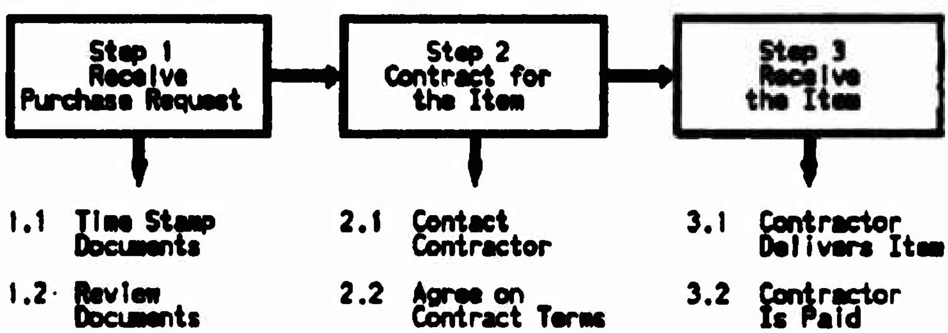

Figure 7. An Example of a Top-down Flowchart

This type of flowchart is easy to construct and focuses on what should happen in a process as opposed to what does happen. This is possible since the major steps do not include complexity (steps put in to fix problems that should not occur in the first place).

Detailed Flowcharts. A detailed flowchart has more information than a top-down flowchart. This type of flowchart shows all steps in a process, including those complexity items mentioned above. Figure 8 is an example of a detailed flowchart. A detailed flowchart may provide unnecessary detail and can take a long time to construct. Therefore, detailed flowcharts should be used only when absolutely necessary.

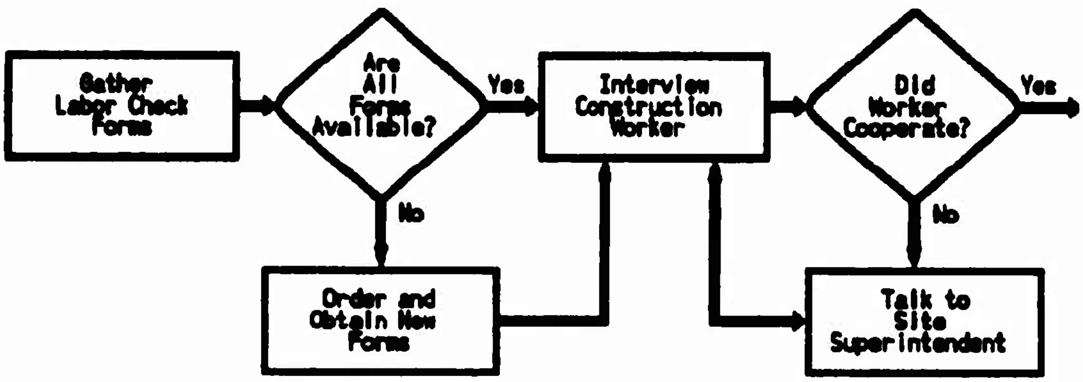

Figure 8. An Example of a Detailed Flowchart

"The easiest and best way to understand a process is to draw a picture of it - that's basically what flowcharting is" (4:64). A good flowchart is one that is understood by those who use it.

Flowchart Symbols. The flowchart symbols must have consistent meanings to ensure a common understanding among flowchart users. The Federal Government's Federal Information Processing Standard Publication 24 prescribes the use of the standard set of flowchart symbols adopted by the American National Standards Institute (1:1-17). Shown in Figure 9 is a review of the basic flowchart symbols found in American National

Standard X3.5-1970, Flowchart Symbols and Their Usage in Information Processing (1:1-17). The text that accompanies each symbol in Figure 9 was taken from Joseph M. Juran's book entitled, Juran's Quality Control Handbook (25:6.7).

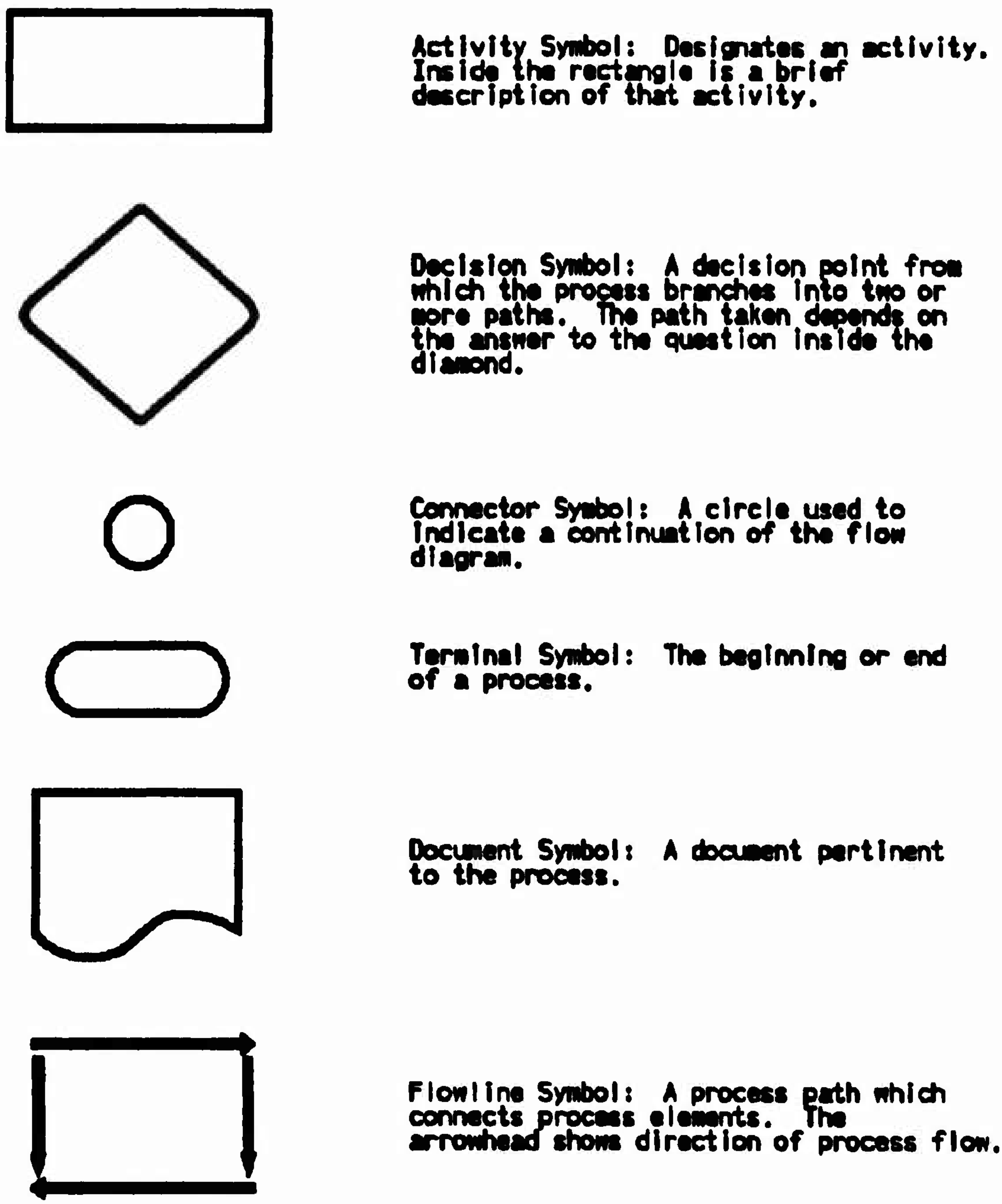

Figure 9. Basic Flowchart Symbols

Process Action Teams

People must use the process improvement plans and tools mentioned earlier in this chapter in order for actual process improvement to occur. "Teaming" people is one method of organizing the human element of process improvement. "A team is a group of individuals who must work interdependently in order to attain their individual and organizational objectives" (24:157). This section reviews why teams are used, defines a Process Action Team, and shows what personnel act as Process Action Team members.

Why Teams are Used. In an article concerning participative management, author Marshall Sashkin contends that, for "people who spend most of their time working together as a group, the group method of participation obviously makes most sense" (36:228). Using this group method of participation, teams can bring synergy, combine interdependent resources, and provide a support base for its members.

Synergy. Teams have the potential to develop more good ideas than the same number of individuals working independently. The synergy of a team is potentially greater than the sum of the combined energies of its members (36:235)(24:159).

Combined Interdependent Resources. Most products and services today are too complex and specialized for any one individual to accomplish alone. The resultant complex organizations bring interdependencies between people. These interdependent people must be brought together to deal with the problems, planning, and implementation of change. The focus of a team is to combine, rather than coordinate, these interdependent resources (36:235)(24:159).

Support Base. Use of individuals in group actions helps develop a support base for any resultant solutions, decisions, or changes. This social and emotional support base provides a more satisfying and productive work environment for team members (36:235)(24:159).

Process Action Team Definition. A Process Action Team is one type of team that can be used for process improvement. It is a team specifically formed to review a process and seek ways to improve its overall performance (3:28). Tasked with process improvement, a Process Action Team seeks to inject quality into every step of a process, eliminating the need for quality control measures at the end of the process (3:28).

A Process Action Team is not a Quality Circle. Quality Circles are generally "problem" oriented and involve workers who share a common work area. Many times the Quality Circle members decide which problem will be investigated.

On the other hand, Process Action Teams are "process" oriented. Team members represent workers involved in the process, not necessarily those from the same work area. In addition, team members receive their mission and direction from some higher-level management authority (38:5.6).

Arguing that most Quality Circles fail to improve processes, author Joseph C. Bowman advocates the use of "natural work groups" (2:38). A natural work group is a "group that normally works together to accomplish a result" (2:38). A Process Action team is one such natural work group since its members normally work together within the process being improved.

Process Action Team Members. In developing its most recent quality initiatives, Air Force Logistics Command recognized that "workers themselves knew best how to improve the products and processes they faced everyday" (3:28). Put another way, "the minds of the individuals who are engaged in a process are the best source of ideas for improving that process" (27:3.21). Thus, team members are usually people who work within the process being improved. These team members receive training in process improvement tools and techniques.

Taking this concept even further, authors Moen and Nolen contend the team chosen to work on improving a process "should include people working in the process, people in authority to change the process, upstream suppliers, downstream customers, and related experts" (32:65). The Process Action Team concepts incorporates this belief. Although only selected people working in the process are usually referred to as Process Action Team members, many others are involved throughout the Process Action Team's process improvement efforts. People in authority to change the process (process owners) may be part of the team's management direction or they may actually be team members. Upstream suppliers and downstream customers are routinely involved in Process Action Team actions, especially when determining customer needs and quality requirements. Finally, experts are often consulted when the team does not have the required inherent subject knowledge. As a result, the Process Action Team involves all personnel who have some impact on the process under study.

The Process Action Team is usually guided by a "facilitator." The facilitator helps the team leader "prepare for the PAT meeting, observe the actual meeting, review the minutes, and nurture the team dynamics and process improvement" (38:6.3).

Chapter Summary

This chapter reviewed the history and distinguishing features of SABER contracts. Specifically the SABER contract's Army origins and implementation into the Air Force were reviewed. In addition, the features that distinguish SABER contracts from most non-SABER construction contracts were reviewed.

This chapter also reviewed literature concerning process improvement concepts. The explanations of how to define a process, what is meant by process improvement, why processes ought to be improved, and different process improvement opportunities lay the groundwork for the summary of the process improvement plans also presented. The process improvement tools of flowcharts and Process Action Teams were also reviewed. All of these items provide a basis for the research methodology presented in the next chapter.

III. Methodology

Overview

This chapter describes the methodology used to accomplish the research objectives stated in Chapter I:

1. Locate an Existing SABER Delivery Order Award Process.
2. Create a Customized Process Improvement Plan.
3. Apply the Customized Plan to the SABER Process.

How the researcher accomplished these objectives will now be discussed.

Research Objective Number One

The researcher selected Wright Patterson-AFB Contracting Center's SABER delivery order award process for this study. The prime factors affecting this selection were resources, type of SABER contract, and the degree of management commitment.

Resources. Limited money for travel expenses forced the researcher to find a process near or on Wright-Patterson AFB. Time constraints also dictated that a nearby process be chosen in order to minimize travel time and allow timely face to face communications with process participants.

Type of SABER Contract. The Wright-Patterson AFB SABER delivery order award process was based on a contract type that was typical of most SABER contracts. Refer to Chapter II for a review of typical SABER contract elements.

Degree of Management Commitment. At the time of research, the Wright-Patterson Contracting Center had a very aggressive process improvement program. Many of its people were trained in process improvement techniques and had participated in process improvement efforts.

Research Objectives Number Two and Three

A review of process improvement literature, outlined in Chapter II, led the researcher to develop a customized process improvement plan, based on the principles within the literature review. A customized process improvement plan considers any special circumstances within the process improvement effort. The limited amount of research time, the high instability of current SABER process activities, and the small number of SABER process experts available for improvement efforts all impacted the way the researcher's customized process improvement plan was developed. Described below are the 12 steps to the researcher's customized process improvement plan. Specific application results can be found in Chapter IV.

Step 1. Obtain Management Commitment. Management commitment was essential to keeping the work environment "ripe" for improvement. The researcher conducted informal, unstructured discussions with the Wright-Patterson Contracting Center quality representative to ensure top-level support of SABER process improvement existed. In addition, the researcher conducted similar discussions with the SABER delivery order award process owners. Since the contracting and civil engineering organizations both participate actively in the process, discussions were held with the two process owners who were accountable and responsible for the process actions performed by those two organizations. Step two was pursued once the researcher was convinced these managers were willing to show support, dedicate people and other resources, and allow their SABER process to be used as a subject for serious improvement efforts.

Step 2. Form Process Action Team. A team of knowledgeable experts was assembled to act as the nucleus of process improvement. The team consisted of the researcher and persons from contracting and civil engineering who perform SABER process activities at Wright-Patterson AFB. This team worked together to execute the remaining steps of this customized process improvement plan. The team was called a Process Action Team. An explanation of the Process Action Team can be found in Chapter II.

Step 3. Review Customer Needs. The process under study was designed to meet specific customer needs. All improvement efforts were focused on how best to meet those needs. Process customers are generally divided into two categories, external and internal. External customers are those who purchase the product or service and internal customers are employees working within the process "whose work depends on the work that precedes them" (39:1.11). Working from this definition of the customer, the civil engineering organization was considered to be the external customer and the contracting organization was considered to be the internal customer. Conveniently, the process owners identified earlier were also the main customer representatives since the process customers were the persons performing the process. The researcher conducted informal, unstructured discussions with these customer representatives to determine what results they needed most from their SABER delivery order award process. These most needed results were the measurement criteria upon which all future improvements were based.

Step 4. Describe Current Process. A description of the SABER delivery order award process was necessary to provide a common understanding among those involved in the improvement effort. The Process Action Team discussed where the process under study would start and end (process boundaries). All process activities within these boundaries were flowcharted to show how the current process actually worked. Flowchart accuracy was verified by team members actually tracing an active delivery order through the flowcharted process.

NOTE: The researcher was not able to progress beyond the first five steps of this customized process improvement plan. Chapter IV explains why the remaining steps could not be carried out, as originally intended.

Since progress could not be made beyond the beginning of step five, the researcher had to modify his research methodology. Since the modified methodology was a "result" of using this customized process improvement plan, the methodology modification is described in Chapter IV (along with results from steps one through five).

Steps five through twelve will now be fully described to provide a full understanding of the researcher's customized plan. Since these particular steps were not applied as originally intended (step five was only partially executed), the following text will show the intended actions and intended results for each step.

Step 5. Make Simple Improvements.

Action. The flowcharting activities of the previous step would point out some obvious process problem areas that could be corrected with simple team actions. Things like redundant steps, mishandling of paperwork, and unneeded coordination would be investigated and simple corrective changes would be made to the process. Because no accurate measurement baseline existed yet to allow objective improvement calculations, the team would subjectively decide, using consensus decision making, whether or not improvement had occurred.

Result. A revised process flowchart indicating where simple improvements have been made.

Step 6. Standardize the Process.

Action. Prior to investigation by the Process Action Team, the Wright-Patterson AFB SABER delivery order award process had been under a state of constant change. Process steps, guidelines, and players have all changed frequently since the governing contract was awarded. Because of this instability, it was impossible to develop credible process measurements (since each delivery order has been processed differently) and it was impossible to determine proper measurement points (since the process activities have constantly changed). However, steps 4 and 5 of this plan would have documented the process and removed simple problems. Process owners would now allow the Process Action Team to be involved with any further process changes in order for the team to determine acceptable process measurement points. Once this is done, baseline measurements would be taken. From here on out, improvement efforts would be compared to these baseline measurements to determine if improvement efforts are successful. For example, if speed of the process was the measuring criteria, the speed of the process would be measured and this measurement would become the reference point to which all further improvements are compared.

Result. Baseline process measurements reflecting how well the process currently meets customer needs.

Step 7. Establish Realistic Goals.

Action. The SABER delivery order award process has been too unstable to develop realistic process goals prior to this step.

Personnel changes, process activity changes, and learning curve changes associated with a new contract all contributed to the instability.

A point of clarification needs to be made here. This research project was geared towards improving an existing process. It did not focus on developing a new process to meet customer needs. If a new process were to be developed, process goals would have been determined earlier, based solely on identified customer needs. However, since this is a study based on improving an already unstable process, it did not make sense to establish goals prior to this point since expectancies of the process would not be realistic nor credible. Now that the process would be "settled down," the researcher would conduct informal, unstructured discussions with process customerr to determine their realistic process goals.

Result. A clear statement of customer goals based on a realistic assessment of process capabilities.

Step 8. Attack Process Variation.

Action. The Process Action Team would now investigate why the standardized process may vary from one delivery order to the next. Common causes of variation and special causes of variation would be identified. Solutions would be suggested for eliminating those causes. The team would decide on a consensus basis which solutions to implement. The process would be changed to reflect the solution and one or more delivery orders would be processed through the changed process. The team would then measure the measurement criteria at the measurement points and compare the results with previous process performance to judge whether or not actual improvement had taken place. Successful process changes would be incorporated into the process standard. The standard would always reflect the best known way of executing the process. The team would decide how many times this step would be reiterated before advancing to step 9.

Result. A list of identified causes of process variation, a prioritized list of potential process changes needed to eliminate or minimize the variation causes, a description of the tested process change(s), the measured impact of the tested change(s), and a new flowchart depicting the updated process standard which now includes tested improvements. Unsuccessful process changes would be documented along with suspected reasons for failure.

Step 9. Evaluate Similar Processes.

Action. Now the team would need fresh ideas to keep improvement motivation high. Most of the team's own ideas on how to improve the process would have been brought out in step 5 or step 8. However, the researcher anticipated the team would still feel certain areas within the process could still be improved. It is here that the researcher would perform informal telephone interviews with SABER delivery order award process participants at other locations. The discussions would address how the other units perform the SABER process actions of concern. The results of these discussions would be documented and presented to the Process Action Team in the next step.

Result. A prioritized list of areas of concern identified by the Process Action Team and documentation showing how the interviewed process participants execute the areas of concern.

Step 10. Implement New Ideas.

Action. Now the Process Action Team would review the results of the telephone interviews conducted in the previous step. The team would evaluate the different ideas and prioritize the ideas the team saw as being "workable." The highest priority ideas would be investigated and a plan for incorporating these ideas would be devised. The proposed changes would be implemented into the current Wright-Patterson AFB process and measurements would be taken to see if actual improvement occurred. As earlier, the process standard would be updated with improvements.

Result. A prioritized list of new ideas the team viewed as being feasible, a description of the tested process change(s), the measured impact of the tested change(s), and a new flowchart depicting the updated process standard which would now include tested improvements. Unsuccessful process changes would be documented along with suspected reasons for failure.

Step 11. Check Process Against Regulations.

Action. The remaining process would be checked against SABER process regulations, reports, and policies. The researcher would compare all aspects of the improved process to applicable provisions in the Federal Acquisition Regulation and Air Force policy letters. In addition, the process would be compared to findings in all centrally directed and local Air Force Audit Agency audits concerning SABER contracts. All of these materials would be checked to ensure the improved process complies with regulatory guidance. If nonconformances are found in the process, the team would decide on whether to attempt to obtain a waiver or go back to step 10 and devise a new solution to the problem.

Result. A comprehensive list of documents reviewed and an indication of which documents contained items that could potentially pertain to the process under study, in the subjective opinion of the researcher. If waivers are processed, a copy of the waivers would result. If the team decided to change the process as a result of what was found in the document review, step 10 results would occur.

Step 12. Synchronize Remaining Process.

Action. If time permitted, the Process Action Team would attempt to synchronize the improved process. Here, the team would take actions to reduce work in process, reduce paperwork inventories, and reduce paperwork lot sizes. These actions would be taken to achieve the overall goal of reducing process cycle time, the time it takes each delivery order to flow from process beginning to process end.

Result. A prioritized list of proposed synchronization actions, measurement results of tested improvements, flowcharts showing all tested improvements, suspected reasons for any unsuccessful improvement tests, and an updated process standard flowchart showing the final improved delivery order award process.

Chapter Summary

This chapter showed the methodology the researcher used to accomplish the first research objective of locating an existing SABER delivery order award process. In addition, the researcher described his customized process improvement plan. This plan was required by research objective number two and was applied to the existing SABER delivery order award process, as called for by research objective number three. The next chapter will examine the results of the researcher's process improvement efforts.

IV. Results

Overview

This chapter shows the results obtained by the researcher while executing the methodology outlined in Chapter III. The results are categorized by research objective, with each objective divided into necessary subparts.

Research Objective Number One

Chapter III explained the researcher's primary considerations for choosing the Wright-Patterson Contracting Center as the location for the existing SABER delivery order process. This section provides an overview of how the joint contracting-civil engineering SABER contract effort is supported by the Wright-Patterson Contracting Center organization.

Wright-Patterson Contracting Center.

> The mission of the Wright-Patterson Contracting Center is to award and administer contracts in support of the Department of Defense, Air Force, Air Force Logistics Command, Wright-Patterson Air Force Base, other federal agencies, and foreign military customers. The WPCC's 423 employees negotiated contracts totaling $1.5 billion in fiscal year 1990. (45:1)

There are five contracting divisions at the Wright-Patterson Contracting Center: the Specialized Contracting Division, the Systems Support Division, the Logistics Support Contracting Division, the Logistics Management Systems Support Division, and the Operational Contracting Division. The Operational Contracting Division is the largest Air Force operational contracting unit in terms of both personnel assigned and dollars obligated. It supports approximately 100 Wright-Patterson AFB tenant units (45:1).

Operational Contracting Division. The Wright-Patterson Contracting Center's Operational Contracting Division provides "installation and tenant unit commanders with the contractual coverage required to support the daily operation of the installation missions" (9:1). Its acquisition of goods and services includes construction and architectural/engineering services (8:1). To accomplish this mission, the division's 124 personnel are divided into four main branches: the Management Analysis and Support Branch, the Commodities Contracting Branch, the Services Contracting Branch, and the Construction Contracting Branch (43)(44).

Construction Contracting Branch. The 26 member Construction Contracting Branch is responsible for procuring and administering construction and architect/engineer contracts in support of installation missions (43)(9:4). Specific construction actions include the "construction, alteration, or repair of buildings, structures, or other real property" (5.36.1Ø2). To accomplish these tasks the branch is functionally divided into the Construction Contracting Section and the Construction Administration Section (44). "Cradle-to-grave" responsibility for the award and administration of all SABER delivery orders has been assigned to the Construction Contracting Section. This section receives new SABER requirements and associated technical support from the SABER Branch of the 275Ø Engineering and Services Group's Engineering and Planning Division.

Engineering and Planning Division. The 133 member Engineering and Planning Division is a subunit of the 1,156 member 275Ø Engineering and Services Group (not including nonappropriated fund personnel) (17)(16). The Engineering and Planning Division is divided into the Contract

Management Branch, the Contract Planning Branch, the Engineering and Technical Design Branch, and the SABER Branch (16). It is this SABER Branch that prepares initial SABER requirement documentation and works in conjunction with the Construction Contracting Branch to award SABER delivery orders. These SABER delivery orders are based on terms and conditions found within the SABER contract.

SABER Contract. Competitively awarded on July 13, 1990, the Wright-Patterson Contracting Center's SABER contract is a firm fixed-price, indefinite quantity contract with provisions for up to four option years. A unit price book and specifications are used in conjunction with pricing coefficients to price and define work specified by construction delivery orders. The contractor is guaranteed $475,000 of work in the basic year as well in each exercised option year (42:1-10).

Delivery Order Procedures. Upon receipt of Government notification of a new SABER requirement, the contractor is required to meet with Government personnel to define the scope of the proposed project. Drawings and statements of work are prepared by the Government and provided to the contractor. Once the scope is defined, the contractor is required to submit a proposal for accomplishing the work. Using the official Government estimate as a guide, the contractor's proposal is reviewed by the Government and items needing further discussion, as identified by the Contracting Officer, are negotiated with the contractor. All agreements are documented in the resultant SABER delivery order (42:19).

Delivery Order Dollar Limits. The contractor is not obligated to furnish construction requirements less than $2,000. In addition, the contractor is not obligated to honor any order over $200,000 when statutory cost limitations apply or any order over $5,000,000 when statutory cost limitations do not apply (42:28).

Summary. Based on specific terms and conditions found in the SABER contract, delivery orders are awarded through a joint effort between the Operational Contracting Division's Construction Contracting Branch and the Engineering and Planning Division's SABER Branch.

Research Objective Number Two

The customized process improvement plan created by the researcher is specified in detail in Chapter III. The major steps of this plan are outlined below:

Step 1. Obtain Management Commitment

Step 2. Form Process Action Team

Step 3. Review Customer Needs

Step 4. Describe Current Process

Step 5. Make Simple Improvements

Step 6. Standardize the Process

Step 7. Establish Realistic Goals

Step 8. Attack Process Variation

Step 9. Evaluate Similar Processes

Step 10. Implement New Ideas

Step 11. Check Process Against Regulations

Step 12. Synchronize Remaining Process

The next research objective calls for applying this 12-step process improvement plan to the existing SABER delivery order award process identified in research objective number one.

Research Objective Number Three

How the researcher applied each step of the customized process improvement plan to the existing SABER delivery order award process will be explained in this section. Specific results of the plan's application will also be shown.

Step 1. Obtain Management Commitment. This step focused on getting project support from the persons responsible and accountable for SABER process actions. These persons include the Wright-Patterson Contracting Center commander (WPCC/CC), the Operational Contracting Division Chief (WPCC/PMK), and the 2750 Engineering and Services Group, Engineering and Planning Division Chief (2750 ENSG/DEE). In addition, the researcher gained support from the Air Force Logistics Command Director of Operational Contracting (HQ AFLC/PMK).

Wright-Patterson Contracting Center Commander. The researcher made initial contact with the Wright-Patterson Contracting Center Assistant to the Commander for Quality (WPCC/QP) on January 8, 1991 (26). Informal discussions conducted on this date set the stage for several subsequent personal discussions that convinced the researcher of the Commander's outstanding commitment to quality programs.

Commander Involvement. The Commander is directly involved in Total Quality Management efforts throughout his organization. He personally participates in quality awareness training and ensures he and his division chiefs continually meet with customers to ensure requirements are being met. The Commander has an extensive formal quality training background and stresses the importance of total corrective action, going well beyond short term solutions (45:3-6).

Strategic Planning. The Commander's strategic planning efforts include the specific goals of identifying more processes to improve and establishing accurate measurement systems (45:21).

Employee Training. Nearly half of the Wright-Patterson Contracting Center supervisors have completed the Quality Leadership for Managers class taught by the 2750 Center for Quality Education. In addition, other employees are trained in the Quality Participation for Employees Course, the Process Action Team Course, and the Facilitators Course, all taught by the 2750 Center for Quality Education. In addition, many employees attend quality seminars and in-house quality training sessions (45:52-59).

Employee Recognition. The Wright-Patterson Contracting Center has a Quarterly Total Quality Management Award for individuals or teams. Recipients also get recognized in the Wright-Patterson Contracting Center newsletter and at commander's call (45:63).

Process Action Teams. As of January 1991, the Wright-Patterson Contracting Center had five active Process Action Teams that met regularly (26).

Chief, Operational Contracting Division. The Operational Contracting Division Chief is a SABER process owner because he is responsible and accountable for the contracting events within the SABER delivery order award process. He has final approval on changes to the process methodology within contracting.

Background. This process owner has an extensive SABER background, having developed, implemented, and administered a SABER program while assigned to another Air Force base. In addition, he formed SABER policy and procedures while assigned to a major command headquarters (31).

Commitment. The researcher conducted his first informal personal discussion with the Operational Contracting Division Chief on October 29, 1990 (31). At this time the researcher was told that the Operational Contracting Division would welcome a SABER Process Action Team aimed at improving the way delivery orders were awarded. The chief verbally pledged personnel (assigned to the Construction Contracting Branch), facilities, and any other resources needed to help improve the SABER delivery order award process.

Chief, Engineering and Planning Division. The Engineering and Planning Division Chief is the other SABER process owner because he is responsible and accountable for the engineering events within the SABER delivery order award process. He has final approval on changes to the process methodology within engineering.

Commitment. The Engineering and Planning Division Chief was first contacted by the researcher on November 20, 1990 (21). A followup informal personal discussion on January 15, 1991 brought a verbal engineering commitment to provide personnel (assigned to the SABER Branch) and resources needed to support the SABER Process Action Team efforts (22).

AFLC Director of Operational Contracting. The first of several meetings between the researcher and the Air Force Logistics Command Director of Operational Contracting was held January 30, 1991 (34). The Director was familiarized with the researcher's thesis project and objectives. The Director reviewed command oversight of the SABER program and outlined the status of SABER throughout the Air Force

Logistics Command. In addition, she pledged support and cooperation in accelerating Process Action Team requests for deviation from command SABER regulations. Although regulation deviation requests were not likely to arise, the researcher and Director agreed to an arrangement that would provide timely headquarters response to potential Process Action Team requests.

Step 2. Form Process Action Team. A Process Action Team was formed to facilitate upcoming process improvement activities. After the team's initial meeting on January 25, 1991, the team met weekly in the Wright-Patterson Contracting Center for 60 to 90 minute sessions. The final team meeting was held April 22, 1991. Meeting minutes were forwarded to the two process owners as well as to the Wright-Patterson Contracting Center Assistant to the Commander for Quality. The team consisted of the researcher, two civil engineering personnel, two contracting personnel, and an independent facilitator.

The Researcher. Although he did not play an active role in the Wright-Patterson AFB SABER process, the researcher had nearly two years of "cradle-to-grave" SABER experience at a previous assignment. In this capacity, the researcher served as the contract administrator and the contracting officer. To legitimize his role on the team, the researcher received Process Action Team member training at the Air Force Logistics Command's Center for Quality Education during the period of January 9, 1991 through January 11, 1991. His previous SABER and quality experience and his familiarity with the team's purpose, goals, and direction served as the basis for the researcher being elected Process Action Team leader.

Civil Engineering Personnel. Two civil engineering personnel from the Engineering and Planning Division's SABER Branch became SABER Process Action Team members: the SABER Chief and SABER Project Manager. These two persons were responsible for all engineering actions required to support the SABER process. The SABER Chief was directly involved with all preaward and postaward SABER contract activities. The SABER Project Manager has worked on all delivery order actions since contract award. Their key positions in the SABER process made the SABER Chief and the SABER Project Manager necessary participants on the team.

Contracting Personnel. Two contracting personnel from the Wright-Patterson Contracting Center served as SABER Process Action Team members. One person was the contract administrator responsible for the "cradle-to-grave" administration of all SABER delivery orders. His critical SABER position and his prior quality experience (Process Action Team member and facilitator) made this contract administrator essential to process improvement efforts. The other person was a contract negotiator. Although she was not directly involved in the Wright-Patterson Air Force Base SABER process, her fourteen months of SABER contracting experience at another base brought additional contracting perspectives to the Process Action Team.

Facilitator. The team facilitator was assigned her duties by the Wright-Patterson Contracting Center Assistant to the Commander for Quality. The facilitator was trained in facilitator duties while assigned to the Wright-Patterson Contracting Center's Pricing Division. Her lack of SABER experience allowed the facilitator to perform her team duties in an unbiased manner.

Step 3. Review Customer Needs. Customer needs were identified to give the team's improvement efforts some direction. All forthcoming improvement efforts would be based on the specific needs of the internal and external SABER delivery order award process customers.

Internal Customer. Using the internal customer definition in Chapter III, the Wright-Patterson Contracting Center's Operational Contracting Division was identified as the internal customer. The spokesman for this organization was also one of the two SABER process owners, the Chief of the Operational Contracting Division.

External Customer. The Engineering and Planning Division was identified as the SABER delivery order award process external customer. Although many base organizations are the end user of SABER construction projects, the Engineering and Planning Division is the focal point of representation for all customers who purchase the construction. The official spokesman for the Engineering and Planning Division was also the other SABER process owner, the Engineering and Planning Division Chief.

Expression of Needs. At the request of the researcher, the Operational Contracting Chief and the Engineering and Planning Division Chief held discussions between themselves to jointly decide on a formal expression of their needs. A joint expression of needs was sought in order to prevent the pursuit of different objectives between the Process Action Team's contracting and civil engineering personnel. This joint statement of needs was expressed to the researcher on February 7, 1991. Specifically, the results the process customers needed most from the SABER delivery order award process were, in order of decreasing importance: a quick start of actual construction, few Government claims against the contractor, and a small pricing and administration workload.

Quick Start of Construction. The customers' greatest need from the SABER delivery order award process was a quick process that would result in less lead time prior to the SABER contractor actually beginning work on a project described in an issued SABER delivery order.

Few Government Claims Against the Contractor. The next most needed result was a product (delivery order and resultant construction) and process (delivery order award process) that would minimize the number of Government claims against the contractor.

Small Pricing and Administration Workload. Third on the customers' list was a process that resulted in a small pricing and administration workload that accompanies each SABER delivery order.

These specific customer needs became the measurement criteria upon which all future improvements would be based. For example, when deciding whether a process change would result in a process improvement, the Process Action Team would primarily consider whether the change would bring a quicker start of construction, fewer Government claims against the contractor, or a smaller pricing and administration workload, in that order. Application of these criteria was left to the subjective judgement of the Process Action Team; no weighting scheme was used.

Step 4. Describe Current Process. The researcher used the period of January 25, 1991 through February 11, 1991 to flowchart the existing Wright-Patterson AFB SABER delivery order award process. Discussions were held with process participants in order to depict which process activities were occurring. Process Action Team members incrementally validated the researcher's flowchart through visual inspection and through comparison of the flowchart activities to actual job activities the team members were performing within the Construction Contracting Branch and the SABER Branch. This hands-on validation ensured the process flowchart shows the process actually used to award SABER delivery orders.

Process Boundaries. For purposes of this study, the process beginning was defined as the initial site visit used to explain the proposed project to the SABER contractor. The process end was defined as the contracting decision to negotiate or accept the SABER contractor's proposal.

Flowchart of Current Process. Figure 10 shows the flowchart constructed by the researcher and used by the Process Action Team as an accurate depiction of how the SABER delivery order award process was being executed. The following activity explanations correspond to the numbered activities shown in Figure 10.

Activity 1. The SABER contract administrator (cradle-to-grave), the SABER Project Manager (or SABER Chief), the SABER contractor, and the end user of the construction attend a site visit. These persons meet at the proposed construction site and discuss elements of work. Preliminary Government drawings are given to the contractor. Additional meetings may be necessary depending on the size and complexity of the project.

Activity 2. The SABER Branch prepares the official Government estimate based on the site visit discussions. The Government estimate is input by SABER Branch personnel into the civil engineering

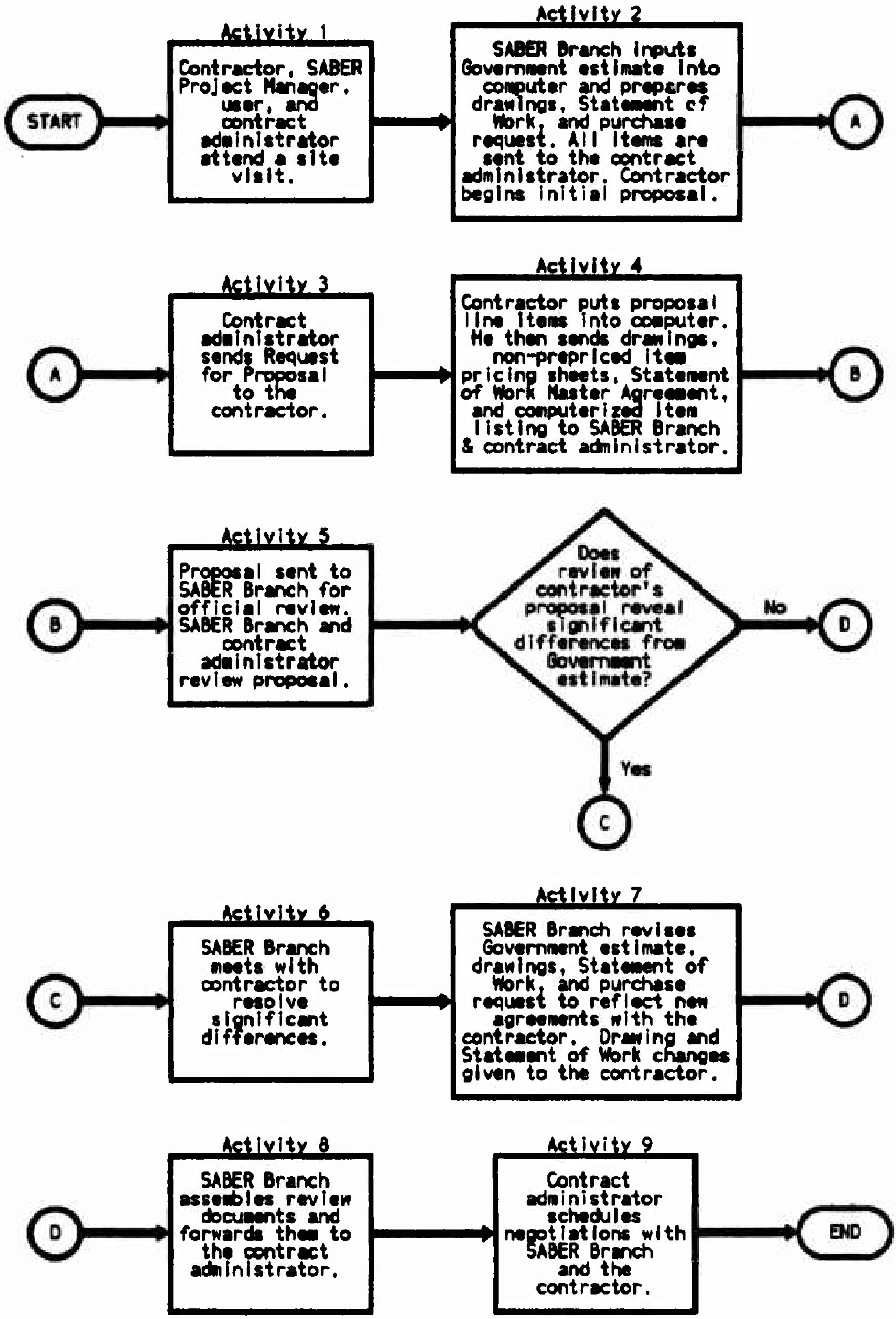

Figure 10. Current SABER Delivery Order Award Process

computer. A computer listing is produced showing all prepriced Unit Price Book items and an estimate of all non-prepriced items. This computerized listing, a funded purchase request, Government-prepared project drawings, a Government-prepared Statement of Work (which also contains the required performance period), any applicable waivers, and a cover sheet are assembled by the SABER Branch. This collection of items will be hereinafter referred to as the "Government estimate package." This Government estimate package is sent to the contract administrator. At the same time, the contractor begins his initial proposal development based on information presented at the site visit.

Activity 3. After a brief review of the Government estimate package, the contract administrator will assemble and send a Request for Proposal to the SABER contractor. The Request for Proposal consists of a cover letter, drawings, Statement of Work, and a list of line items from the computerized Government estimate (prices and quantities excluded). The package is either handcarried to the contractor or the contractor may pick it up from the contract administrator.

Activity 4. The contractor now completes his proposal based on information provided in the Request for Proposal. He enters his list of line items and quantities into the civil engineering computer system and produces a computerized listing that shows all prepriced Unit Price Book items and all non-prepriced items. The contractor's proposal consists of a cover letter, a computerized estimate of all prepriced and non-prepriced items, detailed non-prepriced item pricing sheets (breaking down all price elements), drawings, and a Statement of Work Master Agreement. The Statement of

Work Master Agreement is an agreement the contractor has with his proposed subcontractors outlining the contractor's detailed understanding of the required work. The contractor normally handcarries this proposal to the contract administrator. A courtesy copy of the proposal is given to the SABER Branch from the contractor at the same time the original is delivered to the contract administrator.

Activity 5. The contract administrator handcarries a copy of the contractor's proposal to the SABER Branch for engineering review. The SABER Branch will do a thorough review of the contractor's non-prepriced item pricing sheets. In addition, they will access the civil engineering computer to generate a comparison sheet showing how the contractor's proposal compares to the Government estimate; for each line item. This comparison sheet is reviewed and each item/quantity difference is highlighted. At the same time, the contract administrator will review the contractor's non-prepriced item pricing sheets. He will verify the proposed labor classification and wage rate for each non-prepriced item against those classifications and rates found in the contract. Other elements on the non-prepriced item pricing sheet are reviewed by the SABER Branch (labor hours, type/quantity of materials).

Activity 6. If their initial review of the contractor's proposal reveals several significant item and/or quantity differences from those found in the Government estimate, the SABER Branch will unilaterally decide an additional meeting with the contractor is necessary. The SABER Branch and the contractor will then meet to resolve those significant differences.

Activity 7. After resolution of the differences identified earlier, the SABER Branch will revise the Statement of Work and the drawings, if necessary. These revisions will be given to the contractor by the SABER Branch. In addition, the SABER Branch will go back into the civil engineering computer and revise the computerized Government estimate to reflect the new agreements reached with the contractor. Additional funds and non-prepriced item waivers (if rate exceeds command policy) will be obtained at this point, if necessary.

Activity 8. The SABER Branch will now assemble the revised Government estimate, revised drawings, revised Statement of Work, non-prepriced item pricing sheet review documentation, and documentation showing how the contractor's proposal still varies from the revised Government documents. This paperwork represents the engineering review of the contractor's proposal and will be handcarried to the contract administrator.

Activity 9. Upon receipt of the engineering review documents, the contract administrator will decide that project negotiations are necessary. Note: Although this would normally be one option in the decision of whether or not to negotiate, there had not been an instance when contracting did not schedule a negotiation on a SABER project.

Step 5. Make Simple Improvements. Upon completion of the existing process flowchart, the Process Action Team's next job was to identify obvious process problem areas that could be corrected with simple team actions. Upon identification of these problems, the team sought to make the necessary corrections to the process.

Problem Identification. The team's flowcharting actions and underlying discussions led to the realization of the following problems.

Listed after each problem is the researcher's own determination of why the problem had occurred.

No Documented Procedures. The delivery order award process had no supporting documentation showing what actions participants should take when trying to award a SABER delivery order. Neither engineering nor contracting had internal instructions such as checklists or operating instructions.

This problem may have resulted from process participants seeing no utility in documenting a chaotic process that was under constant change. However, this lack of documentation may have contributed even further to the lack of process consistency.

Early Engineering Negotiations with Contractor. The SABER Branch personnel were negotiating line item differences with the contractor without express contracting approval or authority. As stated earlier in this chapter, if the initial engineering review of the contractor's proposal revealed significant item and/or quantity differences from those found in the Government estimate, the SABER Branch would unilaterally negotiate those differences with the contractor, without contracting involvement. Engineering justified their actions by stating these early agreements with the contractor were needed to prevent lengthy negotiations held later in the process.

This problem resulted from a bad reaction to the first couple of delivery order negotiations held under the Wright-Patterson AFB SABER contract. These first negotiations were lengthy and covered several line item differences. To prevent further time-consuming negotiations, engineering sought to reach agreements with the contractor earlier in the process. Thus, the contract administrator would only have to negotiate those items the engineers and the contractor could not agree on earlier in the process.

The engineers did not wait long enough to realize the tremendous learning that takes place during the contract startup period. Lengthy negotiations are normal for the first several SABER projects since it takes several months for the contractor and Government to communicate effectively during the early stages of the delivery order award process. Effective communication early in the process will eliminate many dissimilarities between the contractor's proposal and the Government estimate. Early patience and communication will bring shorter negotiations since the contractor's proposal will reflect a clear understanding of the Government requirement.

Government Estimate Revision. Upon completion of their premature agreements with the contractor, the SABER Branch would go back into their computer and change the official Government estimate to reflect their new agreements. Besides the problem of the Government estimate now showing negotiated agreements instead of independent data, this estimate revision required much effort, time, and paperwork. This paperwork was eventually sent to contracting with other review documents.

The SABER Branch began revising their estimates to help the contract administrator lay a foundation for why the final negotiated delivery order price differed from the original Government estimate.

Courtesy Copy of Proposal to Engineering. The contractor would give the SABER Branch a "courtesy" copy of his proposal at the same time the contractor's official proposal was given to contracting. This was noted as a problem since engineering was not given express permission to receive proposals directly from the contractor. Even further, this created the potential for the SABER Branch to negotiate differences with the contractor before contracting officially contacted the SABER Branch to provide review of the contractor's proposal. This also brought out the redundancy of the contractor giving the SABER Branch a copy of his proposal and contracting giving the SABER Branch a copy of the same proposal a short time later.

The contractor began directly giving the SABER Branch a copy of his proposal in an attempt to speed up the engineering review process.

<u>Absence of Prenegotiation Meetings</u>. The contract administrator was not conducting the meetings necessary to establish the prenegotiation objectives required by the Federal Acquisition Regulation. Instead, the contract administrator would schedule a negotiation immediately upon receipt of the engineering review of the contractor's proposal and enter into negotiations based on informal telephone discussions with engineering. While this may be acceptable for simple projects, many of the Wright-Patterson AFB SABER delivery orders were for high-dollar, complex construction projects. Lack of a more in-depth prenegotiation meeting may have led to time consuming negotiations.

The contract administrator was overwhelmed by the enormous flow of new SABER projects without consideration of his current workload. The prenegotiation meetings were minimized so time could be spent in fulfilling other administrator duties.

<u>New Project Timing</u>. Engineering did not consider the contract administrator's workload when sending new SABER requirements to

contracting. The contract administrator performs "cradle-to-grave" SABER functions and can involuntarily act as a process bottleneck when new projects are flowed to this person without consideration of his current workload and paperwork inventories.

There seemed to be little knowledge about how "feeding" new projects into the system without consideration for what was already in the system will eventually cause all projects to be processed slowly.

Price Negotiation Memorandum Efforts. Although the writing of the price negotiation memorandum was outside of process boundaries, it was noted as a source of problems within the process boundaries. The contract administrator was required to justify every difference between the negotiated amount and the Government estimate, regardless of the magnitude of the difference. For example, a normal SABER project contains several hundred or thousand construction line items. Therefore, it would not be unusual for the contractor's proposal to differ from the Government estimate. Those line item differences may be significant (item left out, wrong item, significant quantity difference) or insignificant. An insignificant difference might be where the contractor's proposal shows 5,000 square yards of carpeting and the Government estimate shows 4,950 square yards. With drawings and a statement of work showing the exact areas to be carpeted, the contractor's proposed carpeting quantity might be regarded as insignificant and accepted as is. Unfortunately, the contract administrator would negotiate all differences, significant and insignificant, and account for them in the resultant Price Negotiation Memorandum.

The researcher could not ascertain whether the contract administrator's efforts in this area were due to strict contracting officer requirements or poor communication between the contract administrator and the contracting officer.

Improvement Efforts. The Process Action Team now tried to use the noted problems as a basis for making simple improvements. The team met during the periods of February 18, 1991 through April 22, 1991 to devise process improvements aimed at eliminating the obvious process problems. During this month, the team could not reach consensus agreement on which actions were necessary to correct the problems identified earlier. The Process Action Team met with the two process owners on March 19, 1991 to discuss the team's dilemma. At this meeting, the researcher reviewed the team's efforts up to that point and outlined forthcoming team actions. After that, each team member gave their opinions on what actions were necessary to correct the identified problems. The nonattribution nature of Process Action Team prevents disclosure of individual opinions expressed at this meeting. However, it was realized at this time that actions were necessary to rid the delivery order award process of its obvious problems. In addition, it became apparent that the Process Action Team was not the mechanism for devising and incorporating the necessary changes.

Team Problems. Several factors accounted for the Process Action Team's inability to devise solutions to the identified process problems. Listed below are the major reasons for the team's failure to make progress, as identified by the researcher:

Team Member Experience. The nature of using a Process Action Team required having the key process participants as team members. However, the development of alternative solutions to a given problem relies heavily on the team members' experiences within the area of concern. Unfortunately, team member experience with SABER and construction, in general, was low. The average number of years of Air Force construction experience for the two civil engineering members was 1.5 years. In addition, the average number of years of Air Force construction experience for the researcher and the two contracting members was 1.8 years. Even worse, each team member's SABER experience was no greater than their construction experience.

Team Member Training. Not all team members were formally trained in Process Action Team actions. The two civil engineering team members refused training, stating their job demands prevented them from receiving formal training. As a result, the researcher spent considerable time explaining basic problem solving concepts that would otherwise be assumed knowledge by all team members. This lack of training may have detracted from all team activities.

Team Size. The team was composed of six personnel: two civil engineering personnel, two contracting personnel, one facilitator, and the researcher. With the facilitator not contributing to team efforts (her role was to guide) and with the researcher acting as a team leader from an outside organization, the four remaining personnel were the core of the team's ideas. A four-person idea base was too small, considering the team's inexperience.

Scope of Identified Process Problems. The problems that surfaced through the team's flowcharting efforts were not simple, noncomplex problems. These complex problems required more time and effort than initially planned for at this early stage of the customized process improvement plan.

Disagreement on Process Problems. There was not consensus agreement on what the problems actually were. Therefore, instead of focusing on how problems could be solved, the team struggled to define what process problems existed.

For example, three team members believed that early engineering negotiations, without contracting authority or involvement, were not only necessary but also legitimate. After the Operational Contracting Division Chief (process owner) stated that he could not support these early negotiations, these team members requested the opinion of an independent auditor. The researcher consulted with the Air Force Audit Agency's most experienced SABER auditor and the auditor stated that these were unauthorized negotiations and should be discontinued. Despite the independent opinion, these three team members insisted that an effective SABER delivery order award process required these early engineering negotiations. Disagreement on such high principles as the actual authority of Government personnel prevented the team from making progress towards improvement.

Time Pressures. The team was aware of the time schedule required to complete the process improvement plan within the researcher's thesis time allowance. As a result, team members may have jumped at quick fixes, without thoroughly evaluating each thought. It may have been too optimistic for the researcher to complete all steps of the process improvement plan within the time allowed.

Other Problem Areas. In addition to internal team problems, other factors contributed to the current state of the Wright-Patterson

AFB SABER delivery order award process and the team's inability to provide improvement solutions in a short period of time. These items are listed below:

Contract Drawings. The Wright-Patterson AFB SABER contract does not require the contractor to develop the delivery order drawings. The requirement for the contractor to provide drawing support was in the initial contract solicitation but was taken out prior to award due to difficulty in defining the required level of drawing detail and due to uncertainties about whether or not the drawings would constitute architect-engineer work. As a result, the SABER Branch develops delivery order drawings. This added requirement adds complexity and Government time to the delivery order award process.

Computer Hookup. Although the SABER contractor had a direct link with the civil engineering computer the Construction Contracting Branch did not have such access; they had no direct computer hookup with the SABER Branch. This limited all ideas of using the computer to electronically transfer documents between the process participants.

Political Pressures. Internal pressures prevented civil engineering from even considering lowering the delivery order dollar thresholds to facilitate process improvement. The Engineering and Planning Division Chief received pressure from Aeronautical Systems Division customers to provide timely service for high dollar amount construction projects (23). Aeronautical Systems Division had a time and materials contract that was being used for all types of construction projects, including real property changes. This contract was seen as being the most timely way to begin actual construction of new requirements. However, use of this alternative construction contract left the Engineering and Planning Division "out of the loop," even though they were still accountable for the resultant construction. To prevent Aeronautical Systems Division from putting all high dollar projects under the time and materials contract, the Engineering and Planning Division Chief needed to keep the door open to high dollar SABER delivery orders.

Unit Price Book. The SABER Branch believed their Unit Price Book was outdated and did not contain many of the items other bases had in their Unit Price Books. As a result, the SABER Branch saw the non-prepriced item limitations as unreasonable and too restrictive. Consequently, the SABER Branch would spend much time trying to gain approval for waivers to the non-prepriced item limitations.

Delivery Order Thresholds. SABER delivery orders could range from $2,000 to $200,000, with different levels of design. It is nearly impossible to streamline a process when you cannot predict the magnitude and complexity of the product the process is designed to serve. Because the SABER contract allows such a varying range of projects, different process activities (cost comparisons, approvals, waivers, justification letters, certifications, and other paperwork) are required for different delivery orders, depending on the dollar value and complexity of the project. Again, it is difficult to devise an improved process designed to handle so many different situations and contingencies.

Outside Involvement. Engineering personnel from Air Force Logistics Command Headquarters and Aeronautical Systems Division tried to become involved in shaping the Process Action Team's efforts.

These organizations mistakenly saw the team as a policy-making entity, instead of realizing that the team's role was to make recommendations to the process owners. This outside involvement only detracted from the team's efforts.

Process Owner Updates. The process owners stayed informed of Process Action Team activities by receiving copies of team minutes sent to them by the researcher. When completed, the existing process flowchart was attached to these meeting minutes. Although the researcher met with these process owners several times during the study period, the researcher did not personally discuss the flowchart of the existing SABER delivery order award process with these process owners until the team was trying to make simple improvements to the process. Earlier discussion of the flowchart with the process owners might have brought the process owners together, possibly reaching agreement on some of the identified problems. With the process owners agreeing on what the problem areas were, the Process Action Team could have focused on solutions instead of disagreeing on problem identification.

Modification to Methodology

With the Process Action Team unable to make timely progress beyond step five of the customized process improvement plan, the researcher had to make adjustments toward achieving a recommendation for an improved process for awarding SABER delivery orders.

SABER Policy Guide Representatives. The researcher met with SABER representatives of the Air Force Logistics Management Center and the Air Force Engineering and Services Center on April 17, 1991 to discuss the status of the researcher's project (20). The researcher explained how the Process Action Team was no longer effective in providing a timely proposed improved process for awarding SABER delivery orders for inclusion in the upcoming SABER Policy Guide. The Air Force Logistics Management Center and Air Force Engineering and Services Center representatives stated that the researcher's work up to this point had identified some critical SABER issues that the policy guide would consider. The representatives recommended the researcher:

1. Review the basic delivery order award process at other SABER bases as initially intended in step nine of the researcher's customized process improvement plan. This would provide an insightful "snapshot" of what processes the Air Force bases are using to produce a SABER delivery order.

2. Determine if the detailed problem-related process activities identified in the researcher's process improvement efforts (at the Wright-Patterson Contracting Center) exist at other SABER bases. Specific activities that might lead to problems similar to those experienced at Wright-Patterson AFB could be addressed in the SABER Policy Guide.

Termination of Customized Process Improvement Plan. On April 23, 1991, the researcher terminated the remaining steps in the customized process improvement plan. Since each successive step relies on successful actions in the previous step, continued use of the plan would not produce information helpful in the development of an improved SABER delivery order award process.

New Objectives for Continued Research

Next, the researcher developed "secondary objectives" in order to continue with his research. The term "secondary objectives" was used to differentiate these new objectives from the researcher's initial objectives. The following two secondary objectives guided the researcher through the remainder of his research:

Secondary Objective One. Find out what basic delivery order award processes are used at SABER bases other than Wright-Patterson AFB and compare those processes to the Wright-Patterson AFB process.

Secondary Objective Two. Determine if the detailed problem-related process activities identified in the researcher's process improvement efforts exist at bases other than Wright-Patterson AFB.

Methodology for Secondary Objectives One and Two

To obtain secondary objectives one and two, the researcher conducted informal, semi-structured telephone interviews with continental United States operational contracting offices (Air Force only) that have SABER contracts.

Telephone interviews were selected as the information-gathering device because the researcher determined them to be quicker and less expensive than surveys or in-person interviews. Telephone interviews also brought a high response rate (100%) and were suitable for the researcher's semi-structured questions.

The researcher interviewed all stateside operational contracting units (with SABER contracts) within Air Force Logistics Command (AFLC), Air Training Command (ATC), Military Airlift Command (MAC), Strategic Air Command (SAC), and Tactical Air Command (TAC). With the exception of Air Force Logistics Command, these commands were "judgementally selected" because they contained the highest number of operational contracting units among the different Air Force major commands. Air Force Logistics Command was chosen because it is the command under which Wright-Patterson AFB, supported by the Wright-Patterson Contracting Center, belongs.

The researcher interviewed 100% of the SABER bases within the five selected commands between June 13, 1991 and June 19, 1991. Since an accurate, comprehensive list of Air Force SABER bases did not exist at the time of the interviews, the researcher called every operational contracting unit within the five commands to determine which bases had SABER contracts. 45 out of the 70 contacted bases had SABER contracts. As a result, the researcher conducted 45 interviews.

Personnel interviewed by the researcher were either SABER contract administrators or SABER contracting officers. Contract administrators were the researcher's first choice since the researcher determined these persons most likely to be familiar with the "hands-on" SABER operations. Engineering personnel were not interviewed due to research time limitations. All interviewed personnel were asked the following question to determine their functional SABER position.

Question 1: Which position do you hold: SABER contract administrator or SABER contracting officer?

<u>Question for Secondary Objective One</u>. The interviewees were asked the following open-ended question in order to learn the basic steps of their SABER delivery order award process.

Question 2: What basic actions lead up to award of a new SABER delivery order? Start with the first notification engineering gives contracting concerning the new requirement and end with the decision to either negotiate or accept the contractor's proposal.

<u>Questions for Secondary Objective Two</u>. The interviewed SABER personnel were asked the following questions to determine if problem-related SABER process activities occurring at Wright-Patterson AFB were

also occurring at other SABER bases. Directly following each question is an explanation of the question's purpose.

> **NOTE: These questions were not designed to determine if specific problems existed at bases other than Wright-Patterson AFB. Nor were the questions designed to determine if the process actions at other bases are necessarily wrong or if they are causing problems. The questions were merely intended to find out if other bases perform certain SABER operations similar to Wright-Patterson AFB.**

Question 3: Other than the generic procedures that might be stated in your SABER contract, what documentation does your office have showing what actions are necessary to award a SABER delivery order? This does not include Air Force policy letters or command regulations.

Purpose: Wright-Patterson AFB's chaotic SABER process had no supporting documentation showing what actions participants should take when trying to award a SABER delivery order. Some type of documentation might have helped stabilize their process. This question will determine if other bases have documented procedures. The researcher acknowledges that the absence of documented procedures is not necessarily a problem. The actual need for documentation will vary from base to base, depending on factors such as personnel experience and personnel turnover.

Question 4: When is the first time engineering personnel agree on line item quantities with the contractor and is a contracting representative present at these discussions? This does not include specifying major line item quantities in the Government's Statement of Work or discussions whose sole purpose is to inform the contractor of the scope of work.

Purpose: After reviewing the contractor's proposal, the Wright-Patterson AFB engineers would negotiate line item differences (between the Government estimate and the contractor's proposal) with the contractor. These agreements were seen as "necessary" to prevent lengthy negotiations once contracting became involved. This question was designed to determine if engineers at other bases are also negotiating line item quantities with the contractor before what is normally seen as "formal negotiations." In addition, the Wright-Patterson engineers had no express contracting approval or authority to conduct their early negotiations. No contracting person was present when their negotiations took place. The second part of the question was intended to find out if other bases have a contracting person present during the first time engineering personnel agree on line item quantities with the contractor.

Question 5: After review of the contractor's proposal, does engineering normally create a new Government estimate, regardless of the magnitude of differences between the Government estimate and the contractor's proposal? This does not include adjustments made to the Government's position upon examination of the contractor's proposal. The intent of this question is to determine if your engineers redo their entire Government estimate paperwork every time they review the contractor's proposal.

Purpose: After every review of the contractor's proposal, the Wright-Patterson AFB engineers would go back into their computer and generate a completely new "Government estimate," reflecting what they believed to be a more informed Government estimate. This question was designed to find out if engineers at other bases also normally spend time creating an entirely new Government estimate after examination of the contractor's proposal; every time. The question had added wording to ensure the interviewees did not confuse a complete revision of the Government estimate with paperwork normally generated by engineering to show their agreement or disagreement with the contractor's proposal.

Question 6: From whom and when does engineering normally receive a copy of the contractor's proposal?

Purpose: The Wright-Patterson AFB SABER contractor would give engineering a courtesy copy of his proposal at the same time the contractor gave the proposal to contracting. While this may normally be seen as a process improvement action (especially if contracting only "rubber stamps" the proposal prior to sending it to engineering for technical review), this courtesy copy may have contributed to process chaos at Wright-Patterson AFB. This question was designed to find out when and from whom engineers at other bases receive a copy of their SABER contractor's proposal.

Question 7: Is there normally a joint contracting/engineering prenegotiation meeting prior to delivery order negotiations?

Purpose: No prenegotiation meetings took place prior to any of Wright-Patterson AFB's SABER delivery order negotiations. This question was designed to determine if other bases are normally conducting prenegotiation meetings prior to their SABER delivery order negotiations.

Question 8: If prenegotiation meetings are normally held prior to delivery order negotiations, are the meetings normally done in person, over the telephone, or by other means?

Purpose: This question was designed to determine the methodology of the prenegotiation meetings that do take place.

Question 9: Does engineering normally consider the SABER contract administrator's workload before sending contracting a new SABER requirement?

Purpose: Contributing to Wright-Patterson AFB's SABER process problems was the project bottleneck caused by engineering sending new projects over to contracting without consideration of the contract administrator's current workload. To determine if a similar situation exists at other bases, this question asked contract administrators and contracting officers if they believe their engineering counterparts consider the SABER contract administrator's workload before sending contracting a new SABER requirement.

Question 10: Are all line item differences between the Government estimate and the contractor's proposal normally discussed during negotiations, regardless of the depth, scope, and magnitude of the differences?

Purpose: The Wright-Patterson AFB SABER contract administrator negotiated every difference between the Government estimate and the contractor's proposal. It did not matter if the differences were significant or not. All differences were negotiated. This question was designed to find out if other bases do the same.

Question 11: Does the contractor normally provide any type of new project drawings to the Government? (Not including as-built annotations to Government-supplied drawings or routine shop drawings).

Purpose: The Wright-Patterson AFB SABER contract did not require the contractor to develop the delivery order drawings. All delivery order drawings were created by Government engineers. At Wright-Patterson AFB, this added complexity and time to the delivery order award process. This question was designed to determine if SABER contracts at bases other than Wright-Patterson AFB require the contractor to provide any type of new project drawings. The question acknowledged the common contractor practice of providing as-built drawings to the Government at project completion.

Question 12: Is a computer network in place that allows the contractor, engineering, and contracting to communicate directly regarding SABER delivery orders?

Purpose: Process streamlining efforts at Wright-Patterson AFB were limited by lack of a computer network connecting the contractor, contracting, and engineering. This question was designed to find out if other SABER bases have a computer network that allows all three parties to communicate regarding SABER delivery orders.

SABER Bases Contacted

The researcher contacted contracting personnel at 100% (70 of 70) of the Continental United States operational contracting units in the five Air Force major commands under study. Table 1 shows the number of operational contracting bases contacted and the number of contacted bases that had active SABER contracts.

Table 1
SABER Breakdown of Contacted Bases

Major Command	# of CONUS Bases	# and % of Bases Contacted	# and % of Contacted Bases With Active SABER	# and % of Contacted Bases With No Active SABER
AFLC	7	7 (100)	4 (57)	3 (43)
ATC	13	13 (100)	7 (54)	6 (46)
MAC	11	11 (100)	5 (45)	6 (55)
SAC	22	22 (100)	14 (64)	8 (36)
TAC	17	17 (100)	15 (88)	2 (12)
Total	70	70 (100)	45 (64)	25 (36)

Understanding Table 1. This section will explain the meaning of each column in Table 1.

Major Command. The interviewed Air Force major commands were: AFLC (Air Force Logistics Command), ATC (Air Training Command), MAC (Military Airlift Command), SAC (Strategic Air Command), and TAC (Tactical Air Command).

<u># of CONUS Bases</u>. This represents the number of command bases, located within the continental United States, that have operational contracting units. The number for Air Force Logistics Command does not include Wright-Patterson AFB.

<u># and % of Bases Contacted</u>. The first figure represents the number of bases contacted by the researcher. The second number represents the number of bases contacted divided by the number of CONUS bases.

<u># and % of Contacted Bases With Active SABER</u>. The first figure represents the number of contacted bases that had an "active" SABER contract at the time the researcher called. A base was considered to have an "active" SABER contract if the base had a SABER contract (1) without an expired performance period and (2) with at least one delivery order awarded. Bases that were in the process of awarding a new SABER contract and bases that had awarded a SABER contract but had not yet awarded any subsequent delivery orders were not included in this number. The second number represents the number of contacted bases with an active SABER contract divided by the number of bases contacted.

<u># and % of Contacted Bases With No Active SABER</u>. The first figure represents the number of contacted bases that did not have an "active" SABER contract at the time the researcher called. See the preceding paragraph for the definition of an "active" SABER contract. The second number represents the number of contacted bases with no active SABER contract divided by the number of bases contacted.

Interview Results

Every base contacted by the researcher was interviewed if the base had an active SABER contract. The researcher conducted a total of 45 interviews. Appendix B lists the bases interviewed. The tables in this section show the interview results for each question. Each question is printed in front of its corresponding results table. Paragraphs immediately following each table explain the data within each table.

Question 1: Which position do you hold: SABER contract administrator or SABER contracting officer?

Table 2
Question 1 Results

Major Command	Contract Administrator	Contracting Officer
AFLC	0	4
ATC	7	0
MAC	3	2
SAC	9	5
TAC	10	5
Total	29	16

Understanding Table 2. Interviews were only conducted with SABER contract administrators or SABER contracting officers. 29 contract administrators and 16 contracting officers were interviewed. As stated earlier in this chapter, contract administrators were the researcher's first choice. Each base's SABER contracting officer was interviewed only if the contract administrator was not available. This explains why the number of contract administrators is higher than the number of contracting officers. Persons acting as both contract administrator and contracting officer were classified as a contracting officer.

Secondary Objective One Results

The following results were obtained from asking question 2 which was designed to learn the basic steps of each base's SABER delivery order award process.

Question 2: What basic actions lead up to award of a new SABER delivery order? Start with the first notification engineering gives contracting concerning the new requirement and end with the decision to either negotiate or accept the contractor's proposal.

Each response to this question portrayed the delivery order award "process" used at the interviewee's base. The researcher used iterative content analysis of these answers to identify emerging process patterns. Although each process had its own unique characteristics, process patterns did emerge. The researcher grouped these patterns into eighteen representative flowcharts, labeled Process A through Process R. Each process was grouped not only by its process activities, but also by its activity sequence. Table 3 (located on the next page) indicates the frequency of each process within each major command under study.

Table 3
Question 2 Results

Process	AFLC	ATC	MAC	SAC	TAC	Total
Process A	Ø	1	Ø	9	7	17
Process B	Ø	Ø	Ø	Ø	1	1
Process C	Ø	2	2	1	2	7
Process D	Ø	2	Ø	Ø	1	3
Process E	Ø	Ø	1	Ø	Ø	1
Process F	1	Ø	Ø	Ø	2	3
Process G	Ø	Ø	Ø	1	Ø	1
Process H	Ø	Ø	Ø	Ø	1	1
Process I	Ø	Ø	Ø	1	Ø	1
Process J	Ø	Ø	Ø	1	Ø	1
Process K	Ø	1	Ø	Ø	Ø	1
Process L	Ø	Ø	Ø	1	Ø	1
Process M	1	Ø	Ø	Ø	Ø	1
Process N	Ø	Ø	1	Ø	Ø	1
Process O	Ø	1	Ø	Ø	Ø	1
Process P	1	Ø	Ø	Ø	1	2
Process Q	1	Ø	Ø	Ø	Ø	1
Process R	Ø	Ø	1	Ø	Ø	1

Understanding Table 3. This section describes each of the eighteen SABER delivery order award processes. Process A is cited first since it was used at more bases than any other process. Process A is fully described. PROCESSES B THROUGH R ARE EXPLAINED ONLY IN TERMS OF HOW EACH PROCESS DIFFERS FROM PROCESS A. Reading of the Process A description is critical since it contains assumptions and definitions used by the researcher to group these processes. Flowcharts depicting each of these processes can be found in Appendix A.

Process A. Figure 11, page 114. This basic process was used by 17 of the 45 interviewed bases (38%), making it the most frequently used process. Process A consists of the following major activities, performed in the order described.

Activity 1. Contracting receives formal notification of a new SABER requirement when engineering delivers a package of documents to contracting. This package normally consists of funds, drawings, a statement of work, and a Government estimate. For purposes of this study, each of these documents can assume different levels of detail, depending on the project magnitude and complexity. Drawings can range from rough sketches to architectural designs. Drawings may not even exist, if not needed. The statement of work can range from a brief project description to several pages of detailed construction instructions. In addition, the Government estimate may range from a handwritten estimate broken down by major elements of work to a computerized estimate showing each Unit Price Book line item. These document variations are not reflected in this study. For purposes of this study, it is sufficient to know that, under normal circumstances, some type of funds, drawings, statements of work, and estimates are delivered to contracting to initiate the new SABER requirement.

Activity 2. After ensuring the adequacy of the engineering documents, contracting will notify the contractor that a new SABER requirement exists. This notification may take the form of a phone call, letter, or personal meeting. Any drawings and statements of work are normally given to the contractor at this point. This notification will also usually outline the time and place of the site visit shown in activity 3.

Activity 3. Next, contracting, engineering, the contractor, and the end user will attend a site visit. Other personnel may attend this meeting, if necessary (shops, safety, subcontractors, etc.). Here, all parties will meet to discuss the scope of the new construction proposed by the Government. A visit to the proposed construction site is common. This exchange of information may require one or more meetings. In addition, these meetings may occur in any subsequent activity, if the need arises for more scope clarification.

Activity 4. After the site visit, the contractor develops his proposal, based on the information given to him by the Government. As a minimum, this proposal will list the Unit Price Book line items and line item quantities for each construction material. These line items and quantities form the basis of the project price, as proposed by the contractor. Non-prepriced line items are also documented in accordance with each base's pricing policy. The contractor may also have to deliver some preliminary drawings or statement of work revision (based on changes brought out at the site visit) with his proposal. Process A assumes the proposal is on paper and delivered to contracting.

Activity 5. Contracting will now review the contractor's proposal and send a copy to engineering for a technical review. Specific areas to be reviewed by engineering normally include the need for each item, the quantity of each item, whether the proper line item was chosen for each element of work, and pricing of non-prepriced line items.

Activity 6. Next, engineering performs its technical review of the contractor's proposal and provides contracting with review results. These review results sometimes take the form of a marked-up copy of the contractor's proposal. Other times, these results are noted on separate engineering review documents, not on a copy of the contractor's proposal. In a few instances, engineering may verbally give contracting the review results.

Activity 7. Upon review of engineering's technical review results, contracting will decide to either accept the contractor's proposal or to negotiate. This decision depends on various factors, many of which are described by engineering. A decision to negotiate will lead to activity 8. A decision to accept the contractor's proposal will lead to other paperwork activities beyond the scope of this research.

Activity 8. A decision to negotiate will bring contracting and engineering together in a face-to-face prenegotiation meeting. Here, both parties target items for negotiation and develop negotiation strategy and tactics. Activities beyond this prenegotiation meeting are beyond the scope of this research.

Process B. Figure 12, page 115. Only 1 of 45 bases used Process B. Here, the Government gives the contractor a list of Unit Price Book line items found in the Government estimate. The contractor uses this listing to aid his proposal formation. This list of line items does not include line item quantities or pricing information.

Process C. Figure 13, page 116. 7 out of 45 bases (16%) used Process C. Here, engineering does not submit its Government estimate to contracting until after the site visit. This way, the Government estimate will reflect all information brought out at the site visit. In this process, Engineering does not get to review the contractor's proposal until the Government estimate is received by contracting. Normally, both the Government estimate and the contractor's proposal are due to contracting at the same time.

Process D. Figure 14, page 117. 3 out of 45 bases used Process D. In this process, joint estimating of line item quantities takes place at the site visit; after submission of the Government estimate and before submission of the contractor's proposal. A contracting person is present at these discussions.

Process E. Figure 15, page 118. Only 1 of 45 bases used Process E. Here, a technical discussion is held between contracting, engineering, and the contractor to reach agreement on major differences between the Government estimate and the contractor's proposal (both received by this time). This early agreement permits either the contractor or the Government to "change" their position prior to contracting's decision to either accept the contractor's proposal or to negotiate.

Process F. Figure 16, page 119. 3 out of 45 bases used Process F. This process is the same as Process A except no prenegotiation meeting is normally held before negotiations.

Process G. Figure 17, page 120. Only 1 of 45 bases used Process G. Here, as with Process F, no prenegotiation meeting is held before negotiations. In addition, engineers are allowed to agree on prepriced line items with the contractor after engineering reviews the contractor's proposal. No contracting representative is present at this meeting.

Process H. Figure 18, page 121. Only 1 of 45 bases used Process H. This process has no prenegotiation meeting, as with Process

F. In addition, engineering receives their copy of the contractor's proposal (paper copy) straight from the contractor. This differs from Process A where engineering receives their copy of the contractor's proposal from contracting.

Process I. Figure 19, page 122. Only 1 of 45 bases used Process I. Here, the line items found in the Government estimate are given to the contractor to use in his proposal formation (as with Process B). In addition, no copy of the contractor's proposal is sent to engineering for a separate technical review. The first time engineering sees the contractor's proposal is at a joint contracting/engineering review meeting. This meeting may extend into a prenegotiation meeting, if necessary.

Process J. Figure 20, page 123. Only 1 of 45 bases used Process J. As with Process I, this process has no activity where contracting sends engineering a copy of the contractor's proposal. Engineering first sees the contractor's proposal at a joint contracting/engineering review meeting. Also, this process allows engineering to agree on prepriced line items with the contractor, before the contractor submits his proposal to contracting. No contracting representative is present at this meeting.

Process K. Figure 21, page 124. Only 1 of 45 bases used Process K. This process has three main deviations from Process A. First, engineering does not submit its Government estimate to contracting until after the site visit (as with Process C). Second, funds are not received until after the site visit (with the Government estimate). Finally, engineering and the contractor privately agree on prepriced line item quantities at what is termed a "constructability review." Engineering would meet later with contracting to discuss the results of the constructability review.

Process L. Figure 22, page 125. Only 1 of 45 bases used Process L. In this process, the contractor initially submits a "design proposal" to contracting. This design proposal shows the line items the contractor proposes to use on the project. It has no quantities or prices. After a joint engineering/contracting/contractor meeting to discuss the contractor's design proposal, the contractor submits his proposal to contracting at the same time the engineering proposal is submitted to contracting.

Process M. Figure 23, page 126. Only 1 of 45 bases used Process M. Here, no funds are received in contracting until after engineering reviews the contractor's proposal. These funds are sent to contracting along with engineering's technical review results. In addition, no prenegotiation meeting is held prior to negotiations (as with Process F).

Process N. Figure 24, page 127. Only 1 of 45 bases used Process N. In this process, a site visit is the first activity. After the site visit, engineering sends the drawings, statement of work, and Government estimate to contracting. Contracting then requests an "informational quote" from the contractor. An informational quote is sought because no funds have been received in contracting yet. Funds are received after the merits of the contractor's quote are discussed.

Process O. Figure 25, page 128. Only 1 of 45 bases used Process O. Three main features distinguish this process from Process A. First, there is normally no prenegotiation meeting prior to negotiations (as with Process F). Second, the site visit is used to negotiate line item quantities (as with Process D). Finally, the contractor's proposal is transmitted to contracting and engineering through the computer, eliminating the need for contracting to send a copy to engineering.

Process P. Figure 26, page 129. 2 out of 45 bases used Process P. Here, the site visit is the first process activity. The Government estimate, drawings, funds, and statement of work are delivered to contracting after this site visit. At the same time, engineering gives the contractor a copy of the drawings and statement of work. In addition, engineering does not provide technical review results to contracting (as depicted in Process A). Since no prenegotiation meeting is normally held, the first time contracting sees the engineering technical review documents is at the negotiations.

Process Q. Figure 27, page 130. Only 1 of 45 bases used Process Q. This process features four differences from Process A. First, the Government estimate is not delivered to contracting until after the site visit. Second, funds are not received in contracting until after the site visit (with the Government estimate). Third, the contractor transmits his proposal to engineering and contracting at the same time through the computer, eliminating a need for contracting to send a copy to engineering. Finally, no prenegotiation meeting is normally held prior to negotiations.

Process R. Figure 28, page 131. Only 1 of 45 bases used Process R. Three main features distinguish this process from Process A. First, the contractor's proposal is transmitted through the computer to contracting and engineering at the same time, eliminating a need for contracting to send a copy to engineering. Second, after engineering review of the contractor's proposal, engineers meet with the contractor to agree on prepriced line item quantities. Third, no prenegotiation meeting is normally held prior to negotiations.

Secondary Objective One Results Summary

Table 4, used in conjunction with Table 3, summarizes the research results aimed at describing the SABER delivery order award processes at the studied bases.

Table 4
Secondary Objective One Results Summary

Deviation From Process A	AFLC	ATC	MAC	SAC	TAC	WPAFB	Total (#/46)
Line Item Quantity Agreements Before Formal Negotiations	Ø	4	2	2	1	Yes	10 (22%)
No Joint Engineering-Contracting Prenegotiation Meetings	4	1	1	1	4	Yes	12 (26%)
Contracting Receives Funds After Activity With Contractor	3	1	1	Ø	1	Yes	7 (15%)
List of Government Estimate Line Items Given to Contractor	Ø	Ø	Ø	1	1	Yes	3 (7%)
Sole Reliance on Computer Transmission of Contractor's Proposal	1	1	1	Ø	Ø	No	3 (7%)
Contractor's Proposal Delivered Straight to Engineering; Not Through Contracting	1	1	2	Ø	1	Yes	6 (13%)
Site Visit is First Process Activity	1	Ø	1	Ø	1	Yes	4 (9%)
Contracting Receives Government Estimate After Site Visit	2	3	3	2	3	Yes	14 (30%)

Understanding Table 4. Since each process shown in Table 3 may contain activities that also exist in other processes, Table 4 was created to focus solely on the process "activities." The researcher reviewed all 45 processes and identified eight distinct activity deviations from Process A. These eight activity deviations are listed in the leftmost column in Table 4. The number of bases whose process contains the identified activity is listed under the bases' respective major command column heading.

The Wright-Patterson Air Force Base is also included in its own column for comparison purposes. A "yes" notation in this column indicates the activity (in the corresponding row) was identified as part of the existing SABER process at Wright-Patterson Air Force Base.

The rightmost column, the "Total" column, indicates the total number of studied bases that perform the corresponding row activity. Each number is also shown as a percentage of the 46 bases studied (45 interviewed plus Wright-Patterson Air Force Base). This column should not necessarily add up to 100% since, theoretically, each cell could range from 0% to 100%, depending on how many of the 46 bases actually perform the particular activity.

Secondary Objective Two Results

The following results were obtained from asking questions to determine if problem-related SABER process activities occurring at Wright-Patterson AFB were also occurring at other SABER bases.

Question 3: Other than the generic procedures that might be stated in your SABER contract, what documentation does your office have showing what actions are necessary to award a SABER delivery order? This does not include Air Force policy letters or command regulations.

Table 5
Question 3 Results

Major Command	Formal Documents	Informal Documents	None
AFLC	1	2	1
ATC	1	3	3
MAC	1	2	2
SAC	1	6	7
TAC	1	5	9
Total	5	18	22

Understanding Table 5. The researcher grouped answers to question 3 into three categories: formal documents, informal documents, and none. Bases using both, formal and informal documents, were categorized into the "formal" category. Five bases (11%) documented SABER delivery order award procedures on formal documents such as office instructions (OI), local contracting/engineering policy letters, training manuals, and locally-developed SABER "how-to" guides. 18 bases (40%) relied on informal documents such as checklists or procedures guidelines that aid the contract administrator but do not give the appearance of being "policy."

The 22 bases (49%) that relied solely on command policy letters, regulations, or procedures outlined in the contract were categorized as having "none."

Question 4: When is the first time engineering personnel agree on line item quantities with the contractor and is a contracting representative present at these discussions? This does not include specifying major line item quantities in the Government's Statement of Work or discussions whose sole purpose is to inform the contractor of the scope of work.

Table 6
Question 4 Results

Major Command	Formal Negotiations	Joint Estimating at Site Visit	Other
AFLC	3 (3 Yes)	Ø	1 (Ø Yes)
ATC	2 (2 Yes)	4 (4 Yes)	1 (Ø Yes)
MAC	3 (3 Yes)	Ø	2 (1 Yes)
SAC	12 (12 Yes)	Ø	2 (Ø Yes)
TAC	14 (14 Yes)	1 (1 Yes)	Ø
Total	34 (34 Yes)	5 (5 Yes)	6 (1 Yes)

Note: The figure in parenthesis indicates the number of "yes" responses given to the question asking whether a contracting representative was present at the discussions.

Understanding Table 6. 34 of 45 bases (76%) stated their engineers first agreed to line item quantities with the contractor during formal negotiations. Formal negotiations, as used here, are considered to be the discussions held between the Government and the contractor after the Government estimate and contractor proposal have been compared and the contracting officer has determined not to accept the contractor's proposal as is. Contracting persons were present during 100% of those formal negotiations.

Five bases (11%) allowed their engineers to jointly agree on line item quantities with the contractor at the site visit. Here, the engineers and the contractor would jointly estimate line item quantities by using estimating techniques such as "taking off" project drawings and specifications. Contracting personnel were present during 100% of those joint estimating site visits.

Six bases (13%) stated their engineers' first line item quantity agreements with the contractor took place at some time other than the formal negotiations or the site visit.

The one ATC "other" response was given from a base that permitted engineering and the contractor to privately agree on prepriced line item quantities (no non-prepriced items) at what was termed a "constructability review." Contracting would coordinate later negotiations to resolve remaining issues.

The one AFLC "other" response came from a base that normally would have been classified in the "formal negotiations" category. However, this base did allow joint estimating to occur on electrical line items, earning it an "other" classification.

MAC had two "other" responses coming from bases that allowed engineering to agree on line item quantities with the contractor after their initial review of the contractor's proposal (formal negotiations still took place later on). One of these bases stated these early engineering agreements were limited to prepriced line items only. The other base used this early engineering/contractor agreement to "iron out the major differences" before formal negotiations. Only one of these bases ensured a contracting representative was present at these early agreement meetings.

Both "other" SAC bases allowed their engineers to agree on prepriced line items with the contractor without a contracting representative present. One such base conducted these agreements after review of the contractor's proposal while the other held the agreements before the contractor's proposal was submitted to contracting.

Question 5: After review of the contractor's proposal, does engineering normally create a new Government estimate, regardless of the magnitude of differences between the Government estimate and the contractor's proposal? This does not include adjustments made to the Government's position upon examination of the contractor's proposal. The intent of this question is to determine if your engineers redo their entire Government estimate paperwork every time they review the contractor's proposal.

Table 7
Question 5 Results

Major Command	Yes	No
AFLC	Ø	4
ATC	Ø	7
MAC	Ø	5
SAC	Ø	14
TAC	2	13
Total	2	43

Understanding Table 7. 43 out of 45 bases (96%) stated their original Government estimate paperwork (usually a computerized listing of line items) would remain intact and would not be revised after reviewing the contractor's proposal. Most of the interviewees admitted there would be times when the original Government estimate would have to be redone. However, this depended on the magnitude of the differences between the Government estimate and the contractor's proposal, unlike the statement asked by the researcher. Often, at contract startup, the Government estimate will differ greatly from the contractor's proposal. During this time of "learning" it is common for engineering to redo their estimate after recognizing differences in scope made evident by the contractor's proposal. However, as the contract progresses, complete estimate revisions will normally only happen when the Government estimate is not based on the same methodology as the contractor's proposal and when major elements of work are added or deleted.

Only two bases (4%), both within TAC, revised their entire Government estimate after reviewing the contractor's proposal, regardless of the magnitude of differences between the Government estimate and the contractor's proposal. Both bases viewed this estimate revision as necessary to show the Government's position going into formal negotiations. The 43 bases answering "no" to this question relied on some other type of summary review document to show engineering's opinion of the contractor's proposal; they did not take time to redo the entire estimate.

Question 6: From whom and when does engineering normally receive a copy of the contractor's proposal?

Table 8
Question 6 Results

Major Command	From Contracting and After Initial Contracting Review	From the Contractor at the Same Time Contracting Receives a Copy	From the Computer After Govmt Estimate is in Computer
AFLC	3	0	1
ATC	6	0	1
MAC	3	1	1
SAC	14	0	0
TAC	14	1	0
Total	40	2	3

Understanding Table 8. The researcher was able to group answers to question 6 into three categories: from contracting and after initial contracting review, from the contractor at the same time contracting receives a copy, and from the computer after the Government estimate is also in the computer.

Engineers at 40 out of 45 interviewed SABER bases (89%) received a copy of the contractor's proposal from their contracting counterpart. Here, the contractor would submit his proposal to contracting, contracting would do a brief review of the documents, and then contracting would furnish engineering a copy of the contractor's proposal.

Engineers at two bases (4%) received a copy of the contractor's proposal directly from the contractor, at the same time the contractor submitted a copy to contracting.

Engineers at the three remaining bases (7%) would obtain a copy of the contractor's proposal directly from the engineering-managed computer system into which the contractor input his proposal. This would be done only after the Government estimate was completed and input into the same computer system. Engineers at other bases would sometimes also have the capability to "download" the contractor's proposal from the computer. However, only the engineers at these two bases would rely solely on the computer for exposure to the contractor's proposal. Also, at both of these bases, the contractor's proposal consisted only of a computerized listing of line items. No other non-computerized documents (drawings, submittal listings, etc.) were included in the contractor's proposal.

Question 7: Is there normally a joint contracting/engineering prenegotiation meeting prior to delivery order negotiations?

Table 9
Question 7 Results

Major Command	Yes	No
AFLC	Ø	4
ATC	6	1
MAC	4	1
SAC	13	1
TAC	11	4
Total	34	11

Understanding Table 9. 34 of 45 (76%) bases normally conduct joint contracting/engineering prenegotiation meetings prior to negotiation of SABER delivery orders. These meetings are normally used to determine Government objectives prior to actual negotiations.

11 of 45 (24%) bases did not normally conduct these prenegotiation meetings.

This question did not explore the complexity of SABER projects at each base. Nor did it ask the normal dollar amount for SABER projects at each base. Both complexity and dollar amount do impact the need for a prenegotiation meeting. However, only one base limited SABER delivery orders to projects in the amount of $25,ØØØ or less (small purchase limitation). All other bases allowed delivery orders above the small purchase limitation.

Question 8: If prenegotiation meetings are normally held prior to delivery order negotiations, are the meetings normally done in person, over the telephone, or by other means?

All 34 bases (100%) that normally conducted joint contracting/engineering prenegotiation meetings stated these meetings were normally held in person; face-to-face.

Question 9: Does engineering normally consider the SABER contract administrator's workload before sending contracting a new SABER requirement?

Table 10
Question 9 Results

Major Command	Yes	No	Don't Know
AFLC	0	3	1
ATC	1	4	2
MAC	0	5	0
SAC	0	9	5
TAC	0	13	2
Total	1	34	10

Understanding Table 10. Only one interviewee (2%) believed her engineering counterparts normally consider her SABER contract administration workload before sending her a new SABER requirement. 34 interviewees (76%) stated engineering did not consider their workload before sending contracting new SABER requirements. 10 others (22%) stated they did not know the answer to the question.

Answers to this question do not reveal whether engineering units actually consider SABER contract administrators' workload prior to sending the administrators new SABER requirements. Answers do determine whether the interviewed SABER contracting personnel believe engineering considers the administrators' SABER workload prior to sending contracting new SABER requirements.

Question 10: Are <u>all</u> line item differences between the Government estimate and the contractor's proposal normally discussed during negotiations, regardless of the depth, scope, and magnitude of the differences?

Table 11
Question 10 Results

Major Command	Yes	No
AFLC	4	0
ATC	2	5
MAC	2	3
SAC	6	8
TAC	7	8
Total	21	24

<u>Understanding Table 11</u>. 21 of the 45 bases (47%) stated all line item differences between the Government estimate and the contractor's proposal are discussed during negotiations, regardless of the depth, scope, and magnitude of the differences.

24 of the 45 bases (53%) stated they did not discuss every difference during negotiations. These bases determined some differences to be too minor to require dedicated negotiation discussion. Several factors weighed into their decision whether or not to discuss a particular line item difference. Some of these factors included: available funding, line item (per unit) cost, criticality of the item, and magnitude of difference.

Question 11: Does the contractor normally provide any type of new project drawings to the Government? (Not including as-built annotations to Government-supplied drawings or routine shop drawings).

Table 12
Question 11 Results

Major Command	Yes	No
AFLC	2	2
ATC	6	1
MAC	5	0
SAC	6	8
TAC	7	8
Total	26	19

Understanding Table 12. 26 of the 45 bases (58%) normally require the SABER contractor to provide new project drawings to the Government. As noted in the question, these drawings are in addition to as-built annotations to Government-supplied drawings or routine shop drawings.

19 of the 45 bases (42%) do not normally require the SABER contractor to provide new project drawings to the Government, beyond as-builts or shop drawings.

It must be stated here that the word "normally" has a significant impact on the interpretation of the answers. The 19 bases that answered "no" to this question may have the capability to require new project drawings from the contractor. However, their answers indicate they do not "normally" require the contractor to provide these drawings. This question did not focus on whether SABER contracts permit the Government to require the contractor provide new drawings. It merely draws attention to what is actually happening, not what possibly could happen.

Question 12: Is a computer network in place that allows the contractor, engineering, and contracting to communicate directly regarding SABER delivery orders?

Table 13
Question 12 Results

Major Command	Yes	No
AFLC	2	2
ATC	3	4
MAC	3	2
SAC	5	9
TAC	1	14
Total	14	31

Understanding Table 13. 14 of the 45 bases (31%) stated a computer network was in place that allowed the contractor, engineering, and contracting to communicate directly regarding SABER delivery orders. 31 of the 45 bases (69%) stated such a computer network was not in place.

This question does not address whether the bases who responded "yes" actually use the computer network in place. In addition, "yes" answers required all three parties (contractor, engineering, and contracting) to be able to communicate directly regarding SABER delivery orders. Therefore, bases with a network connecting only two of the parties answered "no" to this question.

Secondary Objective Two Results Summary

Table 14 summarizes the secondary objective two results in a format that shows which problem-related SABER process activities occurring at Wright-Patterson AFB were also occurring at other SABER bases.

Table 14
Secondary Objective Two Results Summary

WPAFB Problem-Related Process Activity (Interview Question Number)	# and % of Interviewed Bases With Similar Activity
No Documented Process Procedures (Question 3)	22 (49)
Early Engineering Negotiations (Question 4)	5 (11)
Government Estimate Revision (Question 5)	2 (4)
Proposal Straight to Engineering (Question 6)	5 (11)
No Prenegotiation Meetings (Questions 7 and 8)	11 (24)
No Consideration of Admin. Workload (Question 9)	34 (76)
Negotiate All Differences (Question 10)	21 (47)
No Contractor Drawing Support (Question 11)	19 (42)
No 3-Way Computer Hookup (Question 12)	31 (69)

Chapter Summary

This chapter showed the results obtained by the researcher while executing the methodology outlined in Chapter III. The next chapter will present the researcher's conclusions and recommendations.

V. Conclusions and Recommendations

Overview

This chapter summarizes the researcher's thesis study, lists specific research objective-related conclusions, provides conclusions and recommendations for managers considering improving their SABER delivery order award process, and lists recommendations for further SABER research.

Summary of Thesis Research

The researcher sought to identify an improved process that could be used by the U.S. Air Force to award delivery orders under SABER construction contracts. To do this, the researcher applied a 12-step customized process improvement plan to the Wright-Patterson AFB SABER delivery order award process. In steps one through four the researcher obtained management's commitment to process improvement, formed a Process Action Team, reviewed internal and external customer needs, and flowcharted the existing SABER delivery order award process. The researcher terminated application of the 12-step improvement plan once he was unable to progress through step five. However, several problem-related process activities identified in step five were used as a basis for continued research.

Next, the researcher conducted telephone interviews to determine if Wright-Patterson AFB's problem-related process activities existed at other Air Force SABER bases. In addition, the interviews were used to model the delivery order award processes at the interviewed Air Force bases. Chapter IV identifies each problem-related process activity found at Wright-Patterson AFB and details the telephone interview results.

Specific Research Objective-Related Conclusions

This section lists conclusions that came about through pursuit of the initial research objectives (detailed in Chapter III) and the secondary research objectives (detailed in Chapter IV).

Conclusion 1: 18 Different SABER Delivery Order Award Processes Were Used at the 45 Interviewed Bases; None of Which Matched the Wright-Patterson AFB SABER Process.

The 18 processes varied in their process activities and/or their process activity sequences. However, all processes had the similarity of awarding SABER construction projects differently than traditional, non-SABER type construction projects.

None of the 45 interviewed bases used the same delivery order award process as Wright-Patterson AFB. However, many of Wright-Patterson AFB's SABER process activities were used in other SABER processes.

Conclusion 2: Process Activities That Caused Problems at Wright-Patterson AFB Are Being Used at Other SABER Bases.

Application of the researcher's process improvement plan revealed problem-related activities in the Wright-Patterson AFB SABER delivery order award process. Nine of the problem-related activities were investigated by the researcher. Interview results, summarized in Table 14 (page 105), show that each of the nine activities was used by 4% to 76% of the 45 interviewed SABER bases. It is clear the Wright-Patterson

AFB SABER managers were not alone in their approach to awarding SABER delivery orders.

The researcher does not conclude that the mere existence of an activity will cause a problem at a specific base because the same activity led to problems at Wright-Patterson AFB. However, SABER managers should be aware that activities within their SABER processes are similar to the activities that led to problems at Wright-Patterson AFB. These activities may have the "potential" to cause problems at bases other than Wright-Patterson AFB.

Conclusions and Recommendations For Managers Considering Improving Their SABER Delivery Order Award Process

This section discusses the researcher's conclusions concerning improvement of the SABER delivery order award process. Recommendations are made for managers considering the improvement of their SABER delivery order award process.

Conclusion 3: SABER Managers are Using Different Processes to Award SABER Delivery Orders.

The researcher identified 18 different SABER delivery order award processes being used at the 45 interviewed bases. The processes differ in their process activities and/or their process activity sequences.

Process differences may be attributed to the unique operating environments found at each interviewed base. Differences may also be explained by SABER managers not knowing the techniques used by SABER managers at other bases. This lack of "perfect information" may be one reason why some managers fail to use the innovative ideas used by managers at other bases. Appendix A provides flowcharts depicting the

SABER delivery order award processes used at the 45 interviewed bases. These flowcharts can be used by SABER managers as a starting point for their examination of SABER processes used at other bases.

Recommendation. SABER managers concerned with process improvement should study Appendix A to find out what SABER delivery order award processes are being used at other bases.

Recommendation: SABER managers should examine the Wright-Patterson AFB SABER process problem-related activities (listed on pages 64-73) to see if the potential exists for those same activities to cause problems in their own SABER processes.

Conclusion 4: Process Improvement Efforts are Not a Short-Lived Program.

The Wright-Patterson AFB SABER delivery order award process improvement efforts were initiated only once the researcher began his study. Therefore, extensive time was spent laying the groundwork for process improvement efforts. It was unrealistic for the researcher to envision execution of his entire process improvement plan within the time allowed for this study. Given a fixed amount of time, completion of only a few steps of the improvement plan should have been expected. However, tighter process boundaries may have enabled complete application of the process improvement plan.

Recommendation: SABER managers seeking process improvement should prepare for a long-term effort.

Conclusion 5: Reactionary "Corrections" to Perceived Process Problems May Hinder Process Improvement if the Corrections are Not Given Sufficient Evaluation.

The Wright-Patterson AFB SABER process participants jumped at an early process "correction" after their first SABER delivery order negotiation took longer than desired. Instead of realizing the learning that takes place early in a new process, civil engineers immediately "fixed" the problem by negotiating early agreements with the contractor to prevent lengthy negotiations once contracting became involved. This change was not evaluated closely by contracting and civil engineering managers before it was implemented. As a result, the change impeded process improvement efforts once the unauthorized negotiations were "discovered" during process flowcharting.

24% of the studied SABER bases agreed on line item quantities with the contractor before formal negotiations were conducted later in the delivery order award process. 11% of the studied SABER bases allowed engineering to negotiate line item quantities without contracting representation.

The researcher did not investigate why these early negotiations were implemented into so many processes. However, the early negotiations may have, as with Wright-Patterson AFB, resulted from an attempt to "speed up the process." However, process improvement efforts at these bases will stall when the improvement personnel wrestle with either (1) a duplication of negotiating effort, or (2) illegal negotiating actions, or (3) both.

Recommendation: Process owners should ensure process activity changes are not just "quick fixes" that may hinder process improvement efforts.

Recommendation: Process owners should ensure negotiating process participants have negotiating authority.

Conclusion 6: Limited Process Documentation Inhibits SABER Delivery Order Award Process Improvement Efforts.

Documentation of process activities will encourage the standardization necessary for credible process measurement. Measurement of a stable, standardized process will provide baseline data for process improvement.

The Wright-Patterson AFB SABER delivery order award process had no documentation showing what actions are necessary to award a SABER delivery order. This slowed down the process improvement effort since there was no consistency in efforts prior to the researcher's involvement (making measurement impossible). Once the researcher began to document the process activities, there was no easily reached consensus as to how the process was actually being run.

49% of the studied SABER bases had no documented procedures. The researcher understands the reluctance of many managers to create binding office policy that may bring unwanted inspection writeups due to noncompliance with that office policy. However, informal, non-binding documents can easily be created to guide the process participants to consistent actions.

Recommendation: SABER process owners should ensure their process activities are documented.

Conclusion 7: Lack of Supporting Computer Systems May Limit SABER Delivery Order Award Process Improvement Efforts.

While computer systems are not a "necessary" condition for process improvement, they do support modern data transfer methodologies, thus increasing the "potential" for process improvement.

The Wright-Patterson AFB SABER delivery order award process improvement efforts were limited because a computer system was not in place that would enable the computer transfer of information.

69% of the studied SABER bases had no computer system in place that would allow the contractor, engineering, and contracting to communicate directly concerning SABER delivery orders.

Recommendation: SABER process owners should encourage the introduction of a computer system that would ease SABER communications between contracting, engineering, and the contractor.

Recommendations For Further SABER Research

The expanding use of SABER contracts at operational contracting units throughout the Air Force brings with it the need for broader and more in-depth SABER research. This thesis may be useful as a starting point for guiding future research in the following areas.

Process Measurement. SABER contracts are intended to reduce the lead time required to award construction contracts. Contract design and positive customer feedback indicate SABER contracts may be working as intended. However, convincing measurement data showing actual lead time reductions does not exist. Research into this area could prove that SABER's effectiveness is fact, not perception.

Contractor Ideas for Improvement. The researcher invited the Wright-Patterson AFB SABER contractor to participate in his process improvement efforts. However, the contractor chose not to participate.

SABER contractors should have many suggestions for improving the process used to award SABER delivery orders. Future research could consolidate the ideas of SABER contractors and recommend changes designed to improve methodologies used to award SABER delivery orders.

Audit Review. Air Force auditors have completed a centrally-directed SABER audit and several locally-directed SABER audits over the past two years. Future research could consolidate the audit findings for SABER managers who do not have the resources available to accomplish such a task. The audit findings could also be compared to the findings stated within Chapter IV of this thesis.

Source Selection Criteria. Most SABER contracts are awarded using streamlined source selection procedures. These awards are made based on criteria specified in the request for proposal. Since SABER has been fairly new to the Air Force, many SABER contracts were initially awarded based on "boilerplate" selection criteria. Future research could survey the current needs of Air Force SABER managers and determine if the selection criteria being used to award SABER contracts accurately reflect those needs.

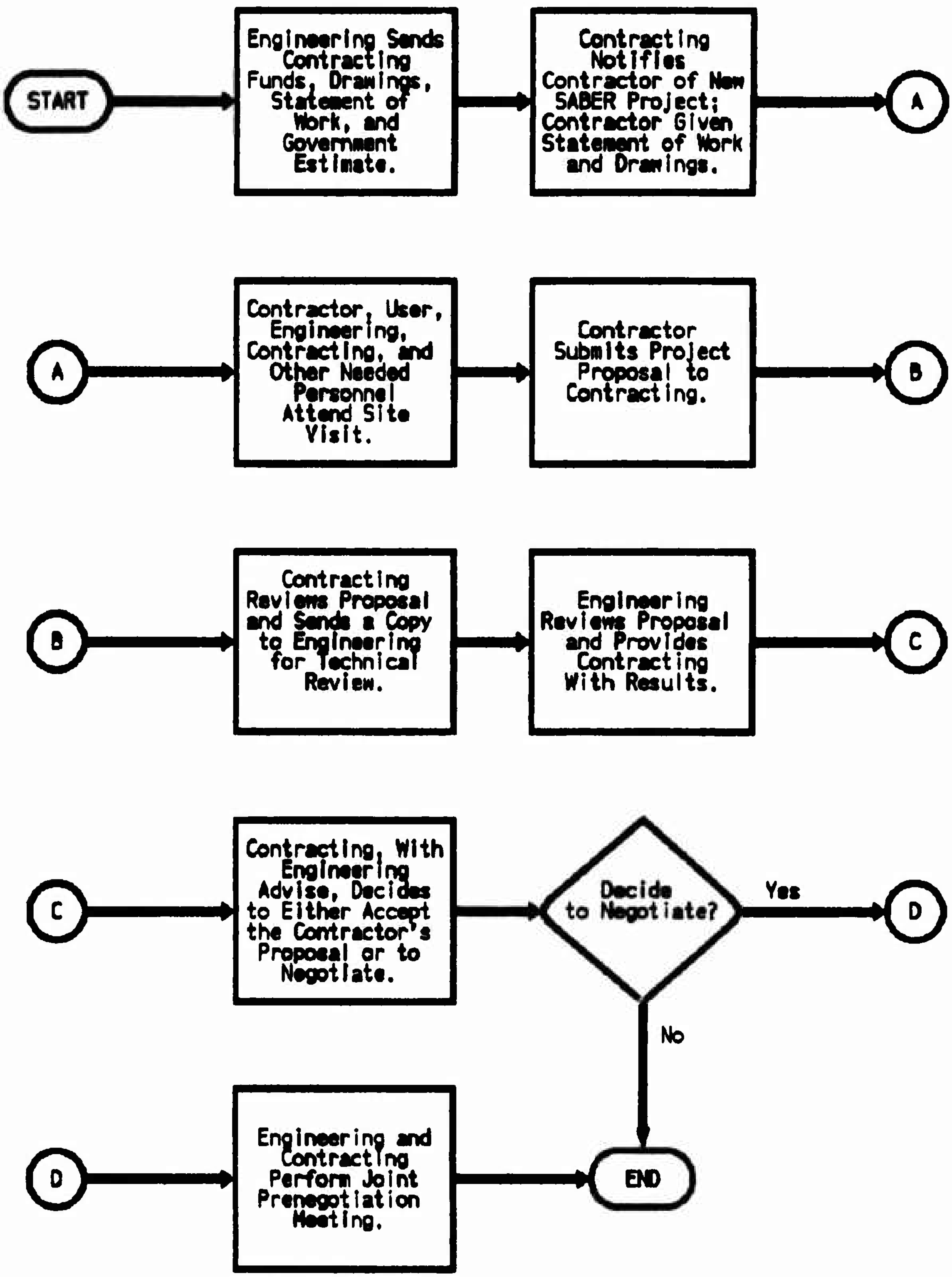

Figure 11. Process A

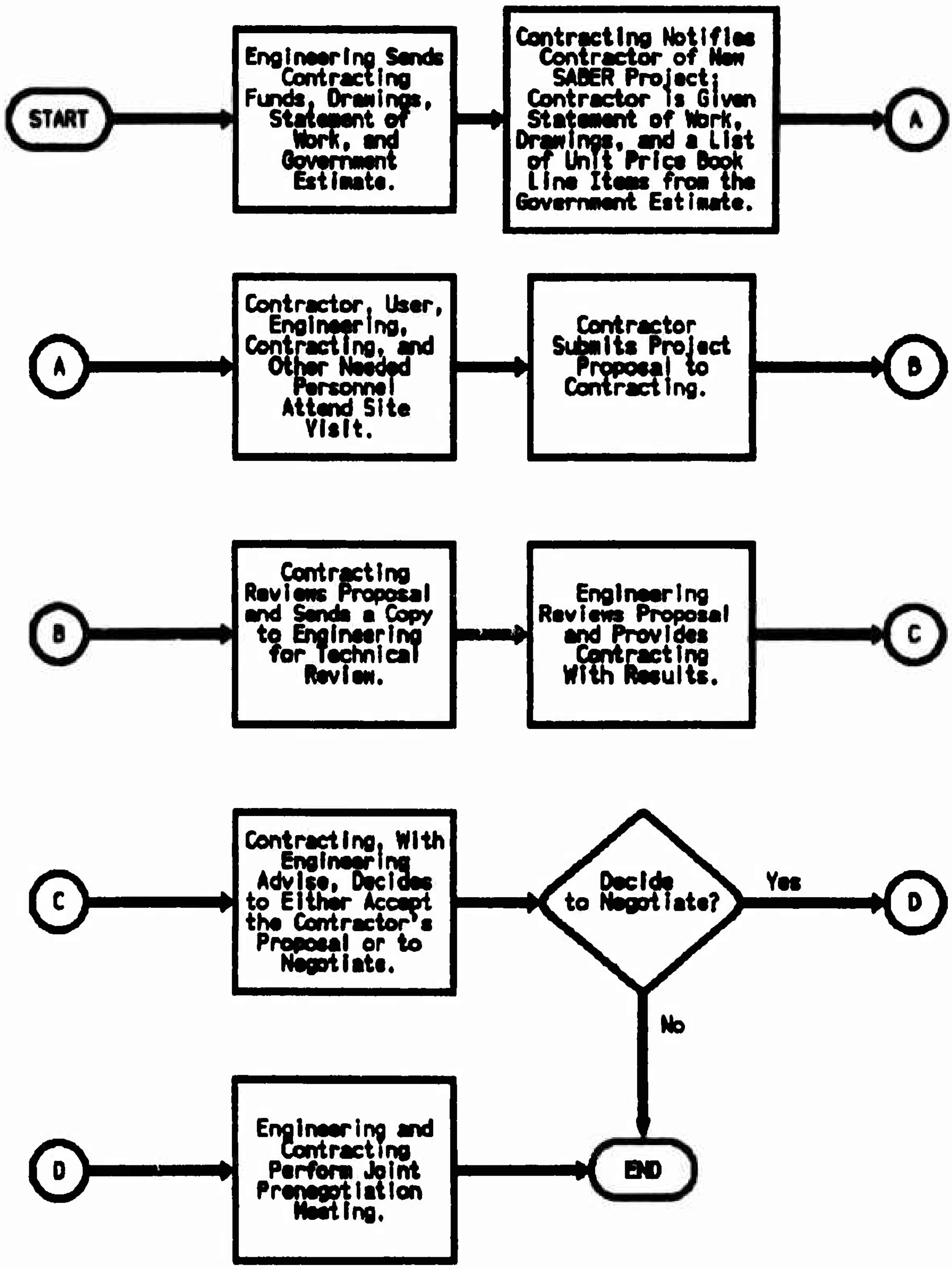

Figure 12. Process B

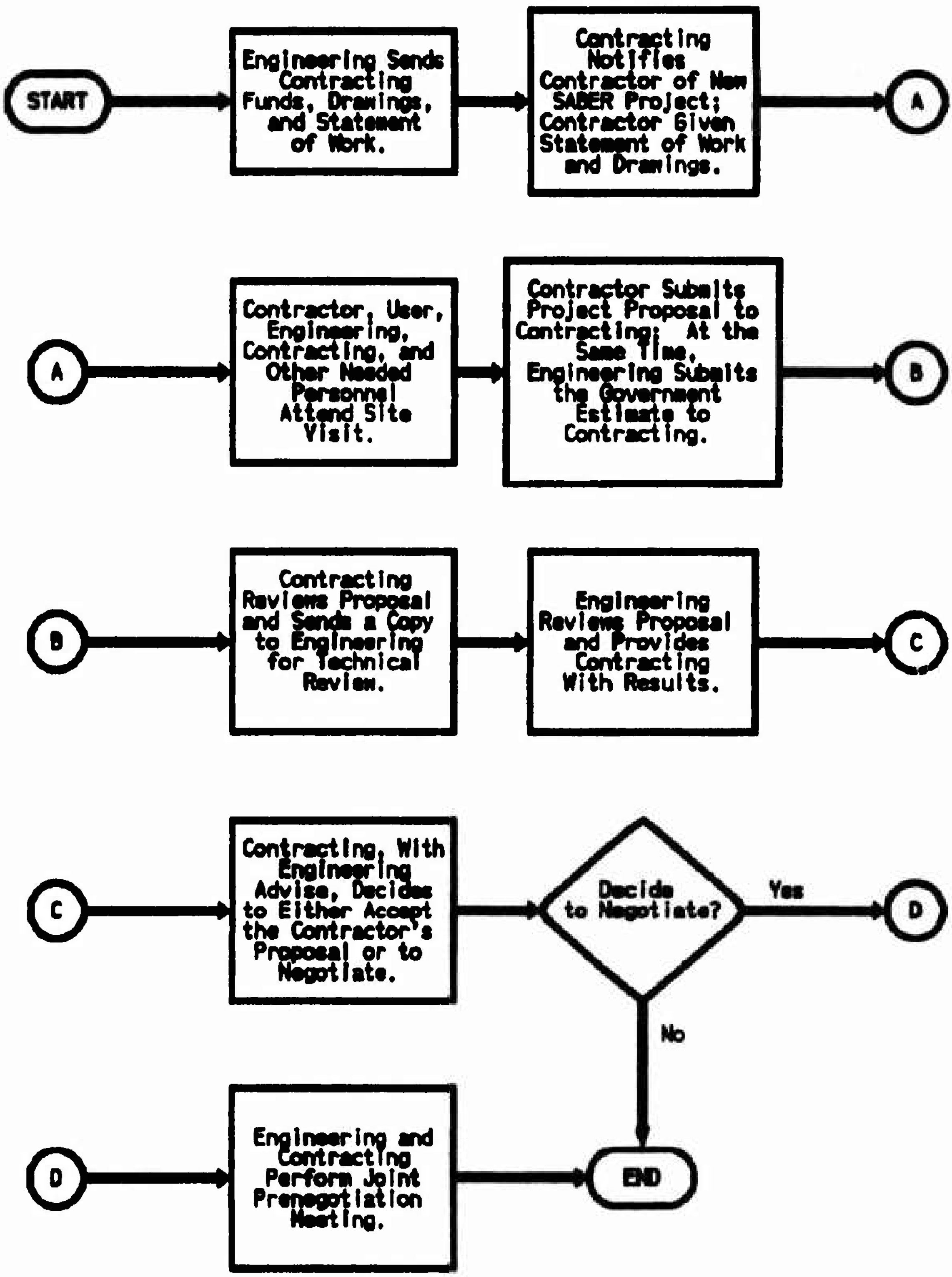

Figure 13. Process C

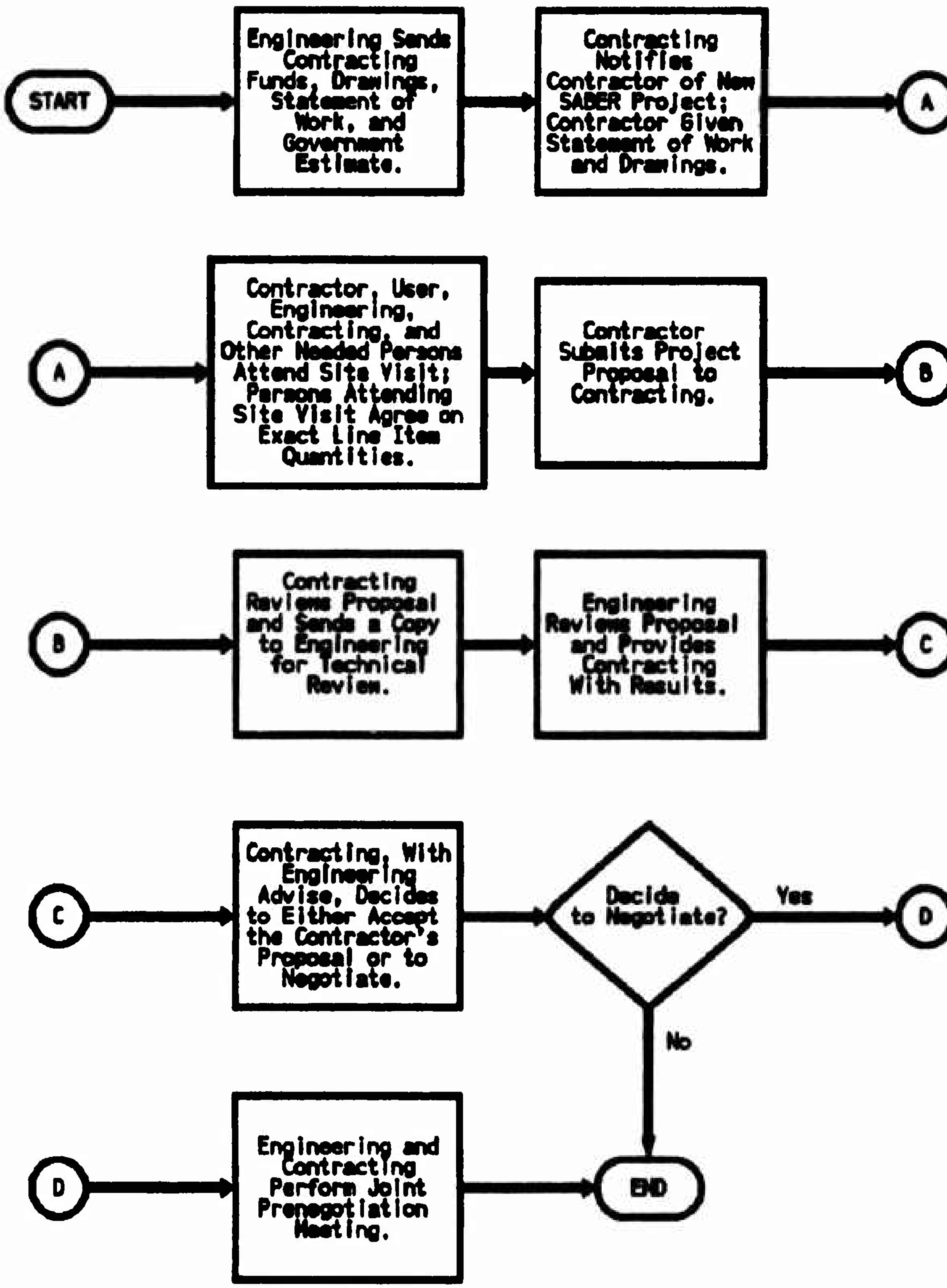

Figure 14. Process D

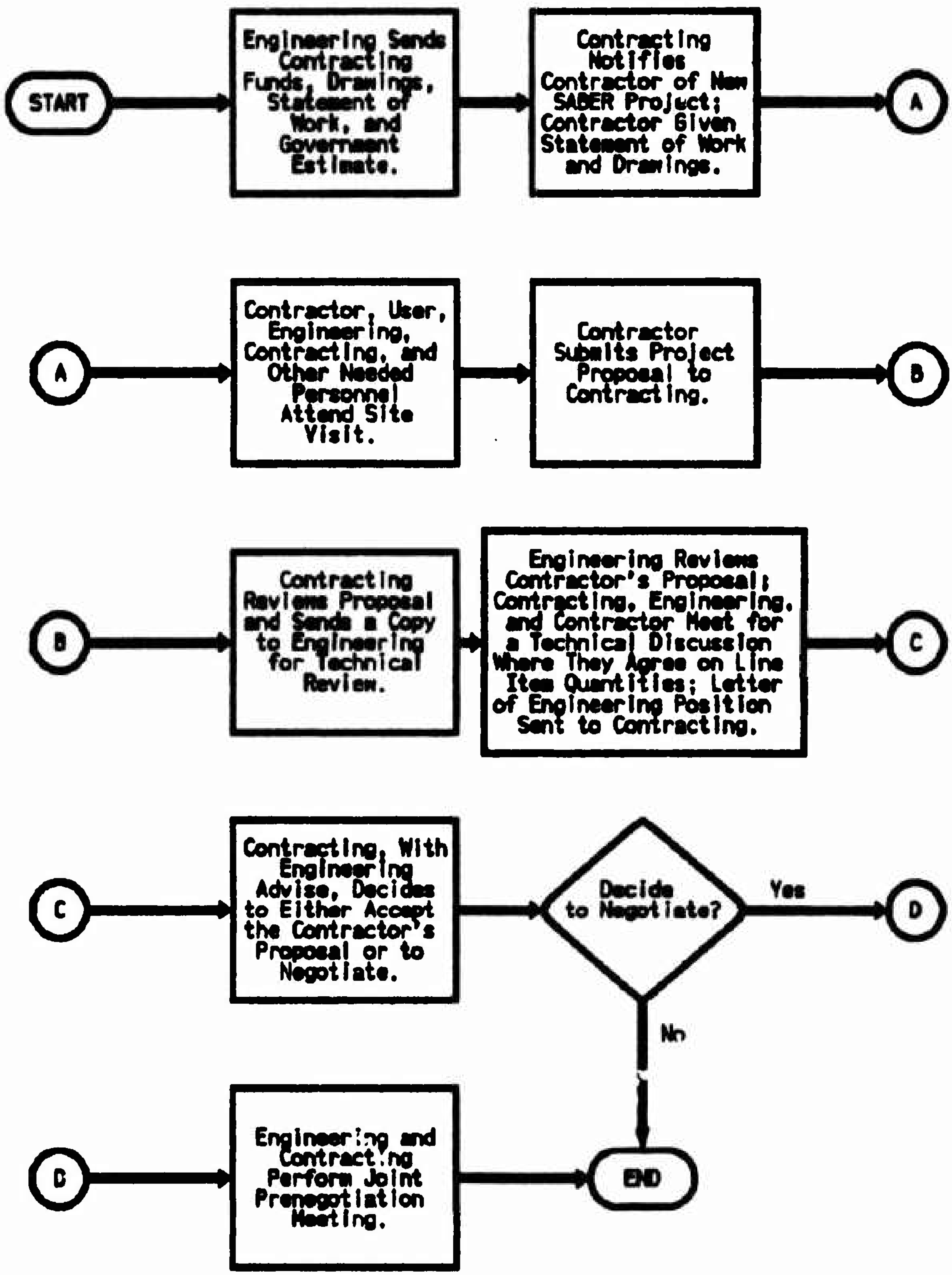

Figure 15. Process E

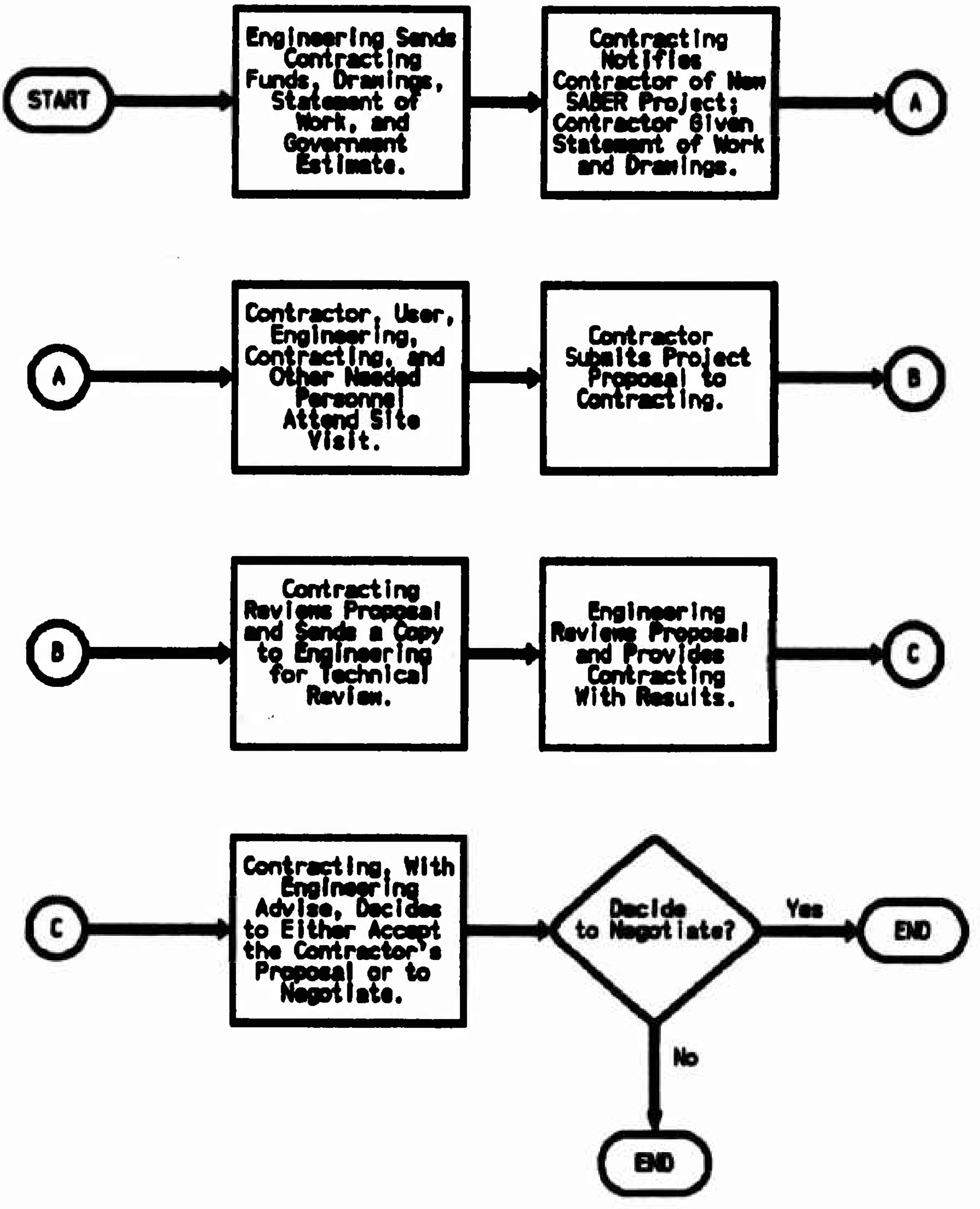

Figure 16. Process F

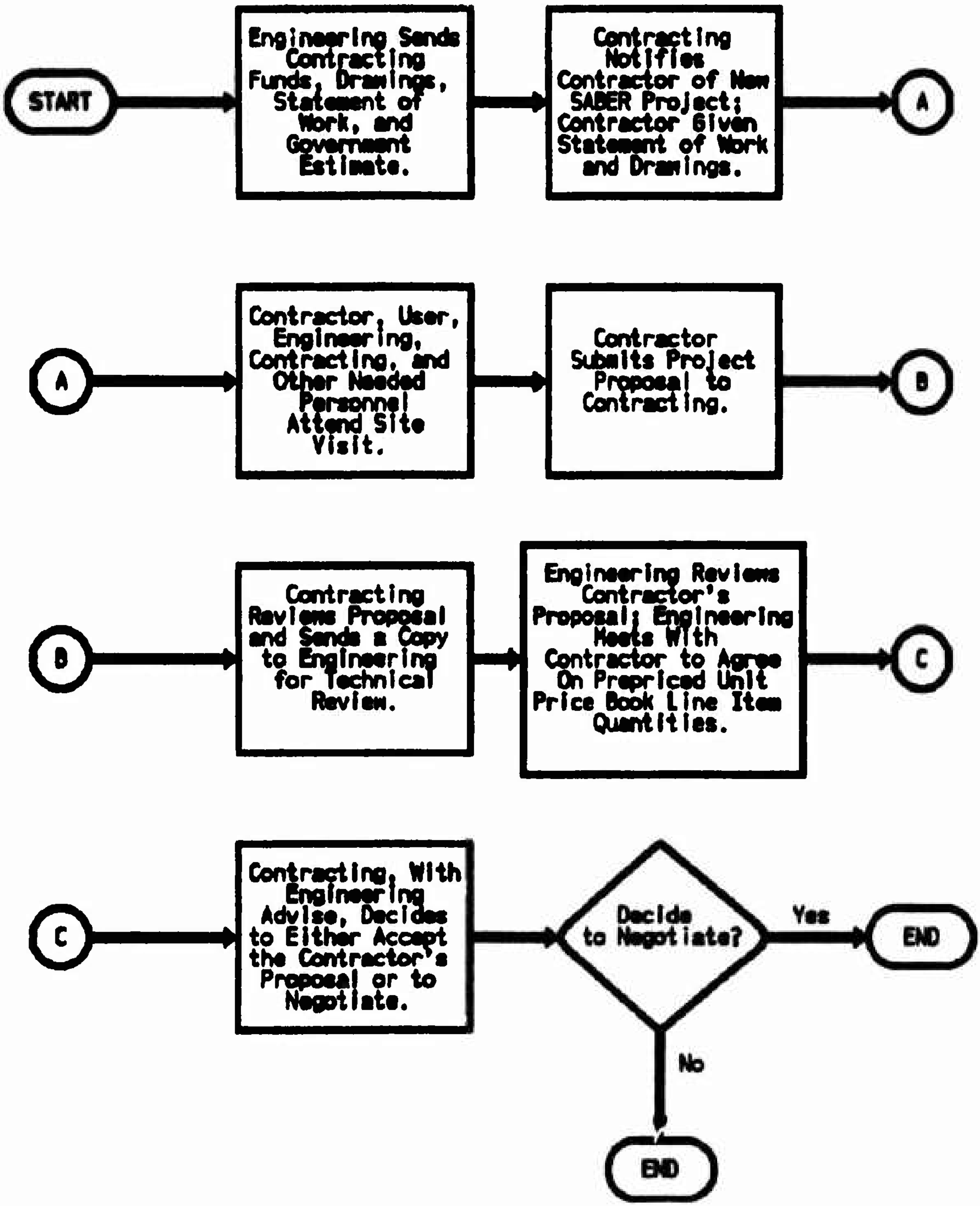

Figure 17. Process G

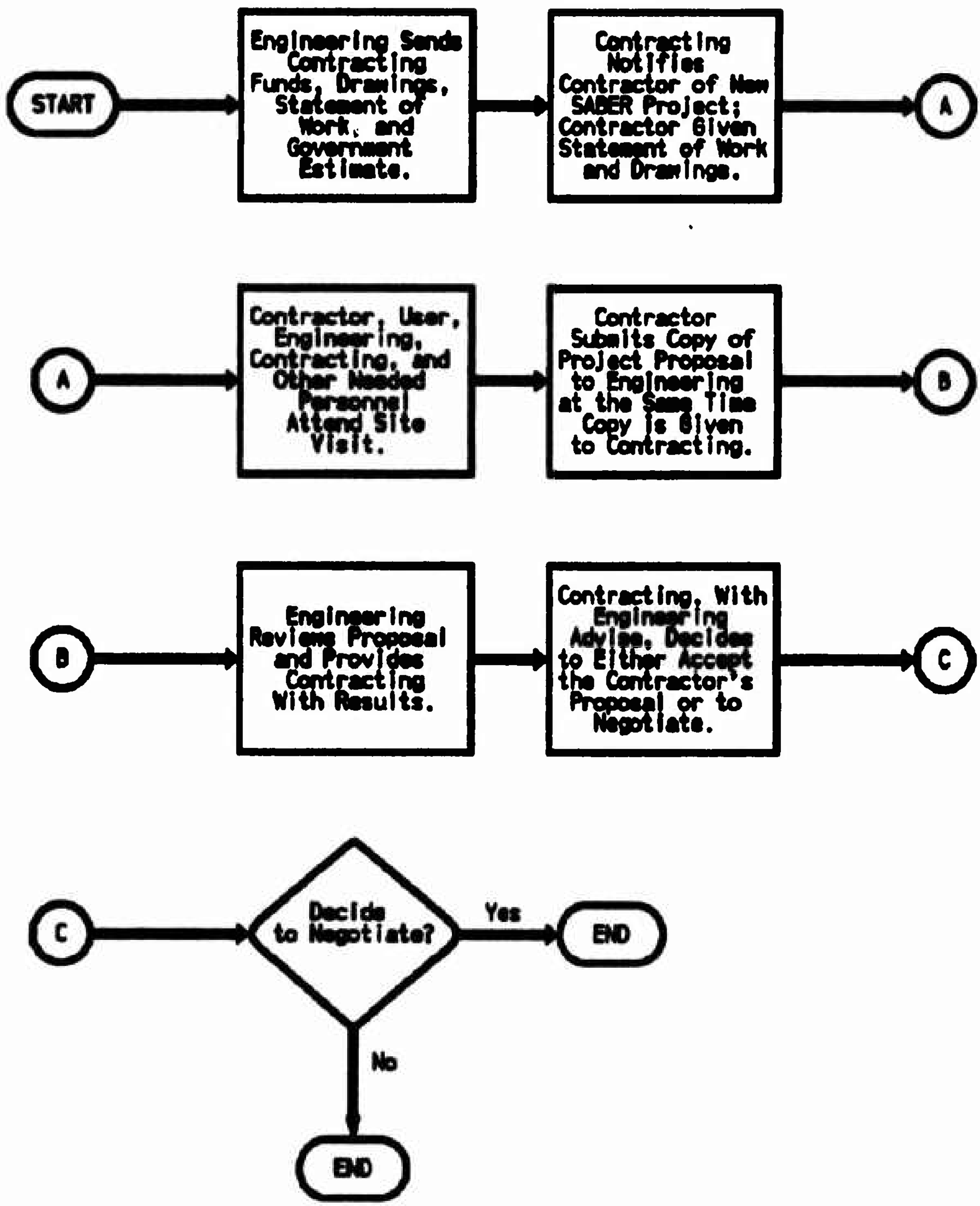

Figure 18. Process H

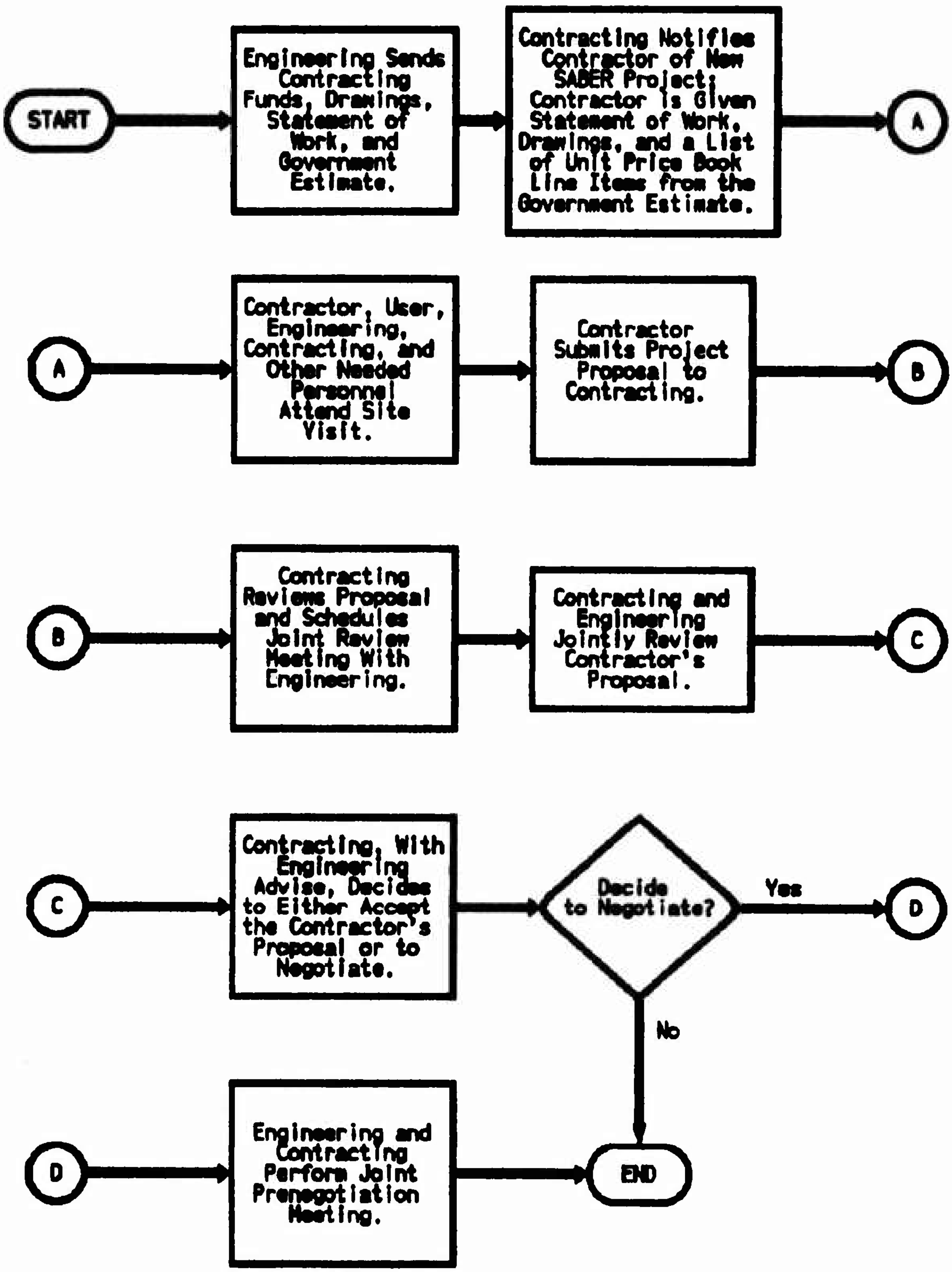

Figure 19. Process I

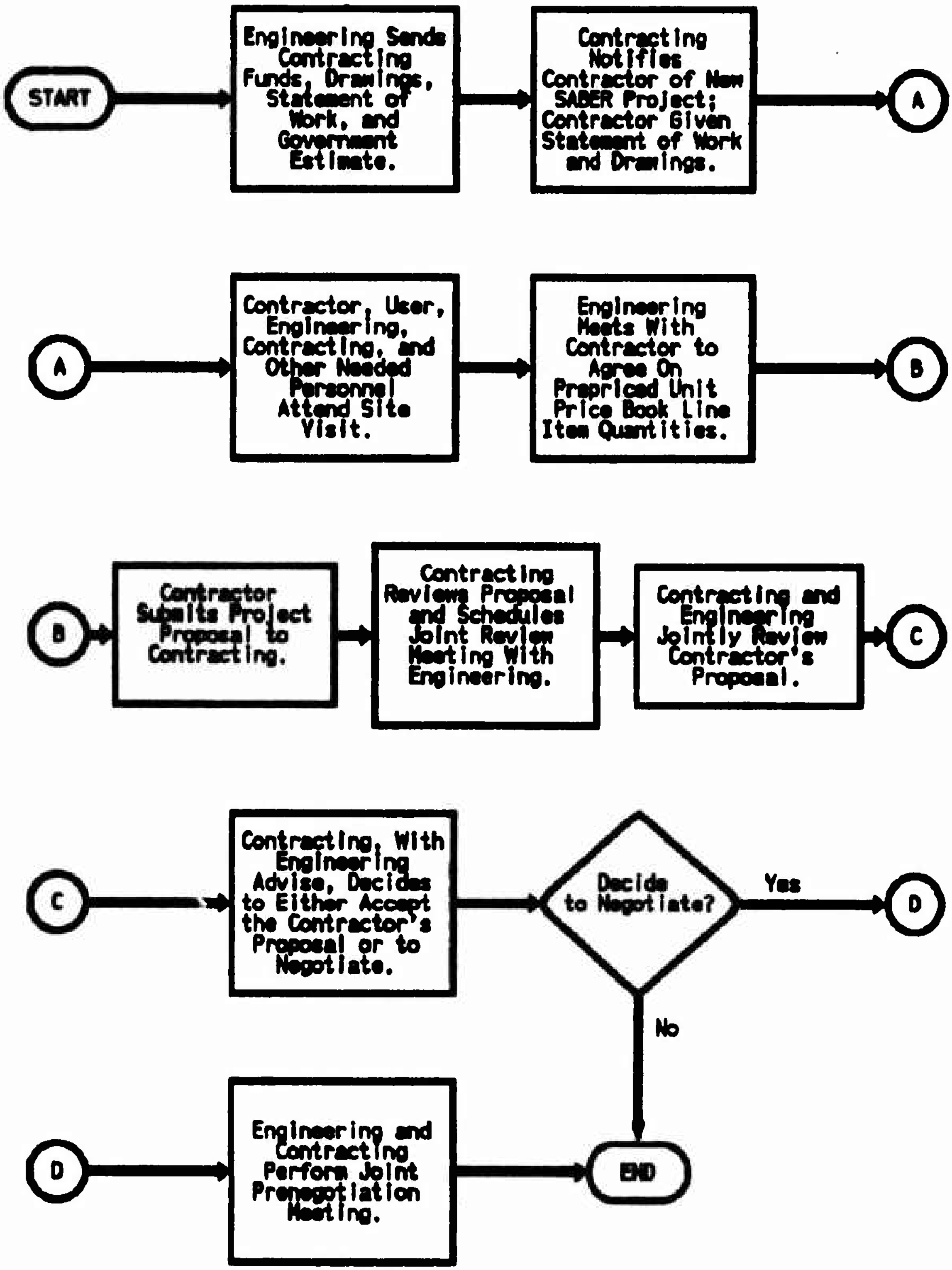

Figure 20. Process J

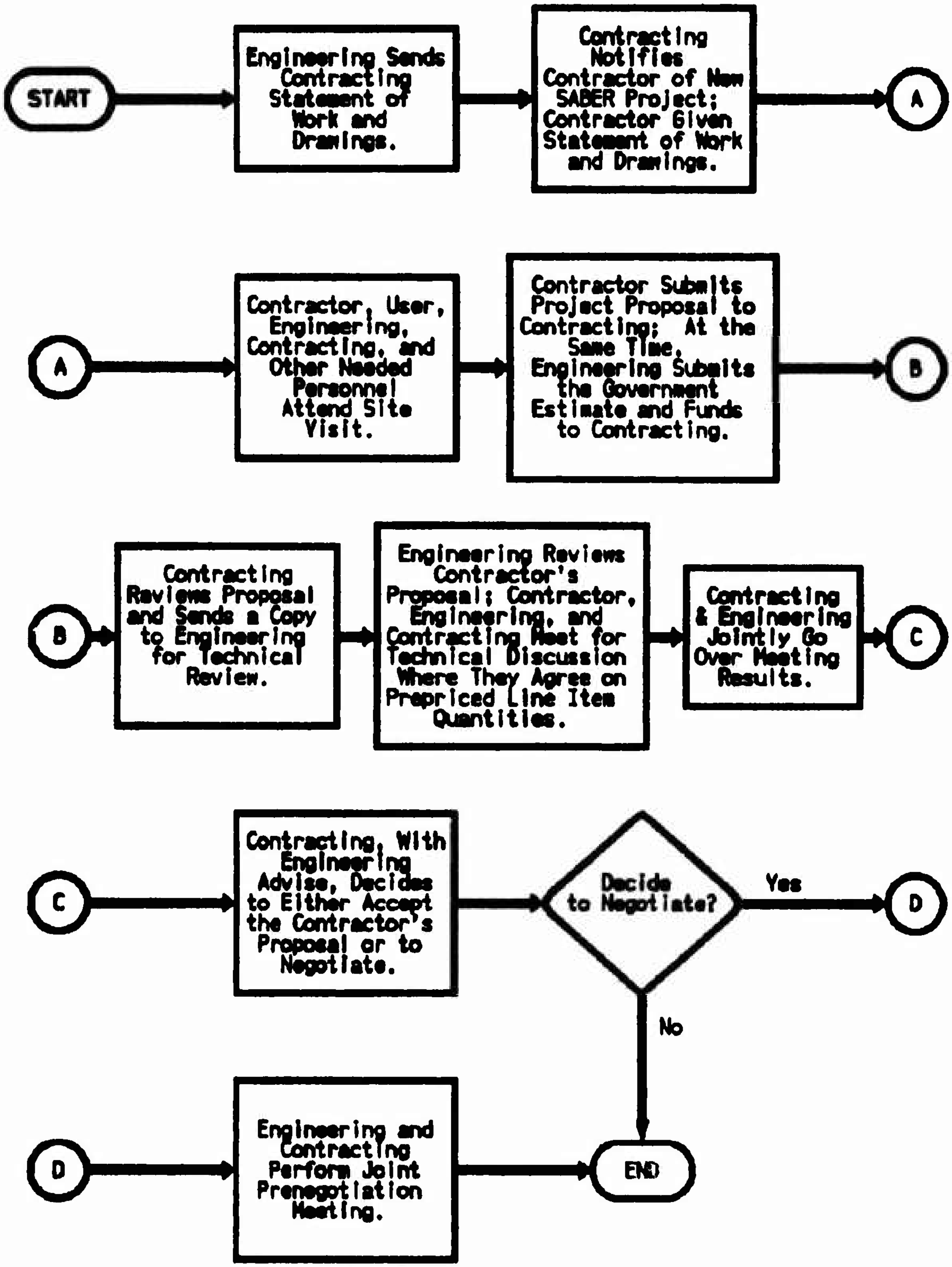

Figure 21. Process K

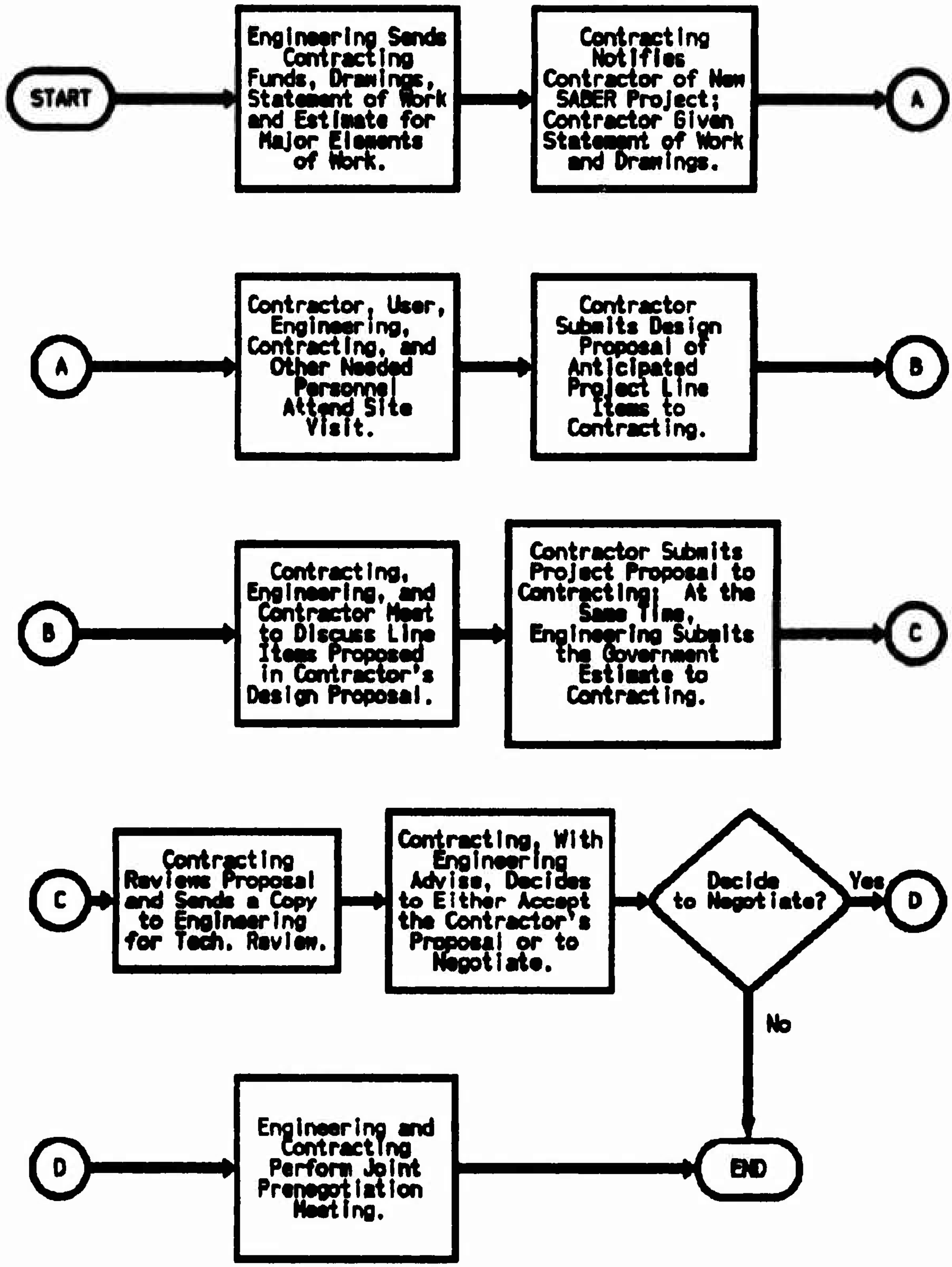

Figure 22. Process L

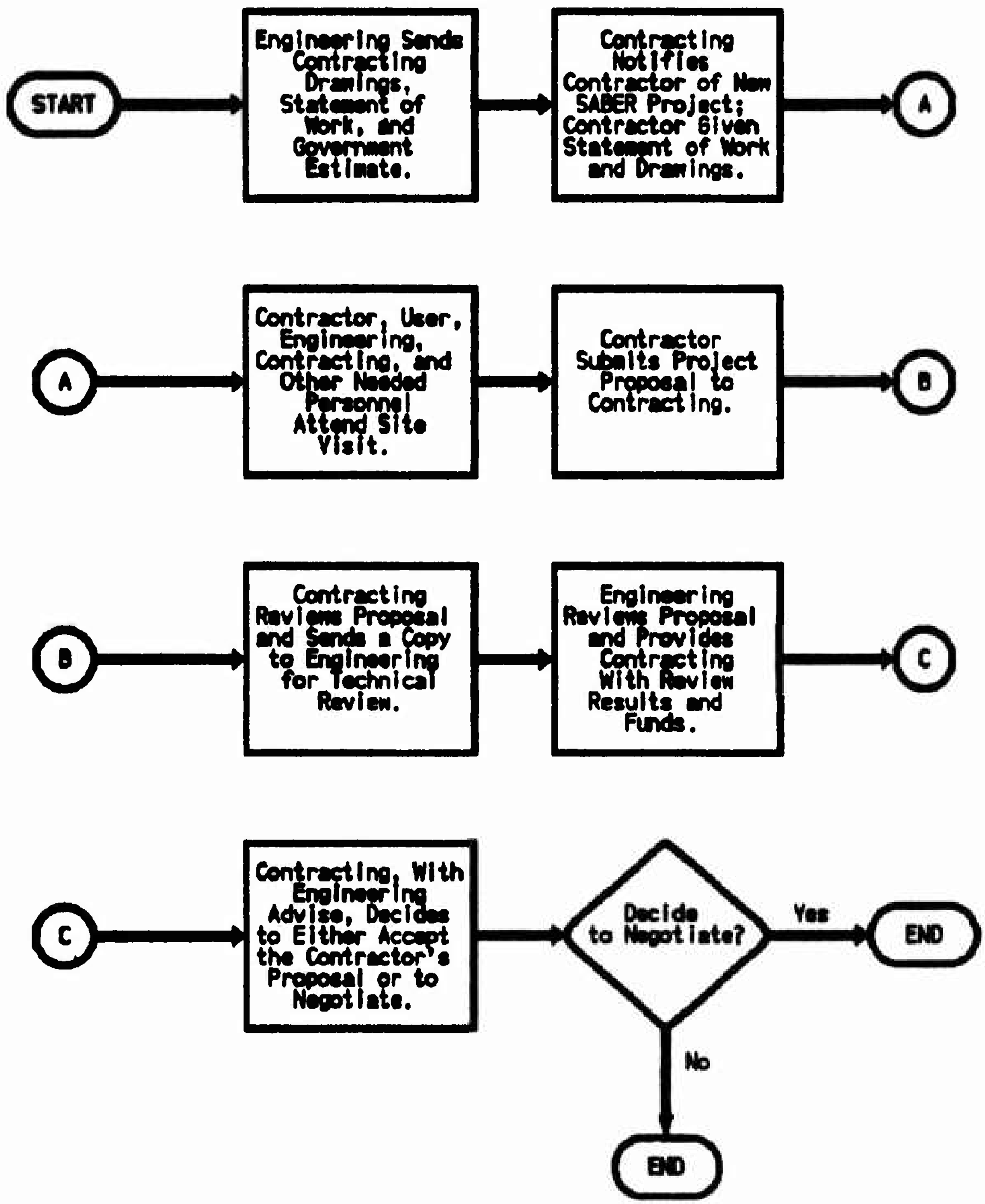

Figure 23. Process M

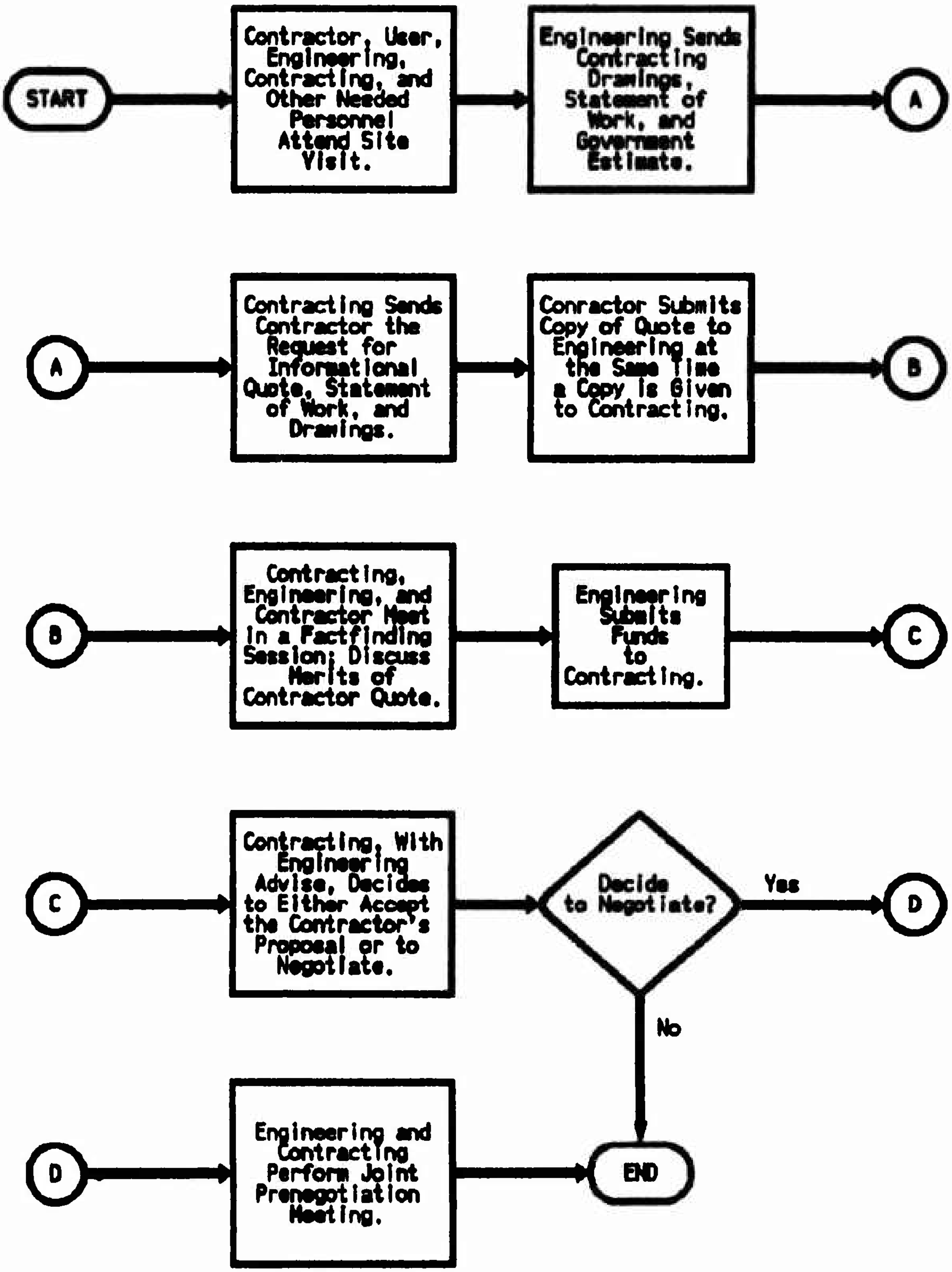

Figure 24. Process N

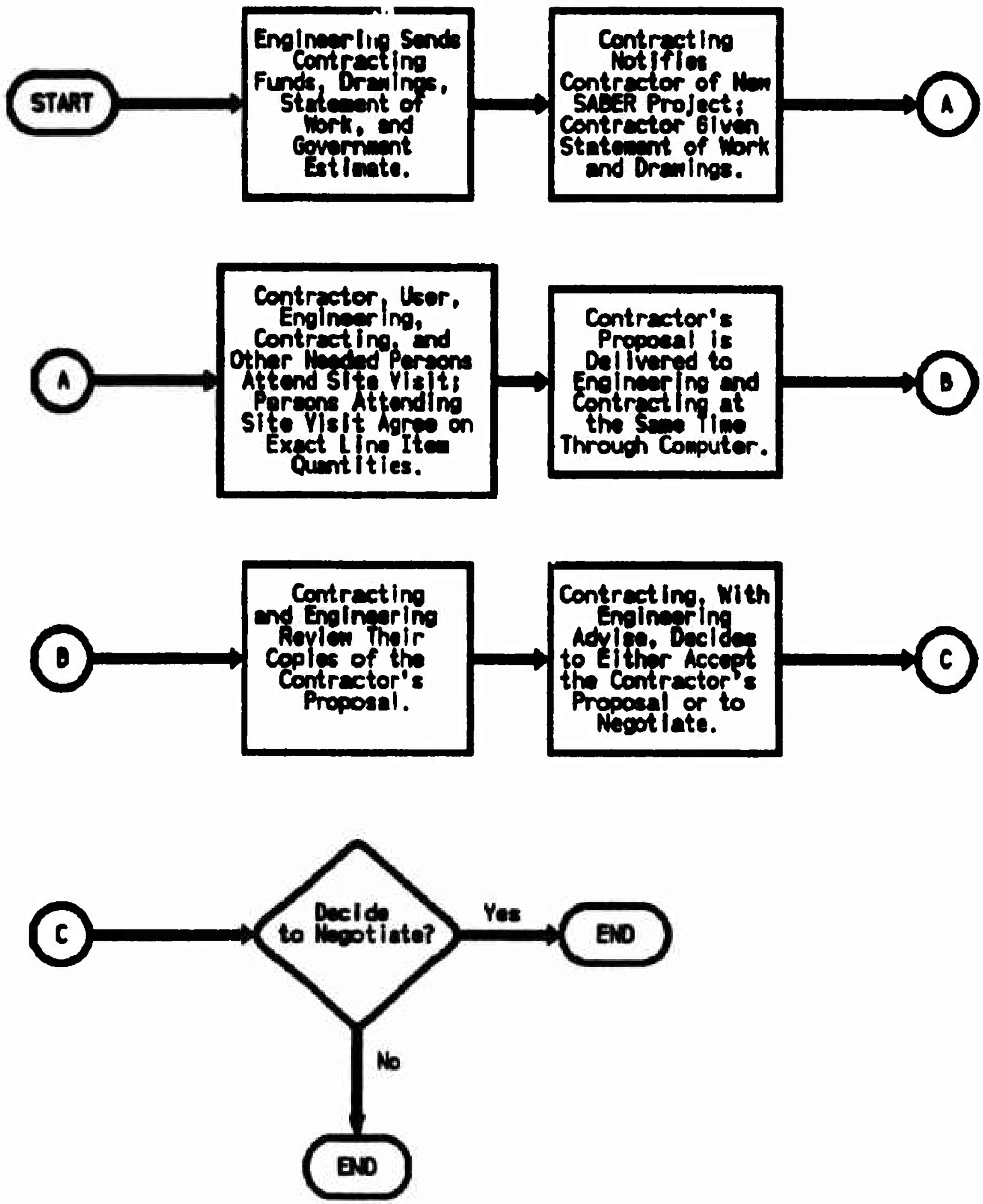

Figure 25. Process 0

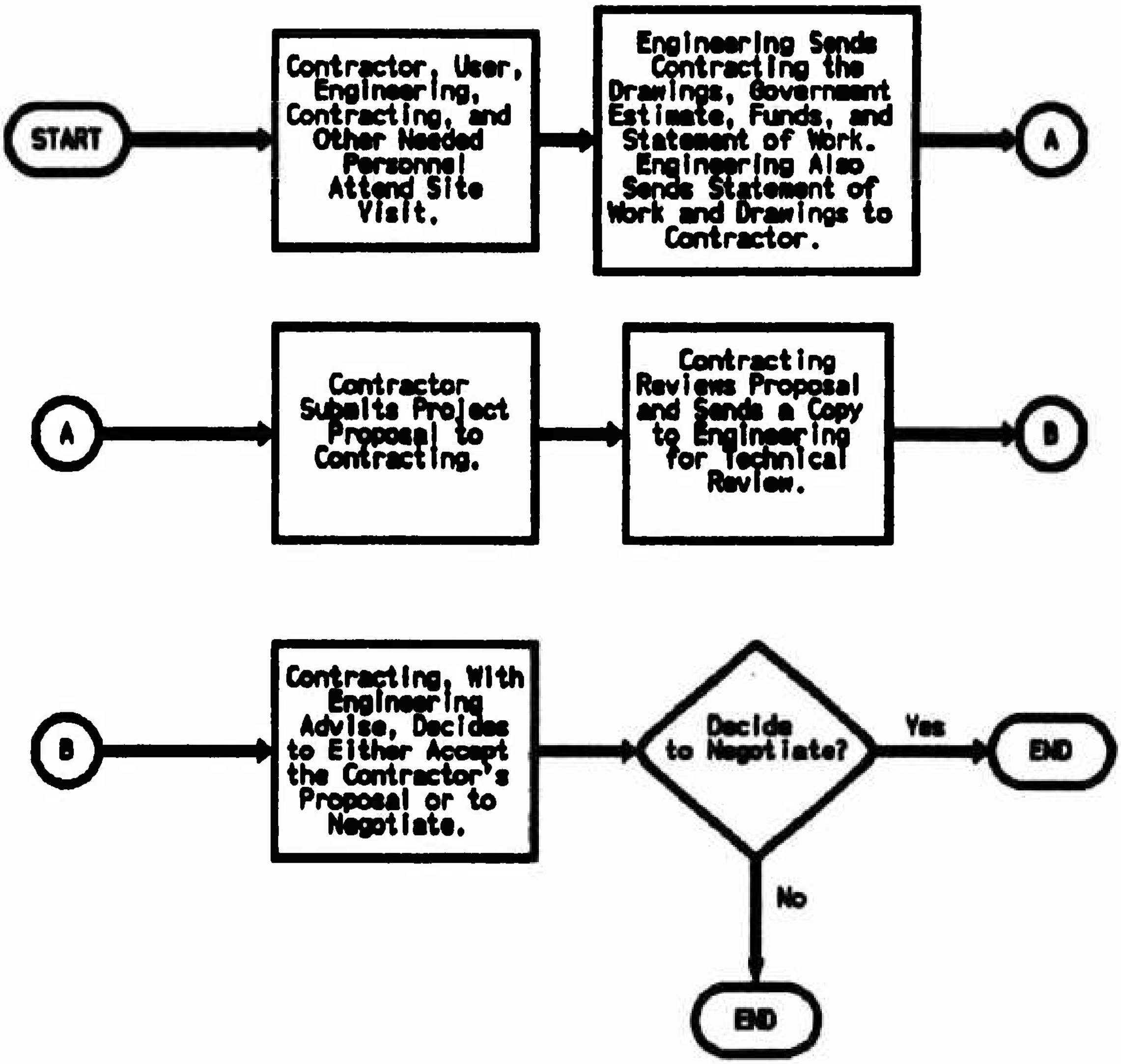

Figure 26. Process P

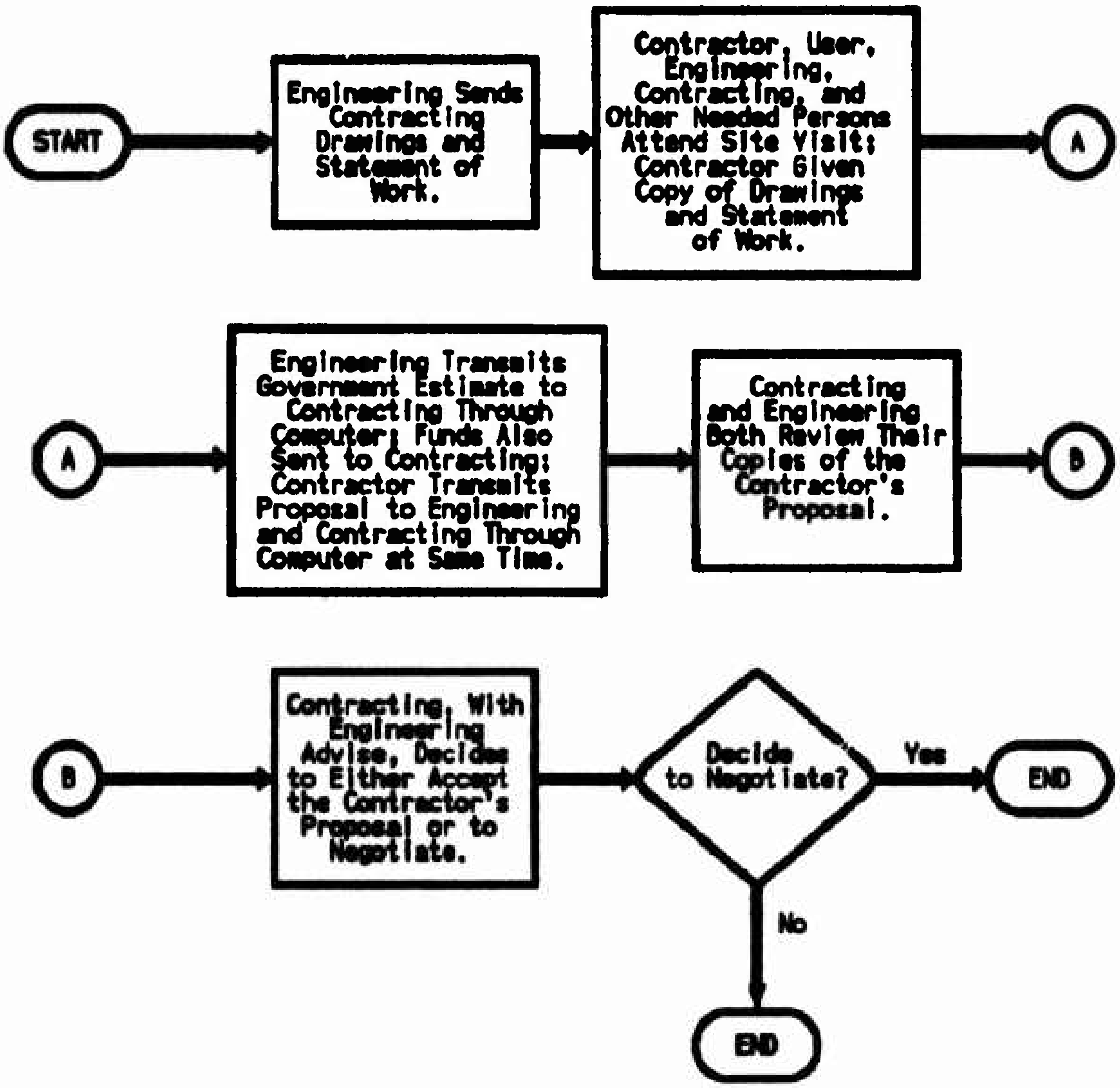

Figure 27. Process Q

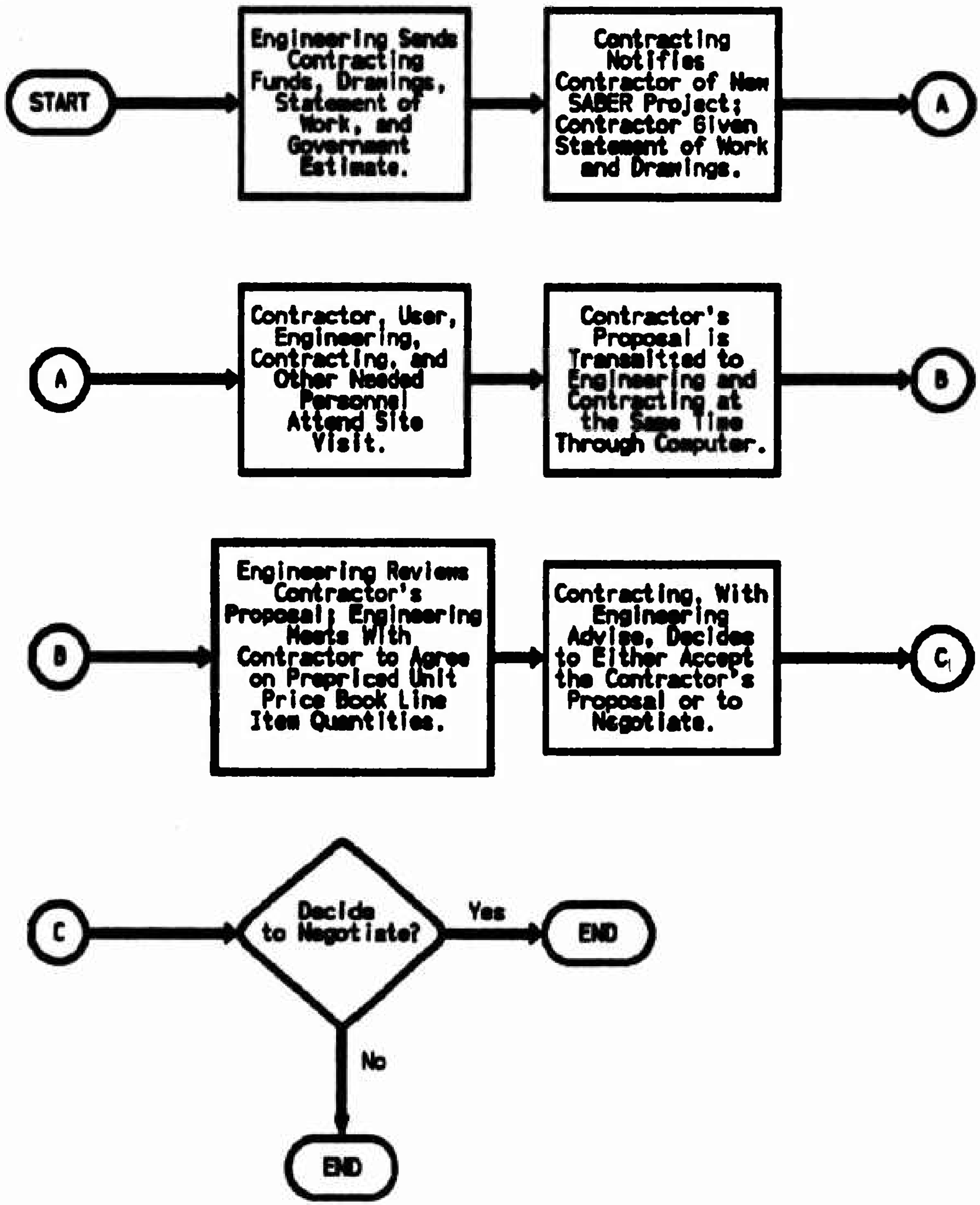

Figure 28. Process R

Appendix B. List of Interviewed Bases

Air Force Logistics Command

Hill AFB, UT	OO-ALC/PMKEB
Kelly AFB, TX	SA-ALC/PMKE
Robins AFB, GA	WR-ALC/PMKEA
Tinker AFB, OK	OC-ALC/PMKEF

Air Training Command

Chanute AFB, IL	3345 LG/LGCC
Goodfellow AFB, TX	GTTC/LGCC
Keesler AFB, MS	KTTC/LGCC
Lackland AFB, TX	3700 CONS/LGCBC
Laughlin AFB, TX	47 FTW/LGCX
Lowry AFB, CO	3415 LTTC/LGCC
Randolph AFB, TX	12 CONS/LGCC

Military Airlift Command

Dover AFB, DE	436 MAW/LGCK
Little Rock AFB, AR	314 TAW/LGCK
McGuire AFB, NJ	438 MAW/LGCK
Scott AFB, IL	375 MAW/LGCK
Travis AFB, CA	60 MAW/LGCK

Strategic Air Command

Barksdale AFB, LA	2 BMW/LGCC
Castle AFB, CA	93 CSG/LGCC
Dyess AFB, TX	96 BMW/LGCC
Ellsworth AFB, SD	812 SSW/LGCC
F.E. Warren AFB, WY	90 SMW/LGCC
Grand Forks AFB, ND	42 AD/LGCC
Griffiss AFB, NY	416 BMW/LGCC
K.I. Sawyer AFB, MI	410 BMW/LGCC
Loring AFB, ME	42 BMW/LGCC
Malstrom AFB, MT	40 AD/LGC
March AFB, CA	22 AREFW/LGCC
McConnell AFB, KS	384 BMW/LGCC
Offutt AFB, NE	55 SRW/LGCC
Whiteman AFB, MO	100 AD/LGCC

Tactical Air Command

Bergstrom AFB, TX	67 TRW/LGCV
Cannon AFB, NM	27 TFW/LGCK
Davis Monthan AFB, AZ	836 AD/LGCK
England AFB, LA	23 TFW/LGCK
Holloman AFB, NM	833 AD/LGCC
Homestead AFB, FL	31 TFW/LGCX
Langley AFB, VA	1 TFW/LGCC
Luke AFB, AZ	832 AD/LGCK
MacDill AFB, FL	56 TTW/LGCK
Moody AFB, GA	347 TFW/AQCCC
Mountain Home AFB, ID	366 TFW/LGCK
Nellis AFB, NV	554 OSW/LGCK
Seymour Johnson AFB, NC	4 LSS/LGCK
Shaw AFB, SC	363 TFW/LGCK
Tyndall AFB, FL	HQ ADWC/LGCK

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Vita

Captain Thomas R. Armiak was born [redacted] He graduated from [redacted] High School in 1982. Upon high school graduation he entered the United States Air Force Academy where, in 1986, he received a Bachelor of Science in Economics and a regular commission into the United States Air Force. His first assignment was to Tactical Air Command's Moody AFB, Georgia. There he served as an operational contracting officer with nearly two of his four years dedicated to "cradle-to-grave" SABER contract functions. He was honored as Tactical Air Command's Outstanding Contracting Officer for fiscal year 1988 and he received the command's Professionalism in Contracting award for fiscal year 1989. In May, 1990 he entered the Contracting Management program at the School of Systems and Logistics, Air Force Institute of Technology.

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13. ABSTRACT *(Maximum 200 words)*

This study sought to identify an improved process that could be used by the U.S. Air Force to award delivery orders under Simplified Acquisition of Base Engineering Requirements (SABER) construction contracts. To do this, the researcher applied a 12-step customized process improvement plan to the SABER delivery order award process at Wright-Patterson AFB. Telephone interviews were then conducted to determine if problem-related process activities at Wright-Patterson AFB existed at other operational contracting units within five Air Force major commands. Interviews revealed 18 different SABER delivery order award processes being used at 45 bases. None of the processes matched Wright-Patterson AFB's process. In addition, each of the nine problem-related process activities identified at Wright-Patterson AFB was being used by 4% to 76% of the 45 interviewed bases. Managers considering improving their SABER delivery order award processes can benefit from the researcher's documented process improvement efforts and from the flowcharts depicting the 18 reported SABER delivery order award processes. Managers can also examine Wright-Patterson AFB's SABER process problem-related activities to see if the potential exists for those same activities to cause problems in their SABER processes.

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