3-23-2004

A Comparative Analysis of the Cost of Oversight of Major Defense Acquisition Programs Strictly under the Direction of the Department of Defense 5000 Series of Instructions

Gary P. Rousseau

A COMPARATIVE ANALYSIS OF THE COST OF OVERSIGHT

OF MAJOR DEFENSE ACQUISITION PROGRAMS STRICTLY

UNDER THE DIRECTION OF THE DEPARTMENT OF DEFENSE

5000 SERIES OF INSTRUCTIONS

THESIS

Gary P. Rousseau, Capt, USAF
AFIT/ENV/GCA/04M-09

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AFIT/GCA/ENV/04M-09

A COMPARATIVE ANALYSIS OF THE COST OF OVERSIGHT OF MAJOR DEFENSE ACQUISITION PROGRAMS STRICTLY UNDER THE DIRECTION OF THE DEPARTMENT OF DEFENSE 5000 SERIES OF INSTRUCTIONS

THESIS

Presented to the Faculty

Department of Systems and Engineering Management

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Cost Analysis

Gary P. Rousseau, BS

Capt, USAF

March 2004

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

AFIT/GCA/ENV/04M-09

A COMPARATIVE ANALYSIS OF THE COST OF OVERSIGHT

OF MAJOR DEFENSE ACQUISITION PROGRAMS STRICTLY

UNDER THE DIRECTION OF THE DEPARTMENT OF DEFENSE

5000 SERIES OF INSTRUCTIONS

Gary P. Rousseau, BA
Capt, USAF

Approved:

//signed//	19 Feb 2004
Michael A. Greiner, Maj, USAF(Chairman)	date
//signed//	19 Feb 2004
John D. Driessnack, Lt Col, USAF (Member)	date
//signed//	19 Feb 2004
David R. King, Maj, USAF (Member)	date

AFIT/GCA/ENV/04M-09

Abstract

The United States Department of Defense has been caught in a continual cycle of acquisition reform since its inception over two hundred years ago. The goal of acquisition reform has always been to find the perfect balance between the amount of program oversight and the amount of flexibility in which program managers are allowed to manage their programs. The only truth learned throughout this process is that defense acquisition does need oversight and that there is no cookie cutter pattern for oversight that will fit all types of acquisition programs equally well. That being said, the focus of this thesis will be to explore the foundations of oversight for programs following Department of Defense Directive 5000-the defense acquisition bible and employ Delphi survey techniques to then develop an estimate for the actual cost of oversight for defense acquisition programs that are under the guidance of the DoDD 5000.

The real value in this research will then be to compare the oversight cost estimate for programs under the DoDD 5000 to oversight cost estimates developed using the exact same methodology but examining programs with different types of oversight. Specifically, space acquisition and communications acquisition have been operating under a different oversight format over the last few years and the interest is in determining if the changes have made defense acquisition any more efficient and any less costly.

To my wife and children
Thanks for supporting me through this and all my endeavors

Acknowledgements

I would like to thank my advisor, Maj Mike Greiner, for providing the insight and guidance through this entire process. I'd also like to thank Lt Col John Dreisnack and Defense Acquisition University for sponsoring this research effort.

To my fellow team members, Capt Neal Monroe, Capt Diane Kuderik, and 1st Lt Darrin DeReus thank you for the support and all the hard work that made this research effort possible. I would like to give special thanks to my family without whom I probably would not have had the drive and inspiration necessary to complete this program. To my wife and my children, thank you for the never ending love, support, and understanding.

Gary P. Rousseau

Table of Contents

List of Figures

Figure Page

List of Tables

Table Page

A COMPARATIVE ANALYSIS OF THE COST OF OVERSIGHT OF MAJOR DEFENSE ACQUISITION PROGRAMS STRICTLY UNDER THE DIRECTION OF THE DEPARTMENT OF DEFENSE 5000 SERIES OF INSTRUCTIONS

1.0 Introduction

1.1 Overview

As a nation we must continue to reform our defense acquisition process, so we can respond to and defeat the unpredictable threats of a post-Cold War world. On July 20, 1995, then Under Secretary of Defense for Acquisition and Technology, Dr Paul Kaminski, hosted a conference on integrated product teams and in his speech summed up the importance of acquisition reform (referring specifically to the need for flexibility in the 5000 series), “We must tailor not only the acquisition strategy, but the acquisition approval process to the specific circumstance of individual programs” (21:3). In his speech, Dr Kaminski addressed the importance of reform and flexibility in our defense acquisition approval, or oversight, process and we are beginning to see his vision implemented into today’s defense acquisition process. It is the defense acquisition approval process that will be the focus of this research effort. Specifically, the aim of this research focuses on the costs associated with the defense acquisition oversight process.

1.2 Background

A discussion of acquisition oversight costs would be impossible without discussing acquisition reform. Acquisition reform in and of itself is a very broad, wide-ranging topic. In his book, *Arming the Eagle: A History of U.S. Weapons Acquisition* *since 1775*, author Wilbur D. Jones, Jr. clearly illustrates how the U.S. defense acquisition process was actually created alongside the creation of our nation. He goes on to show how the acquisition process has evolved for over two centuries. This research will not address as broad a topic as the history of defense acquisition reform, but will focus more specifically with the reform of the Department of Defense (DoD) and its governing body of regulations for acquisition, the DoD 5000 series. This exploration of acquisition reform will begin with the development of the DoD 5000 series in the early 1970s and follow through to the current defense acquisition process. The historical development of the DoD 5000 series will be covered in depth in Chapter 2. The purpose of this exploration of the reform of the DoD 5000 series is to support the discussion of how the DoD acquisition system works for those programs that must strictly follow the procedures outlined in the DoD 5000 series. The discussion of how the defense acquisition process operates serves two purposes; 1) it would be incomplete to discuss how the acquisition process works today without a discussion of how we got there, and 2) that illustration will provide the framework on which the cost of oversight will be evaluated.

1.2.1 Thinking Outside the Box

The reform of the DoD 5000 series and how that reform has affected the defense acquisition approval process, and thus oversight costs, would alone provide sufficient material for an interesting research project. However, that was not the only type of reform taken into consideration. Both the defense space and missile acquisition processes have taken acquisition reform a step further in essentially creating their own set of rules. In a memorandum from the Secretary of Defense dated 2 January 2002, the

Ballistic Missile Defense Organization (BMDO) was re-designated the Missile Defense Agency (MDA) and given much greater flexibility in regards to the acquisition process as stated:

> The special nature of missile defense development, operations, and support calls for non-standard approaches to both acquisition and requirements generation. The memo went on to outline a major 'non-standard' approach. To encourage flexible acquisition practice, I delegate to the Director, MDA, authority to use transactions other than contracts, grants, and cooperative agreements to carry out basic, applied, and advanced research. The memo further stated as part of the commitment to ensure flexibility I will support additional or revised statutory authority as identified by the Director, MDA, to reduce development time and enhance program success (35:2, 4).

Space acquisition also took a similar direction when on 4 March 2002, in a memorandum from the Under Secretary of Defense for Acquisition and Logistics, the Milestone Decision Authority (MDA-the final level of hierarchy in the defense acquisition approval process) was delegated to the Secretary of the Air Force for all DoD Space Major Defense Acquisition Programs. It outlined the following in regards to flexibility in dealing with the regulatory requirements of the DoD 5000 series:

> The secretary of the Air Force in coordination with the Secretaries of the Army and the Navy, may implement further actions with regard to space acquisition streamlining. For Space MDAP's, the MDA is authorized to approve or waive any exceptions to the provisions of DoD instructions and publications… (1:1)

The Secretary of the Air Force then re-delegated MDA to the Undersecretary of the Air Force in a Memo dated 14 March 2002 (34:1). On 20 March 2003, the Undersecretary of the Air Force issued a memo in which he granted "an exemption and waiver to the processes and procedures described in DoDI 5000.2 (Acquisition procedure for Major Defense Acquisition Programs-MDAPs) and related guidance for all current AFPEO/SP

(Air Force Program Executive Officer/Space) programs as well as future space programs executed under the authority of the AFPEO/SP" (39:1). By Spring 2003, the DoD acquisition world had two programs, missile and space, that were not operating strictly under the DoD 5000 series. Throughout the remainder of this research, these programs will be referred to as "outside the box" since they are operating outside the framework of rules of the DoD 5000 series. In the communications acquisition world, another example of acquisition reform can be seen. Communications acquisition remains 'strictly' under the procedures outlined in the DoD 5000 series yet those procedures are streamlined by implementing them into a virtual world. For example, rather than conducting all meetings face-to-face, in a designated meeting location, the communications initiative strives to save time and money by posting all necessary information in a shared database and then conducting meetings via the web. These communication acquisition programs will hereafter be referred to as "virtual box" programs since they still operate under the framework of the DoD 5000 series, but attempt to do so in a virtual, or web-based, environment. While this research will evaluate the cost of oversight for MDAP programs required to strictly follow the DoD 5000 series, as part of a collaborative effort, two additional research efforts will evaluate the cost of oversight for programs following the more flexible space and communications initiatives.

1.3 Problem

This research effort will evaluate the cost of oversight of MDAPs that must operate strictly under the guidelines of the DoD's governing acquisition instructions. Why is this study of the cost of oversight of major defense acquisition programs important? Acquisition programs produce the technologically advanced weaponry that warfighters need to defend the nation and the many other nations who depend on the United States. We must continue to reform our acquisition process with the goal of reducing oversight costs and producing more advanced technological products and faster in order to be prepared for whatever threats may come. In his testimony before the Senate Armed Services Committee 11 January 2001, the Secretary of Defense addressed the issue of reforming the acquisition process and its importance to the defense of the nation:

> The legacy of obsolete institution structures and processes and organization does not merely create unnecessary cost, which of course it does; it also imposes an unacceptable burden on national defense," he said, "In certain respects, it could be said that we are in a sense disarming or 'under arming' by our failure to reform the acquisition process and to shed unneeded organization and facilities (23:4).

The Secretary's testimony put the importance of acquisition reform into clear terms. He emphasized that we are risking the nation's defense if we do not continue to reform the way our country arms itself. The final evidence in support of the importance of studying the cost of oversight and acquisition reform in general comes in a memorandum dated 5 January 2001 from the then Undersecretary of Defense for Acquisition and Technology, in his endorsement to the assistant service secretaries for the establishment of a project to create a history of defense acquisition and confirmation of the services' agreement to support the effort by funding $250,000 per year for fiscal years 2002-2006. He asserts the importance of this project:

> During the more than fifty years since the National Security Act of 1947, the Department of Defense acquisition function has experienced great change and received extraordinarily high public visibility and congressional attention. We are missing however a comprehensive record of Defense Acquisition accomplishments and failures from which we may have opportunity to learn. An official history of the Department of Defense Acquisition System would clearly

fill this historical void and serve as a reference and instructional tool for the entire acquisition community, including our educational institutions (22:1).

1.4 Scope and Definitions

What is meant by “oversight”? The term “oversight” has several meanings in regard to MDAPs. In order to narrow the scope, it is helpful to first state two types of oversight that this research effort will not address. These include congressional oversight of the defense acquisition process and the oversight of the defense industrial base (contractors). This research will not investigate either of these cases. For the purpose of this research, oversight is defined as the vertical levels of approval, or the hierarchy of approval stages, that a program must pass through in order to advance from one acquisition lifecycle stage (milestone) to the next. This research captures the costs that are generated as the program is reviewed and approved at each level in the vertical hierarchy as it moves toward final approval from the governing acquisition board through the milestone approval process. This research effort will study major defense acquisition programs in the horizontal timeline between Milestone B (program initiation) through the Low Rate Initial Production (LRIP) approval at Milestone C, and will look at the vertical approval hierarchy from above the Program Manger’s (PM) level up to the Defense Acquisition Executive (DAE) or Component Acquisition Executive (CAE) at the Defense Acquisition Board (DAB).

Another set of terms from the statement of the problem that needs explanation is ‘operating strictly under the DoD 5000 series of instructions.’ Throughout the remainder of this research, programs that must strictly follow the rules outlined in the DoD 5000 series will be referred to as “box” programs; for they must operate inside the “box”, or framework, of rules outlined in the DoD 5000 series. The assumption is that since the DoD 5000 series governs defense acquisition programs, all DoD acquisition programs would have to operate strictly under this regulation. However, as mentioned previously, both the space and missile acquisition processes have been granted authority to operate "outside the box" environment so that is not the case. These, along with other key terms, will be defined in greater detail in Chapter 2.

1.5 Research Objectives and Questions

The objective of this research effort is to evaluate the cost of oversight of "box" MDAPs. Until recently, all acquisition programs were "box" programs. Recent acquisition reforms in both the communications and space and missile acquisition environments, however, are attempting to make their acquisition processes more efficient by either "virtualizing" box requirements, or developing their own set of acquisition rules. The measuring stick for how effective these reforms are is how their oversight costs compare to each other and to programs still operating "in the box". The final question to be answered by this research effort is, "What are the key oversight cost drivers for "box" MDAPs?" Determining cost of oversight alone is helpful, but it is more beneficial to determine the factors that drive those costs of oversight in order to better focus efforts to make DoD acquisition more efficient.

1.6 Summary

This chapter outlined the importance of this research effort, some initiatives that drove this groundbreaking research effort, and the importance of studying the evolution of the DoD 5000 series. Chapter 2 will further discuss other research and studies that have been conducted dealing with the cost of oversight of MDAPs as well as defining key terms and solidifying the scope of the research effort. Chapter 3 will fill in the blanks left by Chapter 2's discussion of how the oversight process works by employing the Delphi Method to determine an estimate for the cost of the oversight process. The primary aim of Chapter 3 is to collect the data necessary to answer the research question, "What is the cost of oversight of major acquisition programs operating inside the box?" An interesting perspective can be gained by then viewing that cost of oversight as a percentage of overall program cost and then comparing this percentage to the percentages for the communications acquisition programs that are operating in a more flexible box and the space and missile programs that are operating outside the box. Chapter 4 will analyze the data collected using Chapter 3 procedures and provide conclusions. Chapter 5 will discuss further research potential in the area of evaluating the cost of oversight.

2.0 Literature Review

2.1 Overview

The cost of oversight of Major Defense Acquisition Programs (MDAP) significantly impacts the overall Department of Defense (DoD) budget. Hence, of the hundreds of billions of dollars the United States spends every year in supporting its defense programs, a portion of that budget is applied to the oversight of those programs. According to one study, however, "The Department of Defense loses approximately $5 billion per year in investment program content due to cost growth" (9:60). This study shows that despite DoD's attempt at sound oversight of its acquisition programs, those programs continue to be hampered by cost growth. The DoD continues to evolve its oversight philosophy through policy in an attempt to find the best balance between control and flexibility. They do this because if our nation stops looking at the cost of the oversight of our defense programs, program costs could continue to escalate until the acquisition system is no longer able to produce the quality products our war fighters need to defend this nation.

The first section of this chapter describes how a typical MDAP operates as outlined in the DoD 5000 series of instructions. Key terms and definitions are provided as well as review of some of those initially mentioned in Chapter 1. Next, to provide background for the operation of today's acquisition system, the evolution of the DoD 5000 series of instructions is explored. The final section of this chapter discusses previous research in the area of the cost of oversight of MDAPs. The major issue, stated in Chapter 1 concerns the cost of the vertical levels of approval (oversight) in the MDAP process that enables an MDAP to move from one development stage, or milestone, to the next.

2.2 MDAP Operation as Defined in the DoD 5000 Instructions

The MDAP process is governed by the DoD 5000 series of instructions. Since its creation in 1970, the DoD 5000 series has been changed several times; with the most recent version dated 12 May 2003. This section explains the rules established by the current instructions and how the MDAP process is designed to work. The aforementioned descriptions provide a framework of the regulatory environment in which an MDAP must operate. This research will evaluate the cost of that oversight of MDAP's based on the rules outlined in the DoD 5000 series for those programs that must strictly follow these instructions.

2.2.1 Definitions

Some key terms need to be defined prior to establishing the regulatory framework under which a box program must operate. To begin, a MDAP is defined based on dollar thresholds. As outlined in enclosure 2 of DoDI 5000.2, a Major Defense Acquisition Program (MDAP) (also referred to as Acquisition Category (ACAT) I) is, "estimated by the Under Secretary of Defense for Acquisition, Technology, and Logistics to require research, development, test, and evaluation (RDT&E) of more than $365 million in fiscal year 2000 constant dollars or, for procurement of more than $2.190 billion in fiscal year 2000 constant dollars" (15:16).

Oversight refers to the vertical levels of approval above the PM. Figure 2.1 shows the vertical levels of approval, or oversight, above the PM's level.

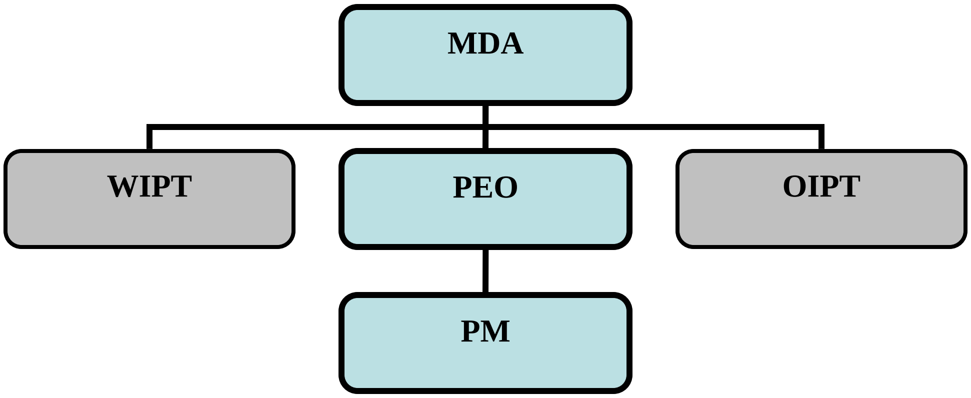

Figure 2.1: Oversight Approval Levels

According to Figure 2.1, the vertical levels of hierarchy appear to be quite streamlined. It is important to note that although the figure appears to put the OIPT and the WIPT on the same level of the hierarchy, that in matters of practice, the WIPT actually falls under the OIPT. The analysis discussed in chapter 4 dissects these levels in order to determine how many meetings it takes before a program is ready to go to the DAB to be reviewed for milestone approval, and how many people at which pay grades are involved. The PM is responsible for the efficient operation of the program he is charged with executing. PM's are responsible to the next level in the hierarchy, the Program Executive Officer (PEO). According to Enclosure 9 of the 5000.2, a PEO is assigned to all MDAP's unless a waiver is granted (15:35). The PEO's sole responsibility is executive management over the PM or PM's to which they are assigned. The final level in the formal vertical chain of command is the MDA who chairs the DAB. The MDA will be the DAE or CAE (depending on whether the program is under the authority of the DoD or Service Component, respectively). The MDA is the final approval authority in determining whether a program moves horizontally from one milestone to the next. Outside the formal vertical oversight chain, but still critical to the oversight process, are the Integrated Process

Teams (both the OIPT-Overarching and WIPT-Working Level). According to the DODI 5000.2, "An OIPT shall facilitate program communications and issue resolution, and support the MDA for ACAT 1 and IA ('ACAT I' refers to MDAP and 'A' refers to communications) programs" (15:12). An Integrated Product Team (IPT) is a group of functional experts with a stake in the operation and success of a program. The IPT establishment and use of IPTs were addressed in a 1995 from then Under Secretary of Defense for Acquisition and Technology, Dr. Paul Kaminski. In his memo, he stated that the purpose of IPTs would be to provide for early and on-going oversight of defense acquisition programs rather than oversight only at the six-month out point from MDA review. IPTs were officially codified in the 15 March 1996 version of the DoD 5000 series (18:48).

2.2.2 Development Stages

Each MDAP moves through horizontal steps that represent movement from one development stage to the next. Figure 2.2 shows the horizontal steps that a program must progress through.

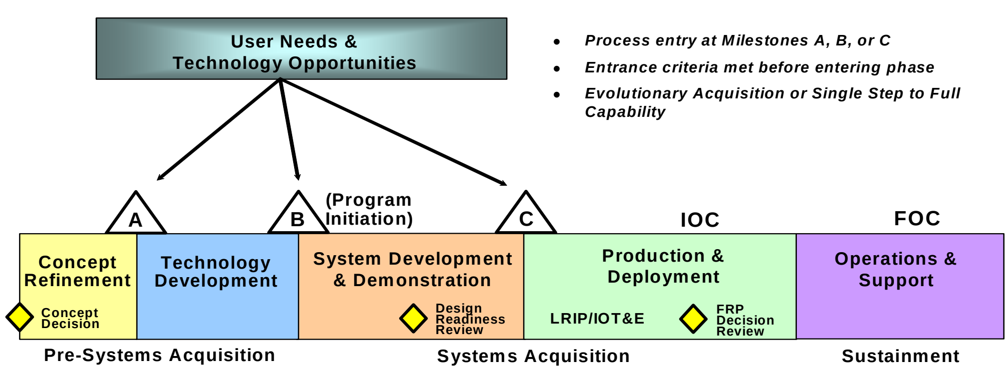

Figure 2.2: Forward Progress (15:2)

The “systems acquisition” process is composed of all the steps included within Milestone B and Milestone C. There are steps under Milestone C that continue on after a LRIP decision, but these are outside the scope of this research. “The purpose of the System Development and Demonstration (SDD) phase is to develop a system or an increment, capability” (15:6). The entry point to SDD is Milestone B. While the refinement of ideas and needs occurring in Milestone A may be considered the conception of a program, it is not until a program is approved to enter Milestone B (program initiation) that the program is established. The tables in Enclosure 3 of DoDI 5000.2 list all of the statutory and regulatory requirements that must be met at each milestone decision point.

The purpose of system development is, “the management and mitigation of technology risk” as well as, “…objective assessment of technology maturity...” (15:8). In order to move from development to demonstration, the system must undergo a Design Readiness Review (DRR), which “provides an opportunity for mid-phase assessment of design maturity” (15:8). After successfully completing the DRR, a program enters into the demonstration phase. The intent of the system demonstration phase is to “demonstrate the ability of the system to operate in a useful way,” and the system exits the demonstration phase when “a system is demonstrated in its intended environment, using the selected prototype; meets approved requirements; industrial capabilities are reasonably available; and the system meets or exceeds exit criteria and Milestone entrance requirements” (15:8). The final result of the demonstration portion of Milestone B is “dependent on a decision by the MDA to commit the program at Milestone C or a decision to end the effort” (15:8).

A MDAP enters LRIP when the MDA approves the program to enter Milestone C. The purpose of LRIP is to "result in completion of manufacturing development in order to ensure adequate and efficient manufacturing capability and to produce the minimum quantity necessary to provide production or production representative articles for …<testing>" (15:9). LRIP is considered 'low rate' because the production quantities are limited in order to provide enough units to ensure testing and producibility yet limit the taxpayer expense before fully approving production. According to DoDI 5000.2, the quantity is normally limited to, "10 percent of the total production quantity documented in the acquisition strategy" (15:9).

2.3 Evolution of the DoD 5000 Series of Instructions

With the environment in which a "box" MDAP must operate described, the next step is to discuss the evolution of the DoD 5000 series. In his book, *Arming the Eagle*, Wilbur D. Jones, Jr. refers to a quotation by Robert T. Marsh that appeared in "U.S. Defense Policy in an Era of Constrained Resources" that is appropriate to the exploration of the evolution of defense acquisition's 5000 series of instructions, "Every administration and Congress since [WWII] has instituted changes to improve the [acquisition] organization and process," Marsh continued, "As one might expect, these changes did not always bring the improvement desired, and in fact sometimes created new problems, more serious than the ones for which the cures were intended" (27:400). The DoD 5000.1 wasn't conceived until 1970 (27:408).

2.3.1 Importance of studying the DoD 5000's Development

According to an article by Joe Ferrara on the evolution of the DoD 5000 series, DoDI 5000.1 and its accompanying DoDI 5000.2, "have been the foundation of the defense acquisition process for over 20 years" (20:109). Ferrara points out that from 1971 to 1993, the DoD 5000 series was reissued nine different times (20:109). A revision in 1996 and others in 2000 (2002 for the 5000.2) and 2003 (for both the 5000.1 and5000.2) brings to total of 12 the times that this governing set of documents has been rewritten. Ferrara points out that the reason it is important to study the evolution of the DoD 5000 series is that, "the 5000 documents offer a unique window on the evolution of policy in a major government department" (20:109). The DoD 5000 series is at the heart of acquisition reform efforts as the tool that each administration has used to implement their vision of how to streamline the defense acquisition system.

2.3.2 Secretary Packard Leads the Way

The 5000 series came about under the direction of David Packard, President Nixon's Deputy Secretary of Defense. Deputy Secretary Packard headed a defense acquisition review council charged to examine the defense acquisition process to discover opportunities to improve the process. In May 1970, Packard issued a memorandum in which the DoD 5000 series was conceived (20:111). This memorandum outlined the ideas that would later form the basis for the first issuance of DoD Directive 5000.1. Some of Packard's ideas listed included, "decentralized execution, streamlined management structures, and use of appropriate contract mechanisms" (20:111). Packard's ideas became the central themes throughout the first DoDI 5000.1, issued in July 1971 (20:111). Ferrara suggests the original guidelines for the operation of a defense acquisition program as outlined in the 5000.1 (as envisioned by Deputy Secretary Packard) have been the driving force behind every acquisition reform effort and DoD 5000 revision ever since (20:111). A key point excerpted from the first DoD 5000 document was that "Layers of authority between the program manager and his Component Head shall be kept to a minimum" (20:111). Over three decades ago, Deputy Secretary Packard knew the importance of the removal of unnecessary layers of oversight. With publication of the document that laid the groundwork for this important concept, what each revision since has attempted to do is find the balance of oversight that provides the greatest amount of flexibility and ensures the most efficient deployment of products to the warfighter.

2.3.2.1 Packard's Key Concepts

Reaffirming his idea that the concepts outlined in the first DoD 5000 Directive were the basis for all future iterations of the document, Ferrara makes the point that,

> The founding 5000.1 set the tone and all subsequent documents have been remarkably consistent in continuing to articulate a few key themes. This is remarkable because as even the most casual observer of the DoD procurement scene is aware, the last two decades have witnessed extraordinary and persistent agitation for reform and improvement (20:113).

Ferrara lists the central themes consistent with all of the DoD 5000 issuances: Centralized policy decentralized execution; fly before you buy; streamlined organization; limited reporting requirements; and program stability (20:113-115). In brief, the first theme, centralized policy-decentralized execution means bringing authority to execute the program to the lowest level possible while ensuring policy is stable and consistent for all parties involved. Fly before you buy stresses the importance of testing. Taxpayer dollars should not be committed to a program until it first proves useful to the warfighter and producible given the current industrial base and technology. Streamlined organizations touch on the importance of the removal of excessive layers of management, as they are detrimental to the efficient operation of the process. Limited reporting requirements attempts to remove duplicated efforts. Ferrara called these themes the “management principles etched in the granite of the [first] 5000.1” (20:113) and supports this observation in several instances by comparing how different revisions of DoDI 5000.1 address and incorporate the key themes in a similar manner.

2.3.3 Changes by Administration

Ferrara asserts that the prime driver behind efforts to revise the DoD 5000 series has been changes in presidential administration. According to Ferrara, the DoDI 5000.1 was first issued in 1971 under Nixon with two revisions under President Ford (1975,1977); one revision under Carter (1980); four revisions under Reagan (1982,1985,1986,1987); one revision under Bush(1991) and one revision under Clinton (1993) (20:115). There is also a second reissuance under Clinton (1996) and then two revisions under Bush (2000, 2003).

2.3.3.1 The Nixon Administration (1968-1974)

The action to begin the DoD 5000 series was conceived in 1970 in response to rising defense acquisition costs (20:110). The first DoD 5000 instruction outlined both the vertical layers of hierarchy and the horizontal steps that a program must move through to reach full production. Under the first series, the horizontal steps included program initiation, full-scale development, and production/deployment (20:112). These steps are somewhat similar to today’s milestones A through C steps; however, the vertical final approval authority for moving form one milestone to the next went all the way to the Secretary of Defense.

2.3.3.2 The Ford Administration (1974-1977)

In 1975 the reissuance of DoDI 5000.1 came with the issue of DoDI 5000.2 (20:116). This new document attempted to bring more concentrated focus to the series, making the DoD 5000 series more user friendly.

The 1977 revision came in response to "the recommendations of the commission on government, the establishment of the Office of Federal Procurement Policy, and the issuance of Office of Management and Budget Circular A-109 (20:117). The new change in the 1977 version instituted a new milestone decision point; Demonstration and Validation (20:117). This initiative attempted to mitigate technical risks as early as possible in the life of a program. Ferrara asserts that this event was likely brought about in part due to the large amount of money being spent to keep up with the Russians during the Cold War (20:117).

2.3.3.3. The Carter Administration (1977-1981)

In the 1980 revision, the Carter administration attempted to reduce cycle time in order to get products to the warfighter more quickly and add more detail in the form of requiring new documents. In support of reducing cycle time, this version authorized services to do some novel things including, "omitting phases altogether" (20:118). To add more detail, the 1980 revision required a new document known as the Integrated Program Summary (IPS). According to the revision, the purpose of the IPS was to provide a document in which the service in charge of the program could summarize the implementation plan for the life cycle of the product being developed (20:118).

2.3.3.4 The Reagan Administration (1981-1989)

1985's revision was in response to the acquisition horror stories about $900 hammers and $500 toilet seats. Jones Jr. describes how these stories affected the climate in Congress in his book *Arming the Eagle*, "Congress at mid-decade was overloaded with some 150 different defense procurement bills in the hopper, many counter productive and contradictory" (27:374). The 1985 version created the DAE to act as a single accountable point of contact over the approval of each acquisition program (20:119).

1986 through 1987 was a time of great change for the DoD 5000 series and for the defense acquisition system overall. In 1986, Congress enacted the Defense Acquisition Improvement Act to implement the Packard Commission recommendations (20:120). One major step coming from the act was the creation of the Under Secretary of Defense for Acquisition. The 1987 series revision actually put a streamlined chain of command into place for the acquisition process, which ran from the PM thru the PEO to the Acquisition Executive. Previously, the role of the acquisition executive and corresponding role of milestone decision authority were held by the Secretary of Defense.

Another bold move made by the new Under Secretary of Defense for Acquisition was the creation of committees to "provide assistance in program review and policy formulation" (20:120). There were several committees, each specializing in a specific function (i.e., science and technology and nuclear issues). The reason for this was to streamline and cut down on the number of committees that met with the new Under Secretary as the chair of the DAB and MDA. The article states that at "one count [the number of committees] went as high as 126 separate boards and councils" (20:120). Committees were never fully adopted however; Ferrara credits this pioneering vision with establishing modern day OIPTs (20:120). These teams, working with today's defense acquisition hierarchy, are implementing the vision of an overarching body of functional experts helping to facilitate the acquisition process, so that by the time a program is brought before the DAB, all of the problems are smoothed out, mitigating the need for the hundreds of meetings. This new OIPT and a WIPT were created as part of the DoD 5000 series revision published on 15 March 1996 (20:120).

2.3.3.5 The Bush Administration (1989-1993)

The objectives of the 1991 revision were to create: 1) a uniform system of acquisition policy, 2) provide rigid guidelines for programs through the acquisition life cycle-did not allow services to supplement the DoD 5000 series, 3) made the DoDI 5000.2 applicable to all acquisition programs (not just MDAPs), and 4) provide that all necessary information would be transmitted in writing (a clear departure from Packard's vision of less paperwork). The 1991 revision consisted of over 900 pages where previous versions since 1971 failed to exceed 60 pages (20:122). The 1991 version burdened the defense acquisition process by requiring paperwork for everything and actually removing all flexibility by forbidding any waivers to the instructions.

2.3.3.6 The Clinton Administration (1993-2001)

Ferrara makes little mention of the 1993 revision; he gives special attention to contrasting the policies that were implemented in Bush's 1991 revision and Clinton's 1996 revision. Ferrara states:

> The 1991 documents represented a dramatic centralization of policy control and procedural specificity. And the 1996 version represents an equally dramatic reversal of these elements (20:121)!

The 1996 revision was the antithesis of the 1991 version as it attempted to re-instill the Packard spirit into the regulations. The 1996 version reversed the decision to make the 5000.2 applicable to all programs in an attempt to give more authority and flexibility to components to run their programs efficiently, (again, Packard's decentralized execution). The 1996 version also attempted to respond to the changing world environment brought on since the end of the Cold War. Since threats to the United States could come from anywhere at anytime, the acquisition system needed the flexibility to be able to respond very quickly. The 1996 version instituted the concept of "Advanced Concept Technology Demonstrations" in order to infuse new technology into the process (20:123). Another major break through in the 1996 version was the institutionalization of Integrated Product Teams to, "breakdown the barriers between different organizations and acquisition disciplines and encourage integrated solutions to management problems (20:123). Finally, the 1996 revision required less paperwork than the 1991 version by canceling, "numerous report formats previously mandated in the 1991 documents" (20:123).

2.3.3.7 The Bush Administration (2001-present)

According to an article written for National Defense Online, president Bush's Secretary of Defense, Donald Rumsfeld demanded the "transformation of the Defense Department business practices, for greater innovation and flexibility in weapons acquisition" from the time he stepped into office (19:3). As the bible for DoD Acquisition, the DoD 5000 series was naturally one of Rumsfeld's prime vehicles for codifying his "transformation". In his memo canceling the DoD 5000.1 and 5000.2 dated

2000 and 2002 respectively, Rumsfeld's Deputy Secretary of Defense Paul Wolfowitz states:

> I have determined that the current subject documents require revision to create an acquisition policy environment that fosters efficiency, flexibility, creativity and innovation (44:1).

According to the National Defense article, the reason the defense department sought to again revise the DoD 5000 series in 2003 was that previous attempts at instilling flexibility in the regulations, "…have not gone far enough because they have not addressed adequately the need for more innovation and efficiency" (19:1). The author of the article asserts that senior defense officials are still frustrated because, "…many weapons programs are years behind schedule, as a result of a cumbersome procurement process, and that acquisition managers don't work as efficiently as commercial businesses do, because they are restricted by the rules" (19:2). The author theorizes that despite all of the previous revisions to the DoD 5000 series, defense officials see the instructions as requiring too much oversight and that the oversight is slowing down the process.

In his briefing entitled "Evolutionary Acquisition Update and the DoD 5000 Revision, Skip Hawthorne summed up the pitfalls of the DoD 5000 prior to the 2003 revision; stating that the policies contained were "overly prescriptive" and they did not "constitute an acquisition policy environment fostering efficiency, creativity, and innovation" (26:14). Hawthorne then states that the objectives of the 2003 version are to, "encourage innovation and flexibility; permit greater judgment in the employment of acquisition principles; focus on outcomes instead of process; empower program manager's to use the system vice being hampered by regulation" (26:14). A couple of examples of those objectives being codified in the 2003 version of the DoD 5000 series are listed in a Defense Acquisition University (DAU) briefing on DoD Business Transformation. The briefing lists two specific ways that the 2003 version will increase flexibility in the DoD acquisition process; one is by allowing the program manager to determine what information is required to satisfy regulatory requirements; and by allowing the milestone decision authority to tailor regulatory requirements (11:19).

Over the course of the DoD 5000 series' more than 30-year history, it appears that with each iteration, the administration in power tried to do what Secretary Wolfowitz cited as a reason for canceling the 2000 and 2002 version; which was to implement procedures in the instructions that would foster an acquisition environment of "efficiency, flexibility, creativity, and innovation." Each iteration was intended to improve the process so the DoD could procure technologically superior weapons, faster than any of our enemies. Today's "box" environment is a product of each of these iterations of the DoD 5000 series that were the result of the political and world environments for each of their respective time periods.

2.4 Previous Research

This focuses on examining the research that has been conducted on the cost of the oversight of MDAPs. This research has been conducted to fill the gap in current literature that is pointed out in the following statement: "…definitive evaluative studies do not yet exist on the efficiency of these various [acquisition] reforms…" (2:295). That quotation came from an article written by Maj Joseph Besselman, Ashish Arora and Patrick Larkey which dealt with evaluating the cost of purchasing styles in the defense acquisition system. It was directed at various acquisition reforms coming out of the mid to late 1990s including integrated product development and the employment of commercial practices. No previous literature specifically addresses the cost of the vertical levels of oversight of MDAPs that accrues while an MDAP moves from one stage of development to the next. A look at studies dealing more generally with the topic of oversight of DoD acquisition follows.

2.4.1 Contractor Oversight

In a General Accounting Office report printed in 1997 titled *Acquisition Reform: DoD Faces Challenges in Reducing Oversight Costs*, the GAO reports on the results of "reinvention laboratories which were conducted in ten different defense contractor sites in 1994 with an eye on reducing oversight costs" (24:1). This effort was one of the major reforms coming out of the National Performance Review of 1993. Each of the test sites set up functional evaluation teams consisting of members from various different government departments, including representatives from weapon systems program offices. Their objectives were to perform cost benefit analyses of oversight requirements and eliminate non-value added requirements. It was a large undertaking with mixed results. The labs' work resulted in "limited progress in implementing changes to reduce contractors' costs of complying with government regulations and oversight requirements" (24:4). They concluded that although they still firmly believed the initiatives were worthwhile, great progress could not be made without greater support from across the DoD. The GAO report highlights an important part of the cost of oversight of acquisition programs, however, it deals with the cost of contractor oversight, not oversight as sought to be evaluated in this thesis.

2.4.2 Cost Overruns

A 1999 article in *Acquisition Review Quarterly* studied the results of the recommendations of the Packard Commission as seen in acquisition progress evaluated over eight years from 1988 through 1995. The report used data from the Defense Acquisition Executive Summary (DAES) database and found that Packard Commission initiatives, "did not reduce the average cost overrun percent experience on 269 completed defense acquisition contracts" (7:251). This article examines the effect the initiatives had on cost overruns, but did not deal with the cost of oversight. Of note, the study concluded that not only were the Packard initiatives ineffective in regards to reducing cost overruns, but that overall cost performance on the 269 contracts they reviewed actually worsened (7:258).

With the topic of cost overruns breached through the literature review of the previous article, the focus moves from cost to oversight. Since cost overruns don't focus on cost as defined in this research effort, is there current literature that relates cost overruns to oversight? The answer to that question is a resounding yes as seen in the literature review of three articles.

In a 1994 *Acquisition Review Quarterly* article cost overruns experienced on government contracts are attributed in large part either to failing to ensure control (or oversight) is shared equitably or to placing too much control with the entity that is responsible for producing the work, in other words the contractor (40:31). The author begins his exploration by asserting the premise, "If you want a job done to your standards-meaning time required to perform the work, the cost, the level of quality, and the required quantity-you should be in control, from start to finish" (40:30). He then makes recommendations for how the government can gain more effective control or oversight of its defense acquisition contracts. He first states that the government must set-up program controls and then enforce them through regulations, reporting requirements, by giving necessary authority to responsible individuals and by breaking work into manageable parts (40:32). The author then states that, "control by government of its programs can be gained only by placing reporting and control methods and procedures in its contracts" (40:33). On the topic of contracts, the author's final recommendation for how the government can achieve more effective oversight through contracts is by employing smaller, task specific contracts to a variety of competing bidders (40:34). The author presents the idea that the governments has put itself in the position to experience high cost overruns by employing large contracts to one source because by doing so, competition is decreased and costs are increased. The author states that by employing competitive, task specific contracts, competition would be increased which would in turn lower overall program cost (40:34).

In another 1994 article that appeared in *Acquisition Review Quarterly* the topic of cost overruns and oversight, specifically program advocacy of persons in oversight positions is covered. Christensen presents the idea that too much emphasis on program advocacy, or attempting to present a program in an over-optimistic light despite contrary data, can be dangerous and refers to the Navy's failed A-12 acquisition program as an example (estimates of the A-12's completion costs were in some cases one billion dollars higher than the estimates supported by the government and its contractors) (6:26). The author examines one form of program advocacy-failing to report accurate cost overrun data to the right people with the goal of determining how widespread this form of program advocacy is in defense acquisition programs. To meet his objective, the author examines 64 completed acquisition contracts that range that occurred from 1971-1991 (6:29). The methodology the author used to determine if advocacy was present was to compare current cost overrun data at various stages of completion to final program cost overrun estimates provided by both the contractor and the government. If the cost overrun estimate, at any stage of completion was less than the final cost overrun estimate, than advocacy was present. The author found that on average, for all 64 contracts, final estimates of cost overruns for both the contractor and the government were less than actual overruns at every stage of completion, beginning at the ten percent completion phase (6:31). Of note, the author also found that the results were not sensitive to contract type, contract phase, weapon type, or which service functioned as the lead and that on average the contractor was more optimistic than the government (6:32).

The final example of literature on cost overruns that relates to oversight came from a 1998 article in *Acquisition Review Quarterly* in which the author sought to identify key factors for successful defense acquisition programs. The author uses cost overruns as one of the delineators for a successful program because as he asserts, "Department of Defense acquisition programs and projects frequently experience cost overruns, performance deficiencies, schedule delays, or cancellation" (12:35). The methodology the author used to determine success factors was to first survey 32 program managers in which they would identify factors they thought most contributed to a program's success. The author received 18 surveys back and the number one and two success factors (among several others) identified were meets technical performance objectives and works well when fielded respectively (12:37). Next the author conducted a literature review to determine how many times the success factors identified in the surveys appeared in relevant literature. The success factors that appeared most often would be considered significant. Comparing the literature review to the surveys, the author found well-defined requirements and quality people were the most significant success factors at 47% (12:41,42). The methodology presented in this article used cost overruns as a metric to determine program success. The relationship between cost overruns and oversight turned up in the surveys completed by the eighteen program managers. On the topic of oversight of their programs, program managers "…viewed involvement from support agencies and higher commands as a hindrance," and surveys went on to reveal that all of the program managers "…felt that involvement of Congress and GAO in specific programs was a detriment to program success" (12:38).

2.4.3 Congressional Oversight

A 1995 article in *Acquisition Review Quarterly* summarized the actions of a project team going through a program management course. Their aim was to review congressional oversight of DoD acquisition programs (37:82). They specifically focused on the reporting process in order to find areas for improvement. The team only had six weeks to complete the project and intensively interviewed members from both House and Senate Congressional staffs, DoD Comptroller, and other pertinent government agencies. The results of their study were interesting. Despite paperwork streamlining efforts through reform and as implemented in various versions of the DoD 5000 series,

> DoD reports to Congress grew 224% from 1980 to 1988, far faster than any other government agency and nearly three times the average growth of other agencies. Acquisition issues comprise approximately 45% of the reports requested by Congress. (37:84-85)

This study produced definitive results and dealt with the topic of oversight; however, it dealt with congressional oversight and did not deal specifically with oversight costs. One might be able to associate oversight cost growth with the increase in the number of reports required. However, the article did not explore that premise.

2.4.4 Some Evidence of Progress

Another look at literature relating to oversight of MDAPs was found in a 1996 issue of *Program Manager Journal*. One article featured a speech by then Undersecretary of Defense for Acquisition and Technology, Dr. Paul G. Kaminski given to kick off Acquisition Reform Acceleration Day, 31 May 1996 (28:28). On this day, the Defense Acquisition Community officially stood down to evaluate current progress on implementing reform initiatives. One item Under Secretary Kaminski addressed dealt with the number of meetings required to reach a milestone event. Dr. Kaminski stated, "because our early and continuous insight process is helping resolve major issues, I have been able to cancel numerous formal DAB meetings," he went on, "last year, 26 DAB meetings were scheduled to occur but I only had to convene eight of them" (28:30). This speech in itself did not completely address the topic of oversight costs; however it did reveal evidence that acquisition reform has resulted in reduction of the number of meetings necessary for a milestone event.

2.4.5 Oversight and Review Process Action Team (ORPAT)

The *Program Manager Journal* featured an article in its May-June 1995 edition in which U.S. Army Colonel John S. Caldwell, Jr. was the subject of an interview. His comments were important because of his role as team lead of the Defense Acquisition Reform Oversight and Review Process Action team that was conducted from 7

September through 16 December 1994 (3:2). The team's mission was "…to develop with in 90 days a comprehensive plan to reengineer the oversight and review process for systems acquisition…" (3:2). Some of the recommendations of the team were groundbreaking, including: creating a three milestone process (the current process employs three milestones); decreasing the number of documents required for each milestone decision; dramatically reducing the number of formal pre milestone meetings occurring in order to prepare for a milestone decision event; and making IPT's part of the formal process to conduct oversight (3:5-6). Many of the recommendations developed from the work the team conducted in 1994 are seen in today's acquisition process. This work did look at oversight as defined for the purpose of this research effort, but unlike the other studies, this study did evaluate the cost of that oversight.

Colonel Caldwell's ORPAT team had 90 days to put recommendations for streamlining defense acquisition together in a report to the DoD. In addition to the recommendations from Col Caldwell's team, they also established an estimate for the cost of oversight of acquisition programs. Col Caldwell's team took a look at three joint service acquisition programs an attempted to come up with an estimated cost of oversight and review. Their analysis resulted in an average estimate of $10-12 million for a single milestone and an estimate of $40-50 million for an entire joint acquisition program (14:9). The report recognizes the fact that $50 million is a small percentage of a billion dollar program however, since the failure of one defense program could mean the loss of American lives in the field, oversight counts for a lot more than the percentage shows.

2.5 Summary

This chapter presented the guidelines under which a "box" program must operate, went on to discuss the evolution of the regulatory series that establishes those guidelines, and concluded with a look at current studies dealing with the topic of oversight of defense acquisition programs. It is apparent from the findings (or the lack thereof) that there are very few definitive studies in which oversight costs (as defined in this chapter) are evaluated. In the ORPAT's report to the DoD however, we found some hope with their estimated oversight and review cost. The goal of the current research is to extend prior research by evaluating the cost of oversight of the DoD's MDAPs

3.0 Methodology

3.1 Overview

From the previous two chapters, we now have a clear picture of the focus of this research. This research will ultimately estimate the cost of oversight of Major Defense Acquisition Programs for those programs strictly under the Direction of the DoD 5000 series of instructions. In addition to estimating the cost of oversight, the aim of this research will be to answer specific research questions. The first and most important question to be answered is what is the cost of oversight for "box" programs? The next question is how does the cost of oversight for box programs compare to the cost of oversight for MDAP's operating under a different framework; specifically, communication acquisition programs which are operating in a "virtual box" and space acquisition programs which are operating outside the box? The final research question to be answered by this research is what are the key drivers that affect the cost of oversight of MDAP's? As noted in chapter 2, the Delphi Method of surveying experts will be employed to answer these questions. This chapter will outline what the Delphi Method is, how it works, and how specifically the Delphi Method will be utilized for this research in order to answer the three aforementioned research questions.

3.2 Delphi Method Background

In this section, of the chapter, some background information on the Delphi Method is provided. After discussing the history of the Delphi Method, it is important to discuss what it is, and finally describes how it works. After discussing the history and providing a thorough background, the Delphi Method will prove itself as a perfect fit and the chapter will close with why the Delphi Method was the chosen methodology for this research. The methodology for the execution of this current research project will be interspersed within the description of each of these subject areas.

3.2.1 History of the Delphi Method

According to Clayton, the name "Delphi" was associated with Greek mythology and refers to a Delphi Oracle which was capable of predicting the future (8:376). The Delphi Method was actually born in the 1960s out of the American defense industry as part of a project called "Project Delphi" which was a study conducted by the RAND Corporation in support of an exploration by the U.S. Air Force (4:700-701). The U.S. Air Force wanted to determine what would be key nuclear targets and what would be the likely number of warheads employed against the United States in the event of nuclear attack by the Soviets. "Project Delphi" sought to reach a consensus of expert opinion in order to answer those two critical questions from the viewpoint of a Soviet nuclear strategist.

3.2.2 What is the Delphi Method?

The Delphi Method is best described as a communication tool that facilitates a communication process by allowing a group of individuals to work as a whole to deal with a problem (4:701). The Delphi Method attempts to reach a consensus of opinion among the members of the group, which will here on be referred to as an expert panel, through a series of questionnaires. A key element of the questionnaires is that they are completed anonymously to allow for freedom of expression and then collected, summarized and returned to panel members to give them the opportunity to refine original responses with the added benefit of knowing the rest of the panel members' responses. This process is continued, "until consensus is obtained or the law of diminishing returns sets in" (26:1010). Another key element of the process is that the panel is made up of pre-selected experts who never physically have to be in the same location. The process, which came into practice in the 1960s, could only be conducted by traditional mail, but of course can now be conducted via the web or e-mail, or a combination of both.

3.2.3 How the Delphi Method Works

The previous section of this chapter offered a preliminary look at how the Delphi Method works, but this section will go into much greater detail on the workings of the Delphi Method. First, it is important to answer some questions. The first is why use a panel of experts that never meet instead of just a single expert. The reason is that an individual is operating along which means they could forget something or fail to consider an issue. Clayton highlighted this issue when he discussed the fact that individuals don't get the benefit of hearing the ideas of others so that they can perhaps refine their ideas (8:375). Clayton goes on to state that by combining the judgment of a large number of people, there's a better chance of arriving at the truth.

Having explained why a separated group and not an individual, the question then becomes, if a group is better than an individual, wouldn't it be better to put them in a room together to allow them to brainstorm and hammer out a consensus? Though this research operates under Clayton's premise that the shared ideas of a group of experts is better than a single expert, putting a panel in a room together could lead to group think (8:375). This phenomenon is the result of a few dominant personalities controlling the discussion and potentially strong arming a consensus despite the initial objections of possibly better informed, yet more timid panel members.

Now that the two preliminary questions regarding the overall set up of the Delphi Method have been answered, the next step is to describe the workings of the Delphi Method. To aid in this presentation, the key elements of the workings of the Delphi Method are explained best in Figure 3.1.

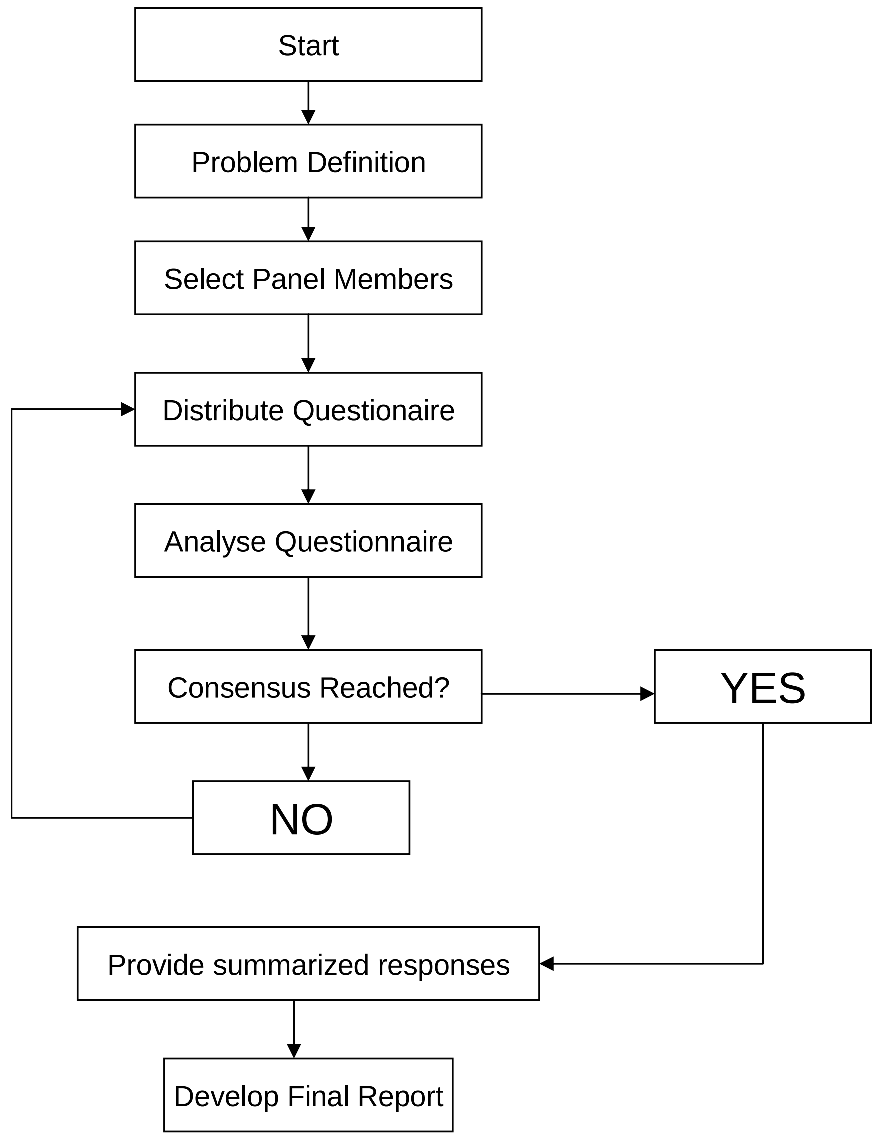

Figure 3.1: Steps in the Delphi Process (13:2)

First, a problem is defined. For this research, the research questions are the main problems defined which is to determine the cost of oversight for “box” programs as well as compare the costs of those "box" programs to the virtual and space programs. The other research focus, using the Delphi Method is to determine key oversight cost drivers. The next step is to develop a questionnaire that is specific enough to divulge the data necessary to answer those questions. The following step is to select a panel of experts to answer the questionnaire. The questionnaires are then sent to the panel and when completed they are collected, analyzed, and summarized. If consensus is not reached, the summarized responses will then be sent back out to the panel to allow them to rethink the questions now that they have the added benefit of the input from the other group members. This process of sending out the questionnaires and then getting them back and analyzing them continues in a looping pattern and each loop is referred to as a "round." Each time a new questionnaire is distributed marks the beginning of a new round. The number of rounds is determined by the achievement of consensus of the expert's opinions. Early criticisms of the Delphi Method centered on the fact that originally, (due to lack of technology) questionnaires were sent by traditional mail channels and depending on the number of rounds needed to achieve consensus, the process took from several months up to a year or two to complete. Today's technology enables the process to flow much more quickly, and for the purpose of this particular research effort, all communication during the process will be conducted via e-mail. Chou takes this e-mail centered Delphi methodology a step further by conducting a web based Delphi Process whereby panel members and the survey director interact in a shared web program (5:233-236). In summary, the Delphi Method, as employed in this research effort, will act as a communication facilitator that attempts to achieve a consensus of opinions from an anonymous, geographically separated panel of experts through a series of questionnaires all conducted via e-mail.

3.2.3.1. The Rounds of the Delphi Method

As previously mentioned, each time a questionnaire is distributed to panel members and returned to the person directing the research effort constitutes a round of the Delphi Method. The big question that arises deals with how many rounds of the Delphi are necessary to ensure the data is stable. Clayton states that only four phases are needed and that the final round is sent out to "provide reasons as to why they agree or disagree with the final results" (8:129). Chan et. al agreed in their study by establishing four rounds (4:701) However, Ludwig states that "Delphi rounds continue until a predetermined level of consensus is reached or no new information is gained" (31:3). While a study in Scotland by Dr. Kerr limited the number of rounds to 3. (29:3) In recent nursing research, Hasson et. al limited the number of rounds depending on "time available…" (25:1011). The research did not find a specific number of rounds needed. Most researchers using the Delphi Method set the criteria of consensus and time available while some limited on a firm number. Based on the evidence, the Delphi method as employed in this research effort to answer the research questions, will contain a minimum of two rounds and a maximum of four.

3.2.3.2 Delphi Method Questionnaires

Mitchell goes into great detail outlining the construction and administration of the Delphi questionnaires. He clearly outlined the length the questionnaire should be by stating how long it should take each panel member to complete the questionnaire. On this topic he states that the questionnaire should take no longer than 30 minutes to complete (32:345). The basis for this assertion is his own experience as he goes on to state that there have been no empirical studies conducted on the appropriate length of time to complete a Delphi questionnaire. Mitchell also discusses the construction of the questionnaire for each round of the Delphi Method. He states that questions should be clearly stated and should not be identical from round to round because the repetition could cause participant boredom, which could hamper results (32:342). Clayton also discussed the format of the questionnaires on a round by round basis. He states that round one questionnaires should be clearly worded but allow for the most freedom in responses. Round one responses, once collected, should be turned into generic statements summarized with measures of central tendency and then resent to panel members to begin Round two. In round two, the process of seeking consensus begins. To aid in the quest for consensus panel members that wish to change previous responses must provide reasons for doing so. In round three and subsequent rounds, questionnaires should summarized responses with a summary of reasons for changing responses and this process continues until consensus is met (8:378). The questionnaires in support of this research effort will be constructed according to the procedures outlined by Clayton and Mitchell. The number of questions will be limited to ten or less. The maximum amount of time needed to complete each questionnaire is estimated at 20 minutes. Each returning questionnaire's questions are altered in each round based on the previous round's input. This will ensure each panel member has the opportunity to re-evaluate each question.

3.2.3.3 Delphi Method Consensus

The rounds of questionnaires must eventually come to a close. In order to set the parameters prior to beginning, once consensus is reached, the rounds will discontinue.

Webster's New International Unabridged Dictionary defines consensus as, "unanimity or general agreement in matters of opinion" (42:567). If that definition is applied to the Delphi Method as employed in this research effort, once the panel reaches a majority opinion, the process is complete, but just a majority may not be far enough. Simply operating under the theme of "majority rule" could overlook important, though less frequently occurring opinions. Therefore, in terms of the application of the Delphi Method for this research effort, consensus must be defined. The problem, as Williams and Webb state, "Consensus is poorly explained in studies which use the Delphi technique…" (43:182). Hasson et. al. also state that "A universally agreed proportion does not exist for the Delphi…" (25:1011). Hasson et al. does list various studies who established percentages for defining consensus, but all vary dramatically and result in mostly a straight majority rules. This study completed by Schiebe et. al. recommends stability of responses throughout the rounds as a better indicator of consensus by evaluating the changes in the questions to a quartile in a distribution (36:IV:C). Without much empirical evidence to support a concrete definition of consensus, this research effort will take an approach similar to the one recommended by Schiebe et. al. Each question will be evaluated on the response and as answers become stable, the question will be considered "closed" until all questions are closed or four rounds have been completed.

3.2.3.4 Delphi Method Expert Panel

Another obstacle when performing the Delphi Method is deciding how big the expert panel should be. Spinelli conducted research utilizing the Delphi Method and the panel consisted of "24 key influential persons knowledgeable as to the factors influencing the general environment…) (38:74). Ludwig conducted research but had a different approach to establishing a panel. Ludwig stated that "The number of respondents was generally determined by the number required to constitute a representative pooling of judgements and the information summarizing capability of the research team" (31:2). This establishes the precedent that as long as all members of the focus research is represented, the number of members on the panel is up to the researcher. Ludwig then states "The majority of Delphi studies have used between 15-20 respondents and run over periods of several weeks" (31:2). Since it seems difficult to find 15-20 volunteers for this research, further studies were scanned and established more attainable precedents. Chan et. al. stated in their selection process "The ten members of the panel represent a wide distribution of professional people…" (4:701). Another study by Des Marchais reduced the panel size to six (17:504). Overall, William and Webb summarize the panel selection methodology by stating "First, there is no agreement regarding the size of the panel, nor any recommendations concerning sampling techniques" (43:182)

The panel assembled to answer the research questions posed in this thesis will be of the heterogeneous type and will embody the principal of breadth of members' experience while maintaining the similar target career field. The panel will contain a minimum of five and a maximum of ten members.

Once the size of the panel has been decided, establishing criteria to judge who are the experts is needed. Based on the findings that were a result of the research conducted to complete this chapter, it appears there is no clear cut definition of what constitutes an expert. While discussing the topic of expert panel member selection, Mitchell states, "No reported Delphi study has addressed this selection issue" (32:340). Dawson and Brucker, in their research, summarized the criteria for determining experts used in several Delphi studies in their field. The common theme was: general experience of seven years; specific experience of five years; at least one published article; at least one national conference presentation; and experience should be recent to within the last three years (10:132-134). For the purpose of this research, we'll relax those general standards a bit by requiring: general experience of five years; specific experience of two years; recent experience within the last five years; and no qualification of presentations or publications.

Once the expert panel is formed, but prior to the process starting, a plan must be instituted for panel attrition. In a study by Chan et al. conducted in the field of medicine, they achieved a response rate of 80% and went on to state that derived from various studies that the average response rate for the medical field ranged from 58% to 80% (4:708). Mitchell states that, "High rates of attrition may mean that final results are based upon an unrepresentative sub sample of the original sample" (32:341). To combat panel attrition and the resulting degraded response rates, this research effort will choose experts from different but related fields and have at least one backup expert for every expert so in the end, even with an attrition as high as 50%, all groups will be represented and the bias that Mitchell describes will be avoided.

3.3 Uses of the Delphi Method

The Delphi Method has had many uses in research. According to the book *The Delphi Method: Techniques and Applications*, the Delphi Method was principally used as a forecasting tool back as early as the 1960s and went on to say today the Delphi Method is used for: normative forecast; to ascertain values and preferences; quality of life estimates; simulated and real decision making; and inventive planning. The book also went on to state that the Delphi Method is used extensively where “judgmental input data” is needed when other data is unavailable or too costly (30:615). Hasson et al. stated that the Delphi Method is used frequently in health and social sciences (25:1008). Mitchell’s article cites a table listing the use of the Delphi method by percentage by field of study from a total of 800 studies. Delphi was most heavily used in physical sciences and engineering (26% of all studies conducted) and the second most frequent usage was in business and economics (23%) (32:334).

3.4 Criticisms of the Delphi Method

If employed properly, the Delphi Method is an excellent tool for gathering data to answer questions when that data first appears to be unavailable. Since this research effort originally sought to analyze historical data and because that data was unavailable, the Delphi Method appeared to be a suitable backup method. There are criticisms to bear in mind before using the Delphi Method. The first criticism deals with who actually decides what qualifies as an “expert”. Clayton acknowledges that expertise is not exactly measurable however, he states that the criteria is really relative based on the peers of the experts. For this research effort, criteria for panelists will be based criteria found in the section on the expert panel found in this chapter. Using Clayton’s premise that experts are deemed as such by their peers, the research will include a preliminary survey of potential experts. We’ll supply them with our panel criteria and ask them whether they agree with each of he criteria or not and why.

Williams and Webb introduce a second criticism of the Delphi Method which is that the researcher’s analysis and summary of each rounds’ responses could introduce bias into the process (43:182). That point is well taken and to combat that threat, responses will be analyzed using basic statistical methods (mean, median, standard deviation) to the fullest extent possible. Additionally, because this research will conduct the Delphi Method as part of a group project, there will be more than one set of eyes analyzing the responses, which should also help to keep the process honest.

A final criticism of the Delphi Method regards the question of reliability; specifically, what evidence is out there that proves the Delphi Method is reliable. In other words, have studies been conducted that prove findings were consistent in different Delphi experiments using similarly composed panels answering the same questions. Williams and Webb found that, “there is no evidence that the Delphi Method is reliable” (43:182). Hasson et al. support these findings stating that their research discovered, “There is no evidence of the reliability of the Delphi Method” (25:1012). Mitchell stated that other studies have found a high degree of replicability, which contradict criticisms that the Delphi Method is unreliable or unproven (32:351).

3.5 Strengths of the Delphi Method

The strengths of the Delphi Method outweigh the weaknesses previously mentioned. First, the Delphi Method enables a group of experts in geographically separated locations to work together without the cost or other logistical problems associated with bringing experts together at a central location (10:129). Anyone who has tried to put together a major conference would greatly appreciate this strength.

The second strength focuses on the fact that the Delphi Method results in a consensus of opinion without the bias or group think that might result from a roundtable process (43:181). This "anonymous factor" ensures all panel members are equally involved and all panel members feel free to answer honestly. By this, the researcher has the opportunity to receive uncensored answers.

Williams and Webb's research also highlights the Delphi concept of conducting a series of rounds to achieve consensus (43:181). The series of rounds allows panel members to review the responses of their fellow panel members and gives them the chance to reconsider or even alter their original responses with the benefit of the added input of their fellow panel members. Conducting only one round would destroy the intellectual synergy created by the sharing of ideas throughout the rounds.

Finally, a criticism of the traditional Delphi process that evolved into a strength for today was that the traditional Delphi process took a long time to complete. This long time period was due to the fact that it was used in the 1960s and 1970s at a time when there was no means other than through postal channels to conduct Delphi rounds. Chien Chou's article highlights the final strength of the Delphi that evolved—speed. Chou stated that traditional Delphi processes averaged six to twelve months from start to finish, but with e-mail and web-based Delphi a three round study can be conducted in four weeks (5:236).

3.6 The Reason the Delphi Method was Chosen

The originally theorized methodology for this research effort was to examine the paper trail left by an actual MDAP going through a milestone decision point i.e. Meeting minutes, meeting notes, sign in rosters to arrive at an estimated cost of oversight. Using these documents, the ranks and number of people at the meetings could be ascertained as well as the number and duration of the meetings. This data could then be used to estimate a cost of meetings based on length of meeting and the hourly wages of each attendee. The estimate for meeting costs at every level of vertical oversight could then be tallied to arrive at a total estimate of the cost of oversight for an MDAP at a certain key decision point. The problem we encountered with this methodology is lack of data. We made the mistake of assuming the meeting minutes, notes and logs would be readily available when in fact in some cases they were nonexistent. I needed to come up with a methodology that would enable me to answer the research questions without the availability of historical data. An article by V.W. Mitchell which appeared in *Technology Analysis & Strategic Management*, outlines why one would use the Delphi Method with the number one reason listed being the unavailability of historical data (32:338).

3.7 Comparative Analysis for Data Collected

Once the rounds of the Delphi are completed, all data from this study must be statistically compared with the data collected by Neal for Command, Control, Communications, and Intelligence (C3I) and DeReus for Space Acquisition Programs. After acquiring their data, all data for questions two through ten will be placed into a statistical analytical software package with a graphical user interface, such as JMP 5.0.1 statistical software. The data will be entered, for each question two through ten in the format seen in Table 3.1.

Table 3.1: Data Input for Statistical Analysis

Oversight	2-Low	2-Avg	2-High
Space	1	4	6
Space	2	6	9
Space	1	4	7
Space	2	4	8
DoDD 5000	6	8	16
DoDD 5000	8	12	18
DoDD 5000	6	10	18
DoDD 5000	6	10	25
DoDD 5000	6	12	18
C3I	12	20	30
C3I	7	9	12
C3I	12	20	30
C3I	12	20	30

The format in Table 3.1 will allow JMP 5.0.1 to analyze the statistical differences and will provide a value which will test whether or not there is a statistical difference among the different oversight processes.

To conduct the analysis of variances, each oversight process will be compared with one other oversight process at a time. For example, DoDD 5000 will be compared first with Space and then compared with C3I. The null hypothesis for the test is that there is not a statistical difference between the means of the populations being compared. The alternative hypothesis is that there is a statistical difference between them.

3.8 Summary

This research effort is aimed at answering the following research questions:

1. What is the cost of oversight for “Box” MDAP’s?

2. How does the cost of oversight for “Box” MDAP’s compare to the cost

of oversight for “Non Box” MDAP’s?

3. What are the Cost Drivers for the Oversight of MDAP’s?

This chapter outlined exactly how this research effort will answer those questions. In summary: the research will consist of assembling a panel of five to ten experts in the field of defense acquisition; prepare questionnaires aimed at collecting the cost of oversight at one key decision point and aimed at identifying oversight cost drivers; then employ the Delphi Survey technique of sending out the questionnaires, collecting, analyzing, summarizing, and resending questionnaires to the panel; and continue with the Delphi rounds until a consensus of expert opinion is reached. In Chapter 4, the results of each round’s questionnaires will be recorded and summarized.

4.0 Data Results

4.1 Overview

The goal of chapter 4 is to provide the results based on the responses from the expert panel members for the Delphi Method. The first section will present the generalized demographics of the panel members while still maintaining the members' anonymity. The next section will provide the results of the survey for each question. The results will be presented for one question as it passed through the four separate rounds of the Delphi Method. The information provided will include the initial answers for each question and how the answer changed through the rounds of the Delphi Method. The final section will provide a review of the change in the standard deviation for each question and will conclude with the final numbers that will be analyzed for the cost of oversight and will be used to statistically compare with Neal and DeReus.

To establish the cost of oversight, an algorithm was created which multiplies and adds the respondents' estimates together to create low, average, and high estimates for the cost of oversight. The algorithm works by multiplying pertinent questions together. To arrive at a TDY cost estimate questions two, three, and four are multiplied. Questions five, six, and seven are multiplied to create a personnel cost estimate. Questions eight, nine, and ten are multiplied together to create a meeting cost estimate. Finally, to arrive at a total program cost for one milestone decision point, the estimates for TDY, personnel, and meeting are added together. The total program cost for the low estimate is then represented by the following algorithm:

3*((Q2low*Q3low*Q4low)+(Q5low*Q6low*Q7low)+(Q8low*Q9low*Q10low))

The total program cost for one milestone decision point is multiplied by "3" because there are three milestone decision points. This process is repeated for the average and high estimates as well.

4.2 Panel Selection

The goal of panel selection was to gather experts in "inside the box" acquisition programs, but from different viewpoints in the oversight process. The following individuals, listed on the table below, were selected and numbered to safeguard their anonymity.

Table 4.1: Panel Selection Demographics

Num.	Military/Civilian	Breadth of Experience	Years Acq	Years Box
1	Civilian	Program Office; Cost Analysis in support of DABs/Milestone reviews; Program/Systems center; C-17, C-5B, F-15, F-16, B-2, F-22	28	6
2	Civilian	Program Cost/Logistics; Acquisition Policy and Procedures; F-22, B-2, C-5	16	8
3	Civilian	Program Office; Financial Mgt; JSF	9	3
4	Civilian	ASC Level Financial Mgt and Cost Analysis; Tri-Service Standoff Attack Missile (TSSAM), National Developmental Airlift Aircraft (NDAA); C-130J	18	12
5	Civilian	Program Office, Financial Mgt, Cost Analysis; PEO level; B-1, C-17, Advanced Cruise Missile	23	20

Since the members are now numbered, the rest of the results and analysis will refer to only the number assigned for the Delphi Method. As seen in Table 4.1, there is a great deal of depth of experience with an average experience in defense acquisition of 18.8 years and an average experience with "inside the box" programs of 9.8 years. Breadth of experience is not as strong with the bulk of the experience at the program office or Aeronautical Systems Center (ASC) level though panelist number five has a number of years at the PEO level. The true "breadth" of experience for this panel comes from the different types of programs they've worked on and the areas they worked in. The panelists' breadth of experience in this area provides adequate heterogeneity that according to the information provided in the methodology section, will provide the greatest probability of approaching the true answer of the unknown forecast we are trying to make and compare. Prior Internal Review Board permission was requested and obtained for this research and the letter of approval can be seen in the attachment section.

4.3 Question One

Stated from the survey, 1. ***From the Program Executive Officer (PEO) request for a Defense Acquisition Board (DAB to the DAB milestone approval, what are the five major cost drivers in the oversight process?***

The goal of question one was to obtain the five key cost drivers that the respondents felt drove the cost of oversight.

4.3.1 Results by Round

In round one, the panel was asked to provide the top five oversight cost drivers in no particular order. With duplicates eliminated, there were 23 cost drivers identified in all. They are listed below, in no particular order:

Table 4.2: Round One Cost Drivers

1	Program is Mult-Service
2	Number of Technologies going into the system
3	Number of Systems the System must interact with
4	Milestone B (requires most documents; 30 to be generated for review)
5	Whether Completely new system or just block upgrade
6	Collecting required data
7	Updating program schedules, estimates, test plans, etc.
8	Drafting charts
9	Meetings
10	Rework/redirection
11	Hours used to develop briefings
12	TDY's
13	User Involvement
14	Congressional involvement
15	Manpower-Civil Service and Military
16	A&AS Support Contractors
17	Office Furniture Supplies-if new program
18	Computer Equipment-if new program
19	Supporting/reconciling with the CAIG
20	Clinger-Cohen Act Compliance
21	Preparing SAMP
22	Command, Control, Communication Computers, and Intelligence Support Plan (C4ISP)
23	Flight Test reports

For round two, the 23 items were sent out and panel members were allowed to pick five drivers by placing an asterisk in front of the items they thought were the biggest cost drivers. Nine drivers fell off the list based on their failure to receive any votes. The round two results are listed below, again, in no particular order:

Table 4.3: Round Two Cost Drivers

		# of Votes Received
1	Program is Mult-Service	4 Votes
2	Number of Technologies going into the system	2 Votes
3	Number of Systems the System must interact with	2 Votes
4	Milestone B (requires most documents; 30 to be generated for review)	2 Votes
5	Whether Completely new system or just block upgrade	3 Votes
6	Collecting required data	1 Vote
7	Updating program schedules, estimates, test plans, etc.	1 Vote
8	Meetings	1 Vote
9	Congressional involvement	2 Votes
10	Supporting/reconciling with the CAIG	2 Votes
11	Clinger-Cohen Act Compliance	1 Vote
12	Preparing SAMP	2 Votes
13	Command, Control, Communication Computers, and Intelligence Support Plan (C4ISP)	1 Vote
14	Flight Test reports	1 Vote

For round three, the 14 items were sent out with the same instructions as those from round 2. This time, two items dropped off based on receiving no votes. The results from round three are listed below:

Table 4.4: Round Three Cost Drivers

		# of Votes Received
1	Program is Mult-Service	5 Votes
2	Number of Technologies going into the system	3 Votes
3	Number of Systems the System must interact with	2 Votes
4	Milestone B (requires most documents; 30 to be generated for review)	2 Votes
5	Whether Completely new system or just block upgrade	4 Votes
6	Collecting required data	1 Vote
7	Updating program schedules, estimates, test plans, etc.	1 Vote
8	Meetings	1 Vote
9	Congressional involvement	2 Votes
10	Supporting/reconciling with the CAIG	1 Vote
11	Preparing SAMP	2 Votes
12	Command, Control, Communication Computers, and Intelligence Support Plan (C4ISP)	1 Vote

Since the goal of question one was to identify only the top five drivers, the drivers from the round three results that received only one vote were eliminated from the fourth survey that went out. With only one round to go, eliminating the drivers with the fewest votes was determined to be the best way to narrow the list down to one that would meet the goal of identifying just five drivers. In order to ensure the list of drivers was prioritized, panelists were asked to identify the top five drivers from the list by placing a one through five in front of their five drivers; a one in front of the biggest driver down to a five for the smallest.

The results from round four are listed below:

Table 4.5: Round Four Cost Drivers

Drivers Picked		# Votes
1,2,1,1,1	Program is Mult-Service	5
2,1,5,3,2	Whether Completely new system or just block upgrade	5
5,3,4,2,4	Number of Technologies going into the system	5
4,2,5	Number of Systems the System must interact with	3
5,3,5	Milestone B (requires most documents; 30 to be generated for review)	3
3,4	Congressional involvement	2
4,3	Preparing SAMP	2

To arrive at a final top five list of cost drivers, the two drivers that received only two votes were eliminated from the list. The only task that remained was to prioritize the list of five cost drivers. The list was prioritized by creating a simple average by adding the values of the votes and dividing by the number of votes. The final results of the prioritization process are below:

Table 4.6: Prioritized List of Top Five Cost Drivers

Drivers Picked		# Votes	Avg Score	Rank
1,2,1,1,1	Program is Mult-Service	5	1.20	1
2,1,5,3,2	Whether Completely new system or just block upgrade	5	2.60	2
5,3,4,2,4	Number of Technologies going into the system	5	3.60	3
4,2,5	Number of Systems the System must interact with	3	3.67	4
5,3,5	Milestone B (requires most documents; 30 to be generated for review)	3	4.33	5

Once the scores were averaged, the drivers were ranked and as seen from the above chart we were able to answer research question number three. The panel determined that the biggest oversight cost driver for an acquisition program is if it is a multi-service program.

4.4 Question Two

> ***From the PEO recommendation, to the DAB approval of the milestone, use your professional judgment and estimate how many TDYs are taken by one person to get one program through one Milestone.***

The goal of question two was to find out how many TDYs are taken by one individual in one program to get through one milestone. The members were asked to provide a low, high and average, or most likely occurrence for this portion. This will allow us to establish a triangular distribution that will be used later for the data analysis portion, as well as to allow us to estimate the low, average, and high costs of oversight for our comparison of the three different MDAP processes. Question two sets up our initial number in our algorithm to calculate the first portion of our cost of oversight model. Question two, three, and four will be multiplied to establish our travel estimate for the cost of oversight.

4.4.1 Question Two- Low Estimate

For the low estimate, round one resulted in a pretty wide range from an estimate of three TDYs to 12 TDYs, but the range quickly closed in and was set by round three. The median was set early on at an estimate of six TDYs. The Mode changed in round two, but it is clear that the panel gravitated around an estimate of 6 TDYs per person involved to get a program through one milestone. Consensus was not reached, however the standard deviation was minimized to a value of less than one by round 4. The results are listed in Table 4.7, shown below.

Table 4.7: Question Two- Low Estimate Results By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	3 to 12	3,8,6,6,12	7.00	6.00	6.00	3.32
2	4 to 8	4,8,6,6,8	6.40	6.00	8.00	1.67
3	6 to 8	6,8,6,6,8	6.80	6.00	6.00	1.10
4	6 to 8	6,8,6,6,6	6.40	6.00	6.00	0.89

4.4.2 Question Two- Average Estimate

The average, or most likely, estimate was similar to the low estimate. The range started out broad, but narrowed in scope as the rounds continued. The median remained constant throughout the process, but it was interesting that the mode or most frequently occurring estimate increased from 10 to 12. Looking back at the column for the frequency of the estimates, an estimate of 10 occurred twice and an estimate of 12 occurred twice and Excel chose 12 as the mode. Again, consensus was not reached but the standard deviation was minimized. The results are listed in Table 4.8, shown below.

Table 4.8: Question Two- Average Estimate Results By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	5 to 20	5,12,10,10,20	11.40	10.00	10.00	5.46
2	8 to 15	8,12,10,10,15	11.00	10.00	10.00	2.65
3	8 to 15	8,12,10,10,15	11.00	10.00	10.00	2.65
4	8 to 12	8,12,10,10,12	10.40	10.00	12.00	1.67

4.4.3 Question Two- High Estimate

The high estimate followed suit with the other two estimates by starting with a wide range that narrowed as the rounds occurred. The median was consistent throughout all four rounds at an estimate of 18 TDYs and this time the mode also remained consistent at 18 TDYs as well. We failed again to reach consensus, but the standard deviation was minimized to the greatest extent possible. Of note, the deviation actually increased by two hundredths from round three to round four. The increase in standard deviation was due to member five dropping their estimate from 20 TDYs to 18 TDYs; by doing so the mean decreased, but the distance between the mean and the data points increased. The results for the question two-high estimate are found below in Table 4.9.

Table 4.9: Question Two- High Estimate Results By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	8 to 25	8,18,18,25,25	18.80	18.00	18.00	6.98
2	12 to 25	12,18,18,25,25	19.60	18.00	18.00	5.50
3	16 to 25	16,18,18,25,20	19.40	18.00	18.00	3.44
4	16 to 25	16,18,18,25,18	19.00	18.00	18.00	3.46

4.5 Question Three

Estimate how many people normally go TDY throughout the Milestone Decision process.

Question three established another portion of the travel estimate in our cost of oversight algorithm. The goal of question three is to find the number of personnel that actually go TDY during the milestone decision process. The respondents were given the same instructions as was given with question two and the answers will be presented in the similar manner.

4.5.1 Question Three- Low Estimate

Question three demonstrated the first occurrence of the inability of the Delphi process to decrease the range of answers. The range started out with an estimate of two to eighty people going TDY in support of the milestone decision process, went up in round two and then stabilized back at the original round one estimate. With such a wide range of estimates, the mean of 33.8 rounded to 34 would appear to be the most reliable estimate in this case. The modal value ended up at an estimate of 80 people going TDY with two of the five panelists sticking with that estimate. Consensus was of course not reached and the standard deviation ended up just over 42.

Table 4.10: Question Three- Low Estimate Results By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	2 to 80	60,80,2,2,3	29.40	3.00	2.00	37.73
2	2 to 120	120,80,4,2,3	41.80	4.00	#N/A	54.98
3	2 to 80	80,80,4,2,3	33.80	4.00	80.00	42.18
4	2 to 80	80,80,4,2,3	33.80	4.00	80.00	42.18

4.5.2 Question Three- Average Estimate

The average estimate also had a wide range of values although unlike the low estimate, this time the mode ended up at a low value of ten with two of the five panelists going with that estimate. The mean ended up at an estimate of almost 63 people going TDY. Again, the mean is probably the safest statistic due to the wide range of estimates with no real cluster around any certain estimate. The standard deviation actually increased as the rounds went on so consensus for this question was not possible.

Table 4.11: Question Three- Average Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	4 to 120	90,120,4,10,6	46.00	10.00	#N/A	54.94
2	8 to 180	180,120,8,10,10	65.60	10.00	10.00	79.92
3	10 to 160	160,120,12,10,10	62.40	12.00	10.00	72.24
4	10 to 160	160,120,12,10,10	62.40	12.00	10.00	72.24

4.5.3 Question Three- High Estimate

The high estimate results listed in table 4.12 show almost the same pattern that occurred with the low and average results. There was a wide range of estimates from 20 to 200 in the final round and the mode was low with no real cluster of estimates around any one value. The results of the estimates were no where near consensus with another very large standard deviation.

Table 4.12: Question Three- High Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	6 to 200	120,200,6,50,10	77.20	50.00	#N/A	82.52
2	12 to 240	240,180,12,50,20	100.40	50.00	#N/A	103.25
3	20 to 200	200,180,20,50,20	94.00	50.00	20.00	88.77
4	20 to 200	200,180,20,50,20	94.00	50.00	20.00	88.77

4.6 Question Four

What is your estimate of the cost for each person on each TDY?

Question four provides the final number for the travel portion of the cost of oversight formula. By multiplying the estimates from questions two, three, and four, an estimate for the cost of travel in the oversight process can be obtained. Question four will provide an actual dollar figure estimate for the cost of one TDY for one person on a team. Results are presented in the same format as previous questions.

4.6.1 Question Four- Low Estimate

Question four's low estimate showed a pattern of a constantly decreasing standard deviation. The range of estimates however, ensured the standard deviation would remain high and that consensus could not be met. The promising news from these estimates is that the mean, median and mode were very close as all were at or near an estimate of one thousand dollars per person for each TDY. The results can be seen below in Table 4.13.

Table 4.13: Question Four- Low Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$450 to $1200	$450,$500,$1200,$1000,$1000	$830.00	$1,000.00	$1,000.00	$334.66
2	$500 to $1200	$700,$500,$1200,$1000,$1000	$880.00	$1,000.00	$1,000.00	$277.49
3	$600 to $1200	$700,$600,$1200,$1000,$1000	$900.00	$1,000.00	$1,000.00	$244.95
4	$700 to $1200	$700,$900,$1200,$1000,$1000	$960.00	$1,000.00	$1,000.00	$181.66

4.6.2 Question Four- Average Estimate

As with the low estimates for question four, the average estimates resulted in only a moderate range. The four rounds produced a result no where near consensus however, with a large standard deviation of almost three hundred and five dollars. There was no modal value, but the mean and median were within forty dollars of each other. The results can be seen in the table below.

Table 4.14: Question Four- Average Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$900 to $1600	$1000,$900,$1600,$1000,$1500	$1,200.00	$1,000.00	$1,000.00	$324.04
2	$900 to $1600	$900,$1000,$1600,$1000,$1500	$1,200.00	$1,000.00	$1,000.00	$324.04
3	$900 to $1600	$900,$1200,$1600,$1000,$1500	$1,240.00	$1,200.00	#N/A	$304.96
4	$900 to $1600	$900,$1200,$1600,$1000,$1500	$1,240.00	$1,200.00	#N/A	$304.96

4.6.3 Question Four- High Estimate

The high estimate for question four had a relatively large range, seen in Table 4.15, but the range remained constant throughout all four rounds. The mode and median were the same for the last two rounds, but this time the mean was a bit lower. The standard deviation was quite large and consensus was not met.

Table 4.15: Question Four- High Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$1000 to $2000	$1400,$1200,$2000,$1000,$2000	$1,520.00	$1,400.00	$2,000.00	$460.43
2	$1000 to $2000	$1200,$1500,$2000,$1000,$2000	$1,540.00	$1,500.00	$2,000.00	$456.07
3	$1000 to $2000	$1200,$2000,$2000,$1000,$2000	$1,640.00	$2,000.00	$2,000.00	$498.00
4	$1000 to $2000	$1200,$2000,$2000,$1000,$2000	$1,640.00	$2,000.00	$2,000.00	$498.00

4.7 Travel Cost Estimate

With all the necessary data collected, it was now possible to develop an overall estimate for travel costs using the previously mentioned algorithm. To review, the travel cost estimate will be developed by multiplying the estimates from question two; the number of TDYs taken by one person, by the estimates from question three; the total number of persons who go TDY, by the estimates from question four; the cost per person for each TDY. The results can be seen below in Table 4.16.

Table 4.16: Estimates of Travel Cost for One Milestone

Questions 2-4

MEMBER	Travel-LOW	Travel-AVG	Travel-HIGH
1	$336,000.00	$1,152,000.00	$3,840,000.00
2	$576,000.00	$1,728,000.00	$6,480,000.00
3	$28,800.00	$192,000.00	$720,000.00
4	$12,000.00	$100,000.00	$1,250,000.00
5	$18,000.00	$180,000.00	$720,000.00
MEAN	**$194,160.00**	**$670,400.00**	**$2,602,000.00**
STD DEV	**$253,711.90**	**$732,320.15**	**$2,524,048.34**

The estimates were calculated by member for low, average and high and then a mean and standard deviation was calculated for all five members for the low, average, and high estimates. Based on the mean, the end result of four rounds of the Delphi was a travel estimate that ranged from about $194 thousand to $2.6 million for one milestone.

4.8 Question Five

Estimate how many hours are spent on support for the DAB approval process per person, not including TDY travel time, but actual job performance while TDY or at home base. (Slide prep, meeting prep, etc)

In question five, a new segment of the cost of oversight algorithm is started. Question five is the beginning of the personnel portion of the estimate. With question five, the goal is to find the number of hours personnel put in directly towards the DAB process.

4.8.1 Question Five- Low Estimate

The results, shown in Table 4.17, started off with another large range. The range stabilized by round two, but panelist number two raised their estimate for the number of per person hours spent supporting the DAB from 200 to 300 so the standard deviation did not stabilize until round three. The mode was almost non existent, but it was promising to see the mean and the median so close together, hovering at about 400 hours. Consensus was not met.

Table 4.17: Question Five- Low Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	10 to 690	690,160,400,10,600	372.00	400.00	#N/A	287.18
2	200 to 690	690,200,400,200,500	398	400	200	208.61
3	200 to 690	690,300,400,200,500	418	400	#N/A	188.73
4	200 to 690	690,300,400,200,500	418	400	#N/A	188.73

4.8.2 Question Five- Average Estimate

In Table 4.18, the average estimates have almost the same pattern as the low estimate for question five. This time however, the range did not stabilize until the third round, but the standard deviation had the same result as it also stabilized by the third round. The mean and median had relatively close values at right around 700 hours. There was no mode and consensus was not reached.

Table 4.18: Question Five- Average Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	20 to 1040	1040,240,660,20,800	552.00	660.00	#N/A	415.84
2	360 to 1040	1040,360,660,600,700	672	660	#N/A	244.38
3	500 to 1040	1040,500,660,600,700	700	660	#N/A	204.45
4	500 to 1040	1040,500,660,600,700	700	660	#N/A	204.45

4.8.3 Question Five- High Estimate

Table 4.19 below shows the results for the high estimates. Once again these showed the similar pattern as the earlier portions of question five. The range, standard deviation, mean and median became stable by the third round. For the high estimate, there was a modal value of one thousand hours. The mean, median and modal values were all close at around one thousand, but consensus was not reached.

Table 4.19: Question Five- High Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	40 to 1560	1560,480,820,40,1000	780.00	820.00	#N/A	569.21
2	520 to 1560	1560,520,820,1000,1000	980	1000	1000	378.95
3	820 to 1560	1560,960,820,1000,1000	1068	1000	1000	284.82
4	820 to 1560	1560,960,820,1000,1000	1068	1000	1000	284.82

4.9 Question Six

Estimate how many people are normally involved with the preparation process.

Question six places an actual number of personnel into the second portion of the algorithm for cost of oversight. The number of personnel involved in the preparation process included those creating slides, preparing briefings, and supporting the DAB. The results are given in similar format as previous data collected.

4.9.1 Question Six- Low Estimate

The low estimate, seen in Table 4.20, had a very large range that didn't get much smaller throughout the rounds. No panelists changed their answers in the third or fourth round where the range was estimated to be from ten to one hundred and fifty people involved. The median and mode were the same for rounds two through four with an estimate of ten personnel involved. With such a great range and large standard deviation, the safest statistic would appear to be the mean with a value of fifty two however, during the last two rounds three of the five panelists agreed to an estimate of ten personnel so the median/mode might be a better statistic to go with.

Table 4.20: Question Six- Low Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	1 to 200	60,200,5,1,10	55.20	10.00	#N/A	84.40
2	5 to 150	60,150,5,10,10	47.00	10.00	10.00	61.81
3	10 to 150	80,150,10,10,10	52.00	10.00	10.00	62.61
4	10 to 150	80,150,10,10,10	52.00	10.00	10.00	62.61

4.9.2 Question Six-Average Estimate

The average estimate, located in Table 4.21, showed almost identical movement as the low estimates. No estimates were changed after round three and the standard deviation was quite large. Consensus was not reached.

Table 4.21: Question Six- Average Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	3 to 300	90,300,8,3,25	85.20	25.00	#N/A	125.00
2	8 to 250	90,250,8,25,25	79.60	25.00	25.00	100.29
3	25 to 225	160,225,25,25,25	92.00	25.00	25.00	94.58
4	25 to 225	160,225,25,25,25	92.00	25.00	25.00	94.58

4.9.3 Question Six- High Estimate

The high estimate, seen below in Table 4.22, ended up with the exact same types of statistics as the low and average estimates did. The mode ended up with a value of sixty personnel. Consensus was not reached.

Table 4.22: Question Six- High Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	7 to 400	120,400,12,7,60	119.80	60.00	#N/A	163.12
2	12 to 300	120,300,12,60,60	110.40	60.00	60.00	112.70
3	60 to 275	200,275,60,60,60	131.00	60.00	60.00	100.77
4	60 to 275	200,275,60,60,60	131.00	60.00	60.00	100.77

4.10 Question Seven

Estimate the cost per hour for each person involved in the process.

Question Seven provides the last portion of the personnel cost estimate for the total cost of oversight. With the estimates provided in question seven, multiplied by the estimates given in questions five and six, the estimated forecast for the cost of personnel in the oversight process can be determined.

4.10.1 Question Seven- Low Estimate

In Table 4.23, the low estimates are provided. The estimates changed in the first two rounds and remained unchanged for the last two rounds. The standard deviation was reduced and leveled out after round three. The median and mode remained constant after round two. In the final round the mean, median and mode were all different, but were within a total of less than five dollars.

Table 4.23: Question Seven- Low Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$27.97 to $60	$27.97,$50,$28,$60,$32	39.59	32.00	#N/A	14.59
2	$32 to $60	$43,$50,$45.58,$60,$32	46.12	45.58	#N/A	10.21
3	$43 to $60	$43,$50,$45,58,$60,$43	48.32	45.58	43.00	7.13
4	$43 to $60	$43,$50,$45.58,$60,$43	48.32	45.58	43.00	7.13

4.10.2 Question Seven- Average Estimate

Question seven's average estimates, located in Table 4.24, show a similar pattern to the low estimates. The estimates stabilized after round two, but the standard deviation doubled as did the total difference between the mean, median and mode. Consensus was not met.

Table 4.24: Question Seven- Average Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$31.26 to $80	$31.26,$65,$34,$80,$37	49.45	37.00	#N/A	21.79
2	$37 to $80	$46,$65,$54.20,$80,$37	56.44	54.20	#N/A	16.74
3	$46 to $80	$46,$65,$54.20,$80,$46	58.24	54.20	46.00	14.45
4	$46 to $80	$46,$65,$54.20,$80,$46	58.24	54.20	46.00	14.45

4.10.3 Question Seven- High Estimate

The high estimate for question seven, seen in Table 4.25, followed suit with the low and average estimates as the standard deviation grew considerably, doubling from that of the average estimate in round four. The mean, median and mode were all different with a total difference of almost twenty six. The high mean can be accounted for by the very large estimate provided by panelist number four. Due to the skewed mean, the median or mode might provide a better estimate for the cost per hour for each person involved in the process.

Table 4.25: Question Seven- High Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$31.31 to $120	$31.31,$85,$38,$120,$42	63.26	42.00	#N/A	38.09
2	$42 to $120	$47,$85,$64.05,$120,$42	71.61	64.05	#N/A	31.86
3	$47 to $120	$47,$85,$64.05,$120,$47	72.61	64.05	47.00	30.76
4	$47 to $120	$47,$85,$64.05,$120,$47	72.61	64.05	47.00	30.76

4.11 Personnel Cost Estimate

With all the necessary data collected, it was now possible to develop an overall estimate for personnel costs using the previously mentioned algorithm. The personnel cost estimate was developed by multiplying the estimates from question five; the number of hours one person spends in support of a milestone review, by the estimates from question six; the total number of persons who support a milestone review, by the estimates from question seven; the cost for one person involved in the milestone review. The results can be seen below in Table 4.26.

Table 4.26: Estimates of Personnel Cost For One Milestone

Questions 5-7

MEMBER	Person-LOW	Person-AVG	Person-HIGH
1	$2,373,600.00	$7,654,400.00	$14,664,000.00
2	$2,250,000.00	$7,312,500.00	$22,440,000.00
3	$182,320.00	$894,300.00	$3,151,260.00
4	$120,000.00	$1,200,000.00	$7,200,000.00
5	$215,000.00	$805,000.00	$2,820,000.00
MEAN	**$1,028,184.00**	**$3,573,240.00**	**$10,055,052.00**
STD DEV	**$1,173,086.83**	**$3,574,565.45**	**$8,408,165.41**

The estimates were calculated by member for low, average and high and then a mean and standard deviation was calculated for all five members for the low, average, and high estimates. Based on the mean, the end result of four rounds of the Delphi was a personnel cost estimate that ranges from just over $1 million to just over $10 million for one milestone.

4.12 Question Eight

Estimate how many meetings are normally held from the PEO preparation, through DAB approval. (This includes meetings while TDY or TDY prep meetings).

Question eight provides insight on how meetings are included into the oversight process. By multiplying questions eight, nine, and ten, we will get an idea of truly what part meetings play in the cost of oversight. Question eight deals specifically with the number of meetings that are held during one milestone in a program. The results are listed in the following three paragraphs.

4.12.1 Question Eight- Low Estimate

The low estimate, in Table 4.27, shows a pretty broad range that solidified by round two with an estimate on the number of meetings estimated from six to one hundred twenty. The mean, median, and mode remained constant and relatively close in value after the third round. The standard deviation actually increased from round one to round two, driven by panelist number one's estimate, but then went down and stabilized in rounds three and four.

Table 4.27: Question Eight- Low Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	5 to 50	5,48,12,6,50	24.20	12.00	#N/A	22.81
2	6 to 120	120,48,12,6,45	46.20	45.00	#N/A	45.38
3	6 to 120	120,48,48,6,45	53.40	48.00	48.00	41.26
4	6 to 120	120,48,48,6,45	53.40	48.00	48.00	41.26

4.12.2 Question Eight- Average Estimate

The average estimate, seen below in Table 4.28, resulted in figures that performed similar to the low estimates. The range remained high throughout the process, but the mean, median and mode were close. This time, three of the five panelists agreed on an average estimate of 60 meetings.

Table 4.28: Question Eight- Average Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	8 to 100	8,60,18,10,100	39.20	18.00	#N/A	40.01
2	10 to 180	180,60,18,10,60	65.60	60.00	60.00	68.02
3	10 to 180	180,60,60,10,60	74.00	60.00	60.00	63.09
4	10 to 180	180,60,60,10,60	74.00	60.00	60.00	63.09

4.12.3 Question Eight- High Estimate

The high estimates for question eight are seen in Table 4.29. Panelist number one went from an initial estimate of 12 to a very high estimate of 240 and kept that estimate for the remaining rounds. The high estimate is again skewing the mean to the high side. The mode and median were constant and equal in both rounds three and four.

Table 4.29: Question Eight- High Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	12 to 150	12,90,26,25,150	60.60	26.00	#N/A	58.49
2	25 to 240	240,90,26,25,90	94.20	90.00	90.00	87.65
3	25 to 240	240,90,90,25,90	107.00	90.00	90.00	79.50
4	25 to 240	240,90,90,25,90	107.00	90.00	90.00	79.50

4.13 Question Nine

What do you estimate as the length, in hours, for each meeting?

Question nine provides a length for each meeting, which will be multiplied by the number of meetings provided in question eight and the cost per hour for each person attending, which will be provided in question ten. Question nine was an estimate that came in with relatively low standard deviations for each estimate, but overall, was not significantly volatile from one round to the next. Results are provided in the following three paragraphs.

4.13.1 Question Nine- Low Estimate

The low estimate in question nine, located in Table 4.30, had a very small range with an estimate of two to four hours per meeting by round two. No answers were changed by round two and the mean, median and mode ended up being very close in value. The standard deviation closed at a value of less than one, but consensus was not met.

Table 4.30: Question Nine- Low Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	1 to 4	2,2,2,4,1	2.20	2.00	2.00	1.10
2	2 to 4	2,2,2,4,2	2.40	2.00	2.00	0.89
3	2 to 4	2,2,2,4,2	2.40	2.00	2.00	0.89
4	2 to 4	2,2,2,4,2	2.40	2.00	2.00	0.89

4.13.2 Question Nine- Average Estimate

The average estimate for question nine, listed in Table 4.31, had a similar pattern to the low estimate. Question now is the first time that we see the Delphi process really starting to work as there is a 4 out of 5 agreement by round two that holds throughout. This time, the mean is skewed a bit high by panelist number four's high estimate of sixteen, so the mode of four hours per meeting may be a better estimate to go with.

Table 4.31: Question Nine- Average Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	1.5 to 16	4,4,4,16,1.5	5.90	4.00	4.00	5.75
2	4 to 16	4,4,4,16,4	6.40	4.00	4.00	5.37
3	4 to 16	4,4,4,16,4	6.40	4.00	4.00	5.37
4	4 to 16	4,4,4,16,4	6.40	4.00	4.00	5.37

4.13.3 Question Nine- High Estimate

The high estimate for question nine, located in Table 4.32 below, had range performance similar to the low and average estimates where it stayed the same through rounds two through four; however, the high estimate was the furthest from consensus. All estimates stayed the same for all members by round two only this time the mode is basically split with two of the five panelists going with a high estimate of 8 hours per meeting, two of the five panelists going with 12 hours per meeting and panelist number four remaining consistent with a high estimate.

Table 4.32: Question Nine- High Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	2 to 24	12,8,12,24,8	10.80	8.00	8.00	8.20
2	8 to 24	12,8,12,24,8	12.80	12.00	12.00	6.57
3	8 to 24	12,8,12,24,8	12.80	12.00	12.00	6.57
4	8 to 24	12,8,12,24,8	12.80	12.00	12.00	6.57

4.14 Question Ten

What is the cost per hour of each person involved in the meetings?

Question ten provided the cost per person to include in the final portion of the cost of oversight estimate for meetings conducted for a milestone. The results of question ten mirrored the results of question seven, due to both dealing with the cost of personnel per hour. The results will still be provided separately due to future discussion on the cost of oversight and the analysis portion of the thesis. The estimates will be provided in the same format as previous questions.

4.14.1 Question Ten- Low Estimate

Question ten's low estimate, listed in Table 4.33, ended with a relatively low standard deviation despite beginning with a pretty broad range. All members locked into their estimates by round three which produced a median and mode that were close in value however the mean was a bit higher driven by two of the five panelists estimating the cost per hour of each member at a meeting of $60 per hour. The mode is actually split with two of the five panelists going with an estimate of $43 per hour. Panelist three went with a very precise estimate of $45.58 per hour putting three of the five panelists in the same ballpark. Based on this fact, the mode might be the safest statistic to use for the estimate of the cost per hour of the people at milestone meetings.

Table 4.33: Question Ten- Low Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$27.97 to $60	$27.97,$60,$34,$60,$32	42.79	34.00	60.00	15.86
2	$32 to $60	$43,$60,$45.58,$60,$32	48.12	45.58	60.00	11.99
3	$43 to $60	$43,$60,$45.58,$60,$43	50.32	45.58	43.00	8.90
4	$43 to $60	$43,$60,$45.58,$60,$43	50.32	45.58	43.00	8.90

4.14.2 Question Ten- Average Estimate

The average estimate, seen in Table 4.34, initially had a large range of almost 50 and a relatively large standard deviation which was almost half of the range. Similar to the action with the low estimates, with the average estimates, panelists locked into their values by the third round. This time however, the mean, median, and mode weren’t real close in value. Two of the five panelists did end up agreeing to a value of $46 per hour, however, the remaining panelists all went with higher values. The mean is skewed high by panelist four’s estimate of $80 per hour, but with most of the panel giving estimates higher than the mode, the mean is probably the best estimate in this case.

Table 4.34: Question Ten- Average Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$31.26 to $80	$31.26,$75,$38,$80,$37	52.25	38.00	#N/A	23.26
2	$37 to $80	$46,$75,$54.20,$80,$37	58.44	54.20	#N/A	18.52
3	$46 to $80	$46,$75,$54.20,$80,$46	60.24	54.20	46.00	16.20
4	$46 to $80	$46,$75,$54.20,$80,$46	60.24	54.20	46.00	16.20

4.14.3 Question Ten- High Estimate

The high estimate, listed in Table 4.35, produced figures that performed in a similar manner to the low and average estimates. Panelists again locked into their estimates by round three and similar to the average estimates, only two of the five panelists agreed on an estimate in the end with the remaining panelists going higher. For the same reason as that given in the section on the average estimate, the mean is probably the best estimate in this case.

Table 4.35: Question Ten- High Estimate By Round

Round	Range	Frequency (Member 1,2,3,4,5)	Mean	Median	Mode	Std Dev
1	$31.31 to $120	$31.31,$95,$46,$120,$42	66.86	46.00	#N/A	38.51
2	$42 to $120	$47,$95,$64.05,$120,$42	73.61	64.05	#N/A	33.20
3	$47 to $120	$47,$95,$64.05,$120,$47	74.61	64.05	47.00	32.06
4	$47 to $120	$47,$95,$64.05,$120,$47	74.61	64.05	47.00	32.06

4.15 Meeting Cost Estimate

With all the necessary data collected, it was now almost possible to develop an overall estimate for the cost of all the meetings supporting the DAB milestone review process using the previously mentioned algorithm. The meeting cost estimate will be developed by multiplying the estimates from question eight; the number of meetings held from PEO preparation to DAB approval, by the estimates from question nine; the length in hours of each meeting, by the estimates from question ten; the cost for one person involved in one meeting. Using the algorithm, we are able to develop a cost estimate for one person at all of the meetings necessary to get through milestone approval. In order to come up with an estimate for the cost of all the meetings, we polled the Delphi panel and asked them to provide a low, medium and high estimate for the number of people who attend the meetings. The results can be seen below in Table 4.36.

Table 4.36: Estimates of the Number of People who Attend Meetings

Member #	Low	Med	High
1	5	12	25
2	6	15	40
3	10	20	30
4	5	10	25
5	4	8	12
Mean	**6.00**	**13.00**	**26.40**
Standard Dev	**2.35**	**4.69**	**10.11**

With all of the necessary figures now available, the data was compiled and produced the following estimates for the cost of the meetings in support of one milestone.

Table 4.37: Estimates of Meeting Costs for One Milestone

Questions 8-11

MEMBER	Meeting-LOW	Meeting-AVG	Meeting-HIGH
1	$51,600.00	$397,440.00	$3,384,000.00
2	$34,560.00	$270,000.00	$2,736,000.00
3	$43,756.80	$260,160.00	$2,075,220.00
4	$7,200.00	$128,000.00	$1,800,000.00
5	$15,480.00	$88,320.00	$406,080.00
MEAN	**$30,519.36**	**$228,784.00**	**$2,080,260.00**
STD DEV	**$18,747.83**	**$123,506.69**	**$1,119,283.55**

The estimates were calculated by panel member on their low, average and high responses and then a mean and standard deviation was calculated. Based on the mean, the end result of four rounds of the Delphi was a cost of meetings estimate that ranged from about $30.5 thousand almost $2.1 million for one milestone.

4.16 Summary of Results

Estimates for the three major oversight cost portions of a milestone review for an “inside the box” MDAP were developed using a simple algorithm. By adding these individual estimates together, we can arrive at an overall estimate for the cost of one milestone decision point. The results of summing the estimates for travel cost, personnel cost, and meeting cost can be seen below in Table 4.38

Table 4.38: Estimates for Oversight Cost of One Milestone

Milestone Decision Point (MDP)			
MEMBER	**MDP Low**	**MDP Avg**	**MDP High**
1	$2,761,200.00	$9,203,840.00	$21,888,000.00
2	$2,860,560.00	$9,310,500.00	$31,656,000.00
3	$254,876.80	$1,346,460.00	$5,946,480.00
4	$139,200.00	$1,428,000.00	$10,250,000.00
5	$248,480.00	$1,073,320.00	$3,946,080.00
MEAN	**$1,252,863.36**	**$4,472,424.00**	**$14,737,312.00**
STD DEV	**$1,423,444.51**	**$4,369,992.94**	**$11,739,247.49**

The three groups of estimates for travel, personnel, and meeting costs were added together to develop an estimated milestone cost. The mean statistic shows a milestone oversight cost range from almost $1.3 million to nearly $14.8 million. By itself, this statistic is interesting enough however more value can be added by comparing this range to the range for oversight costs developed by Col Caldwell's ORPAT team. Recall that they came up with an average estimate of $10-12 million for a single milestone and an estimate of $40-50 million for an entire joint acquisition program in 1994 dollars (14:9). Using raw inflation indices, the ORPAT team's figures can be inflated to fiscal year 2003 dollars or the figures we developed could be brought back to 1994 dollars. We chose to calculate the latter and the results can be seen below in Table 4.39.

Table 4.39: FY2003 Milestone Oversight Costs in FY1994 Dollars

Milestone Decision Point (MDP)-Adjusted			
Milestone	**MDP Low**	**MDP Avg**	**MDP High**
MEAN	$1,252,863.36	$4,472,424.00	$14,737,312.00
3080 Raw Indice (1994)	0.885	0.885	0.885
Adjusted Mean	**$1,108,784.07**	**$3,958,095.24**	**$13,042,521.12**

As the chart shows, the "high" milestone estimate falls close to the ORPAT estimate when the dollars are the same. The procurement or 3080 index was used because we're dealing with the procurement of weapons systems. If the index for wages was used, the figure would be smaller since the military wage index is .750 and the civilian employee index is .738 (41:1).

After developing a milestone oversight cost estimate, a total program oversight cost estimate is arrived at quite easily. Our methodology for developing a total program oversight cost was simply to multiply the milestone figures by three to represent the three milestones. The assumption here is that each milestone costs relatively the same. We decided to stick to that assumption because a whole series of research could be conducted on the cost difference from milestone to milestone. The results of our calculation for total program cost can be seen in Table 4.40 below.

Table 4.40: Estimates for Total Program Oversight Costs

MEMBER	Program Low	Program Avg	Program High
1	$8,283,600.00	$27,611,520.00	$65,664,000.00
2	$8,581,680.00	$27,931,500.00	$94,968,000.00
3	$764,630.40	$4,039,380.00	$17,839,440.00
4	$417,600.00	$4,284,000.00	$30,750,000.00
5	$745,440.00	$3,219,960.00	$11,838,240.00
MEAN	**$3,758,590.08**	**$13,417,272.00**	**$44,211,936.00**
STD DEV	**$4,270,333.53**	**$13,109,978.82**	**$35,217,742.48**

Looking at the range on the mean we've answered research question number one as we see a total program oversight cost estimate from almost $3.8 million to over $44.2 million. Again, it is interesting to compare this range to the range developed by the ORPAT team of $40-$50 million. To make the comparison meaningful we again brought our figures back to 1994 dollars and the results can be seen in Table 4.41 below.

Table 4.41: FY2003 Total Program Oversight Costs in FY1994 Dollars

Program	Program Low	Program Avg	Program High
MEAN	$3,758,590.08	$13,417,272.00	$44,211,936.00
3080 Raw Indice (1994)	0.885	0.885	0.885
Adjusted Mean	**$3,326,352.22**	**$11,874,285.72**	**$39,127,563.36**

Our “high” program oversight cost estimate of just over $39.1 million fell a little below the estimate of $40-$50 million developed by the ORPAT team this time. The ORPAT estimate however, may be on the high side since back when it was developed “box” acquisition programs went through five versus today’s three milestones. In fact, it was Col Caldwell’s ORPAT that recommended reducing the number of milestones. It may be that the team’s recommendation is resulting in actual benefit to today’s defense acquisition.

The goal of the Delphi Method was to complete at least four rounds while trying to reach consensus. The objectives were clear for how consensus would be determined. The rule was met for all ten questions provided in the survey and all objectives for the data collection portion were met.

Now that the estimates have been provided, the information will be placed in statistical software as a database. Each respondent will have their estimates entered for each question. This will be compared with other respondents from the theses research conducted by Neal and DeReus. When comparing all of the estimates together, an analysis of variance test will be conducted by question, by type of regulatory guidance policy programs typically fall under. (i.e., Space, DoDD 5000 series, or Virtual oversight). Once this analysis has been completed, the results and analysis will be presented in chapter five to see if there truly is a difference in the cost of oversight among programs.

5.0 Analysis

5.1 Overview

The goal of chapter 5 is to compare the results from the final round of the Delphi surveys for each of the DoD acquisition disciplines examined. The first section will contain a question by question breakdown comparing the responses from the DoD 5000 or "box" program surveys to the C3I or "virtual box" program surveys to the Space or "outside the box" program surveys. Since question one dealt with identifying cost drivers and left little basis for a statistical comparison, there will be a qualitative comparison of that question. Questions two through ten will be quantitatively compared through hypothesis testing and use of probability or p-values. The stated null hypothesis is that there is no statistical difference between the population means for each of the disciplines. The common p-value of .05 will be used to test this null hypothesis. If in comparing disciplines, a p-value of less than .05 results, then the null hypothesis will be rejected and we'll conclude that there is a statistically significant difference between the population means of the disciplines. A p-value of greater than or equal to the .05 significance level will force us to fail to reject the null hypothesis that there is no difference between the population means. Failing to reject the null lends to the conclusion that the differences that we identified were the result of error in our random sampling of the populations of "box", "virtual box" and "outside the box" programs, not from true difference between the population means. The second section will qualitatively compare the total program costs deduced from chapter four. The final section of this chapter will summarize the chapter five results and examine potential areas for future research of this topic.

5.2 Question One

> **Stated from the survey, 1.** ***From the Program Executive Officer (PEO) request for a Defense Acquisition Board (DAB to the DAB milestone approval, what are the five major cost drivers in the oversight process?***

The goal of question one was to obtain the five key cost drivers that the respondents felt drove the cost of oversight. In the table below, the top drivers identified from each of the disciplines are listed. At first glance it is interesting to note that there are different drivers on each of the lists—no driver from the "box" list appeared on the space list or C3I list and so on. The drivers on the DoDD 5000 list were very top level dealing with issues like spiral development, how many services were involved etc. The space list focused on drivers that were much more "ground" level like actual TDY costs involved. The C3I list of drivers was most like the DoDD 5000 list in that again the focus was more top level dealing with topics like requirements definition and technologies. Though the drivers were different in all three lists, that in no way supports a conclusion that the three disciplines all face different oversight cost drivers. For this first generation of this thesis, a Delphi was conducted using five member panels. If perhaps larger panels were employed or if panelists with different backgrounds were used the results might have been different. Additionally, question one was left very open ended, allowing the panelists to brainstorm cost drivers from any level. If perhaps in future generations of this thesis we provided a baseline list of drivers at the specific area of oversight we wanted to focus on, we might have had a better chance at getting similar oversight cost drivers on the lists. One possibility for the fact that the drivers identified for both the DoD oversight process and its virtual cousin were very top level and the drivers for the space oversight process dealt with more ground-level issues is that fact that the DoD and C3I processes are governed by a centralized body of regulations—the DoD 5000 series. The very reason the space oversight process was allowed to operate outside the box was to allow for flexibility in the management of the process in the hopes of achieving greater efficiency. Because space oversight is more decentralized, the cost drivers may now come from a factors closer to the process.

Table 5.1: Question One-Oversight Cost Drivers

Drivers Picked--DoDD 5000	**Rank**
Program is Multi-Service	1
Whether Completely new system or just block upgrade	2
Number of Technologies going into the system	3
Number of Systems the System must interact with	4
Milestone B (requires most documents; 30 to be generated for review)	5

Drivers Picked--Space	**Rank**
Time away from primary responsibilities while supporting IPA at expense of rest of program	1
TDY from the program office to IPA or IPA folks to program office	2
IPA Personnel Costs (Program Evaluation)	3
Salaries of IPA core members and "gray beard" members who are not government employees	4
IPA Travel/PerDiem costs (Team and support personnel)	5

Drivers Picked--C3I	**Rank**
Lack of functional requirements that are clearly defined and understood	1
Negotiating viewpoints of the various stakeholders…acq strategy re-do	2
The serial process of document approval by the several echelons of oversight	3
The lack of established architectures and the resulting need for unique C4ISP efforts	4
Changing oversight requirements;the way we did things previously not work now due to changing personalities, policy etc.--requires climbing the learning curve again	5

5.3 Question Two

> ***From the PEO recommendation, to the DAB approval of the milestone, use your professional judgment and estimate how many TDYs are taken by one person to get one program through one Milestone.***

The goal of question two was to find out how many TDYs are taken by one individual in one program to get through one milestone. In the table below, the p-values for the comparisons between DoD 5000 and Space and DoD 5000 and C3I are listed for low, average, and high range responses. Shaded p-values indicate cases where we failed to reject the null hypothesis that there is no significant difference between the population means for the disciplines. The table immediately shows that in almost all cases, there was a statistically significant difference between the population means of the disciplines for the question of how many TDY's are taken. The only case where we failed to reject the null hypothesis was in comparing the high value responses between "box" programs and C3I programs. Here the p-value was almost .18; a value far greater than the .05 significance level we established. Looking at the "box" responses the range at the high level was from 16 to 25 with a mean of 19. The C3I responses ranged from 12 to 30 with a mean of 25.5.

Table 5.2: Question Two-Comparison of p-Values

Question 2	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.0001	0.0005	0.0004
C3I vs 5000	0.008	0.0317	0.1766

Null Hypothesis: There is no significant difference
Fail to reject: No difference (Higlighted in Grey)--P>=.05
Reject: There is a significant difference (P<.05)

5.4 Question Three

Estimate how many people normally go TDY throughout the Milestone Decision process.

Question three established another portion of the travel estimate in our cost of oversight algorithm. The goal of question three was to find the number of personnel that actually go TDY during the milestone decision process. As seen in the table below, all comparisons resulted in very high p-values so in all cases we failed to reject the null hypothesis. Failing to reject the null does not conclusively mean that that the population means for the question of the number of people that go TDY are the same however, based on the data we gathered we can not disprove that conclusion. In analyzing the responses from each of the disciplines, DoD 5000 responses ranged from 20 to 200 with a mean of 94, the space responses ranged from 30 to 45 with a mean of 35 and the C3I responses ranged from 12 to 40 with a mean of 23. In both comparisons though the mean from the DoD responses far exceeded the means from space and C3I, their means did in fact fall within the DoD range.

Table 5.3: Question Three-Comparison of p-Values

Question 3	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.4934	0.3418	0.2323
C3I vs 5000	0.2769	0.2335	0.1612

Null Hypothesis: There is no significant difference
Fail to reject: No difference (Higlighted in Grey)--P>=.05
Reject: There is a significant difference (P<.05)

5.5 Question Four

What is your estimate of the cost for each person on each TDY?

Question four provided the final number for the travel portion of the cost of oversight formula. By multiplying the estimates from questions two, three, and four, an estimate for the cost of travel in the oversight process can be obtained. Question four provided an actual dollar figure estimate for the cost of one TDY for one person on a team. Based on the p-values seen below, we failed to reject the null hypothesis in only two of the six possible cases. The first case of failing to reject was on the comparison of average responses between DoD 5000 and space. The DoD responses for the average cost of each TDY ranged from $900 to $1,600 with a mean of $1,240 and the space responses ranged from $1,200 to $1,800 with a mean of $1,450—in both cases the means from one set of responses fell into the range of the other. The second case of failing to reject was in comparing low estimates for DoD 5000 to C3I estimates. For DoD, the low estimate for the cost of each TDY ranged from $700 to $1,200 with a mean of $960 and the C3I responses ranged from $1,000 to $1,200 with a mean of $1,050. Here, the DoD mean did not fall within the C3I range, but the C3I mean did fall within the range of low DoD 5000 responses.

Table 5.4: Question Four-Comparison of p-Values

Question 4	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.043	0.3136	0.0087
C3I vs 5000	0.4071	0.0123	0.0017

Null Hypothesis: There is no significant difference
Fail to reject: No difference (Higlighted in Grey)--P>=.05
Reject: There is a significant difference (P<.05)

5.6 Travel Computation

The table below displays the estimates for the cost of travel associated with the different oversight processes. Although in the earlier comparisons of travel estimates, space oversight was higher in cost per TDY, the overall range of its total costs are lower. This again is hypothesized that due to the IPA process, the cost of each TDY is increased, but the total number of TDYs are decreased, resulting in an overall decrease in total TDY costs. This seems to hold true when actually comparing the total cost for travel among all three oversight processes.

Table 5.5: Travel Cost Estimates for Each Oversight Process

5000 - Travel			
MEMBER	**Travel-LOW**	**Travel-AVG**	**Travel-HIGH**
1	$336,000.00	$1,152,000.00	$3,840,000.00
2	$576,000.00	$1,728,000.00	$6,480,000.00
3	$28,800.00	$192,000.00	$720,000.00
4	$12,000.00	$100,000.00	$1,250,000.00
5	$18,000.00	$180,000.00	$720,000.00
MEAN	$194,160.00	$670,400.00	$2,602,000.00
STD DEV	$253,711.90	$732,320.15	$2,524,048.34
Space			
MEMBER	**Travel-LOW**	**Travel-AVG**	**Travel-HIGH**
1	$9,750.00	$144,000.00	$648,000.00
2	$30,000.00	$195,000.00	$913,500.00
3	$10,875.00	$150,000.00	$630,000.00
4	$35,000.00	$144,000.00	$792,000.00
MEAN	$21,406.25	$158,250.00	$745,875.00
STD DEV	$12,979.70	$24,662.72	$133,206.84
C3I - Travel			
MEMBER	**Travel-LOW**	**Travel-AVG**	**Travel-HIGH**
1	$36,000.00	$400,000.00	$3,000,000.00
2	$42,000.00	$94,500.00	$432,000.00
3	$60,000.00	$400,000.00	$2,100,000.00
4	$240,000.00	$1,200,000.00	$4,800,000.00
MEAN	$94,500.00	$523,625.00	$2,583,000.00
STD DEV	$97,534.61	$473,355.99	$1,821,086.49

5.7 Question Five

> ***Estimate how many hours are spent on support for the DAB approval process per person, not including TDY travel time, but actual job performance while TDY or at home base. (Slide prep, meeting prep, etc)***

With question five, the goal was to find the number of hours personnel put in directly towards the DAB process. The table of p-values for the comparisons of the disciplines below show that in all cases the null hypothesis was rejected. On the question of how many hours are spent in support of DAB approval, the difference in means in the comparison of DoD 5000 to Space and DoD to C3I were statistically significant. The mean value for the low estimates for DoD was 418 hours and the mean value for the high estimates was 1,068 hours. For Space, the mean for the low estimates was about 57 hours and the high was almost 184 hours. For C3I the mean for the low was 12.5 hours and the high was 34. In no case did the ranges on the mean values for each discipline intersect.

Table 5.6: Question Five-Comparison of p-Values

Question 5	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.0071	0.001	0.0005
C3I vs 5000	0.0039	0.0003	0.0002

Null Hypothesis:	There is no significant difference
Fail to reject:	No difference (Higlighted in Grey)--P>=.05
Reject:	There is a significant difference (P<.05)

<u>**5.8 Question Six**</u>

Estimate how many people are normally involved with the preparation process.

Question six provided low, average, and high estimates for the number of people involved in the process to prepare for DAB approval. The number of personnel involved in the preparation process included those creating slides, preparing briefings, and supporting the DAB. In this instance the table of p-values below shows that we failed to reject the null hypothesis in all cases. The mean responses from the populations of DoD 5000, Space and C3I were not statistically significantly different. The only comparison that came close to rejecting the null was comparing high responses from DoD 5000 to C3I.

Table 5.7: Question Six-Comparison of p-Values

Question 6	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.2225	0.2213	0.1415
C3I vs 5000	0.1906	0.1331	0.0587

Null Hypothesis:	There is no significant difference
Fail to reject:	No difference (Higlighted in Grey)--P>=.05
Reject:	There is a significant difference (P<.05)

5.9 Question Seven

Estimate the cost per hour for each person involved in the process.

Question Seven provides the last portion of the personnel cost estimate for the total cost of oversight by providing an estimate of the hourly salary of each person involved in the process. The table of the p-values for the comparisons below shows that in only two of the six possible cases did we fail to reject the null and both instances occurred on the Space to DoD 5000 comparison. The two cases of failing to reject occurred when comparing low estimates for cost per hour and high estimates for cost per hour. The comparison of average responses came close to rejection at .07. but the comparison of low values was very high at almost .62. The DoD low estimates ranged from a cost per hour per person of $43 to $60 with a mean of about $48. The Space low estimates ranged from $32 to $50 with a mean of almost $46. In both cases the mean from one discipline fell into the range of the other.

Table 5.8: Question Seven-Comparison of p-Values

Question 7	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.6153	0.0746	0.0018
C3I vs 5000	0.0012	0.0001	0.0004

Null Hypothesis:	There is no significant difference
Fail to reject:	No difference (Higlighted in Grey)--P>=.05
Reject:	There is a significant difference (P<.05)

5.10 Personnel Cost Computation

When reviewing the total estimates provided by all three types of oversight in the table below, the comparison of total costs for personnel show large value differences. The C3I portion is significantly smaller than the NSSAP and DoDD 5000 oversight processes. The DoDD 5000 oversight process has the largest range for all three. Ranging from \$120,000 to over \$24M, personnel costs create a large portion for the cost of oversight in programs under the centralized control of DoDD 5000. Space is estimated lower at \$17,280 to \$2.4M, but doesn't compare with the C3I estimates of \$4,200 to just over \$144,000. This shows that using the C3I approach could provide some potential cost savings in the oversight process by placing items in a virtual environment and allowing those who have access the ability to view at their leisure.

Table 5.9: Personnel Cost Estimates for Each Oversight Process

5000 - Personnel			
MEMBER	Person-LOW	Person-AVG	Person-HIGH
1	$2,373,600.00	$7,654,400.00	$14,664,000.00
2	$2,250,000.00	$7,312,500.00	$22,440,000.00
3	$182,320.00	$894,300.00	$3,151,260.00
4	$120,000.00	$1,200,000.00	$7,200,000.00
5	$215,000.00	$805,000.00	$2,820,000.00
MEAN	$1,028,184.00	$3,573,240.00	$10,055,052.00
STD DEV	$1,173,086.83	$3,574,565.45	$8,408,165.41
Space Personnel			
MEMBER	Person-LOW	Person-AVG	Person-HIGH
1	$17,280.00	$270,000.00	$2,400,000.00
2	$40,000.00	$252,000.00	$1,200,000.00
3	$22,500.00	$168,750.00	$1,154,250.00
4	$19,800.00	$315,000.00	$1,750,000.00
MEAN	$24,895.00	$251,437.50	$1,626,062.50
STD DEV	$10,293.11	$61,161.80	$582,659.43
C3I - Personnel			
MEMBER	Person-LOW	Person-AVG	Person-HIGH
1	$4,200.00	$25,500.00	$135,000.00
2	$7,200.00	$25,200.00	$129,600.00
3	$7,200.00	$30,000.00	$90,000.00
4	$7,680.00	$33,600.00	$144,000.00
MEAN	$6,570.00	$28,575.00	$124,650.00
STD DEV	$1,596.12	$4,005.31	$23,851.42

5.11 Question Eight

Estimate how many meetings are normally held from the PEO preparation, through DAB approval. (This includes meetings while TDY or TDY prep meetings).

Question eight provides insight on how meetings are included into the oversight process and deals specifically with the number of meetings that are held during one milestone in a program. The table of p-values shows that in comparing the means from each population our results were not statistically significant to disprove the null hypothesis. There were two instances where we came close to rejecting the null; both came in the comparison of DoD 5000 responses to Space responses.

Table 5.10: Question Eight-Comparison of p-Values

Question 8	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.0667	0.1117	0.0768
C3I vs 5000	0.1129	0.2234	0.2686

Null Hypothesis: There is no significant difference
Fail to reject: No difference (Higlighted in Grey)--P>=.05
Reject: There is a significant difference (P<.05)

5.12 Question Nine

What do you estimate as the length, in hours, for each meeting?

Question nine provided an estimate for the length of each meeting related to the DAB milestone approval process. The table of p-values on the comparisons show that there was only one case where the null hypothesis was rejected. The null was rejected when comparing the low estimates for the length of meetings in the DoD 5000 process to the low estimate for the length of meetings associated with the Space process. For the DoD process, the mean duration for the low estimate was 2.4 hours and just under an hour for the space process.

Table 5.11: Question Nine-Comparison of p-Values

Question 9	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.0346	0.3451	0.4016
C3I vs 5000	0.2977	0.3489	0.3326

Null Hypothesis: There is no significant difference
Fail to reject: No difference (Higlighted in Grey)--P>=.05
Reject: There is a significant difference (P<.05)

5.13 Question Ten

What is the cost per hour of each person involved in the meetings?

Question ten provided the cost per person for meetings conducted in support of a milestone decision. The table of p-values shows that comparison between space estimates for the per person costs and DoD 5000 estimates provided the only instances where we failed to reject the null hypothesis. The comparison of low estimates for the cost per hour for an individual in the DoD process ranged from $43 to $60 with a mean of a little of $50 an for space ranged from $32 to $50 with a mean of almost $42. The average estimates from the DoD process ranged from $46 to $80 with a mean of just over $60 and the estimates from the space process ranged from $60 to $75 with a mean of just over $71.

Table 5.12: Question Ten-Comparison of p-Values

Question 10	p-Values (.05 significance level)		
COMPARISON	**LOW**	**AVG**	**HIGH**
Space vs 5000	0.1722	0.2536	0.0049
C3I vs 5000	0.0026	0.0001	0.0002

Null Hypothesis: There is no significant difference
Fail to reject: No difference (Higlighted in Grey)--P>=.05
Reject: There is a significant difference (P<.05)

5.14 Meeting Cost Computation

When comparing the actual cost estimate calculations, an interesting point came to light. As seen in the table below, the total cost for meetings was actually lowest in the DoDD 5000 oversight process. More information would be required to make any large assumptions as to why this had occurred, but the assumption that could be made is due to the lower cost per hour of personnel contributing to the meeting process. The other areas for the cost computation come in significantly higher in the DoDD portion when comparing to the other oversight processes. Because of this one factor, the C3I process still looks as though it could statistically come in with a lower cost for meetings than the DoDD 5000 oversight process. The other interesting occurrence is the high costs that were calculated in the C3I process. They were associated with one high point that may have been just an anomaly, but there isn't sufficient evidence to keep this data point out.

Table 5.13: Meeting Cost Estimates for Each Oversight Process

5000 - Meeting			
MEMBER	**Meeting-LOW**	**Meeting-AVG**	**Meeting-HIGH**
1	$51,600.00	$397,440.00	$3,384,000.00
2	$34,560.00	$270,000.00	$2,736,000.00
3	$43,756.80	$260,160.00	$2,075,220.00
4	$7,200.00	$128,000.00	$1,800,000.00
5	$15,480.00	$88,320.00	$406,080.00
MEAN	$30,519.36	$228,784.00	$2,080,260.00
STD DEV	$18,747.83	$123,506.69	$1,119,283.55
Space - Meeting			
MEMBER	**Meeting-LOW**	**Meeting-AVG**	**Meeting-HIGH**
1	$448.00	$120,000.00	$5,625,000.00
2	$4,000.00	$48,000.00	$1,701,000.00
3	$2,520.00	$105,000.00	$2,812,500.00
4	$3,000.00	$134,062.50	$1,680,000.00
MEAN	$2,492.00	$101,765.63	$2,954,625.00
STD DEV	$1,495.64	$37,757.05	$1,857,179.46
C3I - Meeting			
MEMBER	**Meeting-LOW**	**Meeting-AVG**	**Meeting-HIGH**
1	$33,600.00	$825,000.00	$14,400,000.00
2	$18,000.00	$112,500.00	$448,000.00
3	$37,500.00	$300,000.00	$2,208,000.00
4	$39,600.00	$257,040.00	$3,686,400.00
MEAN	$32,175.00	$373,635.00	$5,185,600.00
STD DEV	$9,771.51	$311,415.24	$6,283,940.47

5.15 Total Program Cost Comparison

Recall from chapter four that a simple algorithm was used to develop estimates for the three major oversight cost portions of a milestone review for an "inside the box" MDAP and then those individual estimates were added together to arrive at an overall estimate for the cost of one milestone decision point. A total program cost by was then estimated by multiplying the cost of one milestone by three since there are three milestones in a program's acquisition lifecycle. This algorithm was applied to the data from the DoD 5000, Space, and C3I process to arrive at estimates of total program cost for all three of the disciplines. This portion of the thesis will answer the research question, "how do the oversight costs associated with the "box" process compare to the oversight costs of the other processes?"

Acquisition reform over the years has been aimed at making DoD acquisition more efficient and cost effective. Throughout this reform, the DoD 5000 acquisition process is assumed to be the primitive way of doing business, so the pressing question becomes are the new reforms associated with the space and C3I acquisition processes improving those acquisition systems? Below, is the table that shows the estimates that were developed for programs associated with the box, outside the box, and virtual box processes.

Table 14: Estimates of Total Program Cost for DoD 5000, Space, and C3I

5000 - Program			
MEMBER	Program Low	Program Avg	Program High
1	$8,283,600.00	$27,611,520.00	$65,664,000.00
2	$8,581,680.00	$27,931,500.00	$94,968,000.00
3	$764,630.40	$4,039,380.00	$17,839,440.00
4	$417,600.00	$4,284,000.00	$30,750,000.00
5	$745,440.00	$3,219,960.00	$11,838,240.00
MEAN	$3,758,590.08	$13,417,272.00	$44,211,936.00
STD DEV	$4,270,333.53	$13,109,978.82	$35,217,742.48
Space - Program			
MEMBER	Program Low	Program Avg	Program High
1	$82,434.00	$1,602,000.00	$26,019,000.00
2	$222,000.00	$1,485,000.00	$11,443,500.00
3	$107,685.00	$1,271,250.00	$13,790,250.00
4	$173,400.00	$1,779,187.50	$12,666,000.00
MEAN	$146,379.75	$1,534,359.38	$15,979,687.50
STD DEV	$63,337.35	$213,056.30	$6,761,137.82
C3I - Program			
MEMBER	Program Low	Program Avg	Program High
1	$221,400.00	$3,751,500.00	$52,605,000.00
2	$201,600.00	$696,600.00	$3,028,800.00
3	$314,100.00	$2,190,000.00	$13,194,000.00
4	$861,840.00	$4,471,920.00	$25,891,200.00
MEAN	$399,735.00	$2,777,505.00	$23,679,750.00
STD DEV	$311,948.30	$1,682,759.26	$21,431,855.48

The tables provide low, average, and high estimates of program costs for each of the processes. The tables also break out those estimates by Delphi expert panel member, but the focus of this analysis will be on the means for each process. As one can see from the data, the estimates for the total program cost of those programs going through the DoD 5000 process are the highest ranging from a low estimate of almost $3.8 million to a high estimate of over $44 million. It was shown in chapter 4 that the program cost estimate arrived at in this thesis coincides with estimates developed in a previous study of the cost of oversight of DoD 5000 acquisition. The expectation prior to conducting this thesis was that assuming the DoD 5000 process is the baseline process targeted to be reformed, then it should have the highest oversight costs associated with it and the results of this thesis supported that expectation. The C3I process was second to the DoD process in total program cost with a low estimate of almost $400 thousand ranging to a high estimate of almost $24 million. The C3I process was nicknamed “virtual box” early on in this research due its adherence to the procedures outlined in the DoD 5000 mixed with innovations in technology aimed at reducing oversight costs. Early expectations were that the innovations associated with the C3I process would reduce oversight costs below that of the standard box process and again the data supported that expectation. Finally, space acquisition came in with the lowest oversight costs which ranged from a low of just over $146 thousand to a high of almost $16 million. The space acquisition process was dubbed “outside the box” since space acquisition operates in an environment that steps outside the framework of rules and procedures outlined in the DoD 5000 series. Early expectations were that space would have the lowest oversight costs because space acquisition had the freedom to develop acquisition rules and procedures that best suited acquisition in the space world. Again the expectation was met. The next step for the comparison of total program costs by oversight discipline was to enter the data in JMP 5.0.1 and perform statistical analysis and hypothesis testing similar to that conducted in questions 2-10. The table below displays the resulting p-values.

Table 5.15: p-Values for Comparison of Total Program Costs

Total Cost	**p-Values (.05 significance level)**		
COMPARISON	LOW	AVG	HIGH
Space vs C3I	0.1625	0.1932	0.5188
Space vs 5000	0.1393	0.117	0.1629
5000 vs C3I	0.1655	0.1557	0.343

The chart quickly shows that in no case were the p-values high enough to reject the null hypothesis that there is no statistical difference between the mean total program costs of the populations of DoDD 5000 oversight, space oversight or C3I oversight. The p-values in table 5.15 were quite surprising considering the range of cost differences on total program cost. These ranges for each process can be seen in Table 5.16. Section 5.17 will show however, that each oversight process has its own cost savings potential.

Table 5.16: Total Cost Ranges by Oversight Process within Range

Process	Low Range	Avg Range	High Range
NSSAP	\$82,434 to \$222,000	\$1,271,000 to \$1,779,188	\$11,443,500 to \$26,019,000
C3I	\$201,000 to \$861,840	\$696,600 to \$4,471,920	\$3,028,800 to \$52,605,000
5000	\$417,600 to \$8,581,680	\$3,219,960 to \$27,931,500	\$11,838,240 to \$94,968,000

5.16 Summary of Results

This research effort was aimed at answering three research questions:

1) What is the cost of oversight of programs under the "box" process?

2) How do oversight costs for box programs compare to oversight costs of programs under space and C3I processes?

3) What are the key oversight cost drivers?

Questions one and three were answered in chapter 4 by using Delphi survey techniques on a five person expert panel. Question two was answered in chapter five by comparing the total program costs developed in chapter 4 for the box process to those program cost estimates developed for space and C3I in other research processes using the same methodology. We found that the actual oversight costs matched up with our expected oversight costs for programs under each discipline. Two questions now come to mind. The first question is if space acquisition costs less to oversee, what is being done there that can be done in DoD 5000 acquisition? C3I acquisition remains within the DoD

5000 framework yet had lower oversight costs in large part due to their reduction in number of people needing to go TDY. The second question then is will some of the virtual box processes employed in the C3I world work for DoD 5000 acquisition? There are no easy answers or DoD acquisition would be perfect with no need for improvement. The best answer may be to consider the possibility of a hybrid mix of the most effective procedures from each acquisition process.

5.17 Recommendations

To enhance the oversight process and decrease the potential cost of oversight that all three oversight processes posses, it is then our recommendation that the process of IPA and C3I be merged into an oversight process that allows approval by an independent board, but information for those meetings and approval processes should be available over a virtual process. This hybrid oversight could potentially reduce the oversight cost ranges that were listed above in Table 5.16 to the smaller ranges which are located in Table 5.17. By combining both processes, the total for potential savings ranges from $40,000 to a little over $74M per program. These funds could be realized either directly or indirectly, either in saved man-hours or actual bottom-line budget savings. Either way, this move has a potential for significant savings to the point that some sort of live program test or feasibility study should be performed.

Table 5.17: Proposed Combined Oversight Process IPA/C3I

Process	Low Range	Avg Range	High Range
Proposal	$43,194 to $140,040	$652,500 to $1,087,988	$7,200,000 to $20,046,000

5.18 Follow-on Possibilities

There is a potential for further research in this area. An analysis gathering more panel members and the inclusion of the Ballistic Missile Defense Agency is a possibility that could add even more possibilities of cost savings for the Department of Defense and the oversight of future acquisition processes. It is also important to note that these experts, from all three panels, were mostly from Air Force sources or backgrounds. An excellent follow-on would gather data from other services and compare the data to this study. Another option is to gather additional data and utilize simulation to increase the number of data points collected. By adding the additional data points, a more accurate range of estimates could be developed. Another possibility is to see if the costs are increased or decreased as programs are delayed in the process. This research only scratches the surface on the potential research trying to capture the cost of oversight. Funds expended in the oversight process aren't always budgeted dollars, but they do cost the government in direct or indirect costs. Overall, this research provided the basis for the identification for potential cost savings in the acquisition environment.

BIBLIOGRAPHY

1. Aldridge, E.C. Jr. *Delegation of Milestone Decision Authority for DoD Space Systems*. Memorandum for the Secretaries of the Military Departments et al., 4 Mar 2002

2. Besselman, Joseph, Maj, Arora, Ashish, and Larkey, Patrick. "Measuring the Readiness Cost of One-Size-Shoe-Fits-All Public Policy: A Look At Cost-, Hybrid-, and Price-Based Purchasing," *Acquisition Review Quarterly*, Fall 2000.

3. Caldwell, John S. Col. "Reengineering the Oversight and Review Process for Systems Acquisition," *Program Manager*, May-June 1995.

4. Chan, Albert P.C. et.al. "Application of Delphi Method in Selection of Procurement Systems for Construction Projects," *Construction Management and Economics*, 2001.

5. Chou, Chen. "Developing the e-Delphi System: A Web Based Forecasting Tool for Educational Research," *British Journal of Educational Technology*, 2002.

6. Christensen, David D. "Cost Overrun Optimism: Fact or Fiction?," *Acquisition Review Quarterly*, Winter 1994.

7. Christensen, David S., Searle, David A. Capt, Vickery, Caisse. "The Impact of the Packard Commission's Recommendation on Reducing Cost Overruns on Defense Acquisition Contracts," *Acquistion Review Quarterly*, Summer 1999.

8. Clayton, Mark J. "Reengineering Delphi: A Technique to Harness Expert Opinion," *Educational Psychology*, Dec 1997.

9. Czelusniak, Daniel P., Rodgers, Philip D. "The Kaminski Initiative-Our Most Significant Piece of Unfinished Business in Reforming the Defense Acquisition Process," *Program Manager,* Sep-Oct 1997.

10. Dawson, Matt D and Brucker, Penny S. "The Utility of the Delphi Method in MFT Research," *The American Journal of Family Therapy*, 2001. .

11. Defense Acquisition University. "DoD Business Transformation: Meeting the Security Challenges of the 21st Century," DoD Business Transformation Briefing, July 16, 2003.

12. Delano, Kenneth J. "Identifying Factors that Contribute to Program Success," *Acquisition Review Quarterly*, Winter 1998.

13. "The Delphi Method," http://www.ryerson.ca/~mjoppe/ResearchProcess/841TheDelphiMethod.htm, 2003

14. Department of Defense. Final Report to the Secretary of Defense by the Acquisition Reform Process Action Team. *Reengineering the Acquisition Oversight and Review Process.* Volume 1. Report 19950607 078 Washington: Department of Defense, 9 December 1994.

15. Department of Defense Instruction. *Operation of the Defense Acquisition System*. Number 5000.2. May 12, 2003.

16. DeReus, Darrin, 1stLt, USAF. *Comparative Analysis on the Cost of Oversight for the New National Security Space Acquisition Policy—A Delphi Method Approach* MS thesis, AFIT/GCA/04M-02

17. Des Marchais, Jacques E. "A Delphi technique to identify and evaluate criteria for construction of PBL problems," *Medical Education*, 33:504 (July 1999)

18. Engel, Richard Col. "Overaching Integrated Product Team-Working Integrated Product Team Process- Successful Acquisition Programs Through Early and Continuous Insight," *Program Manager*, Jan-Feb 1997.

19. Erwin, Sandra I. "Pentagon's Reform Plans Puzzle Experts: Contractors, program managers await release of new acquisition guidelines," *National Defense Magazine*, November 2002.

20. Ferrara, Joe. "DoD's 5000 Documents: Evolution and Change in Defense Acquisition Policy," *Acquisition Review Quarterly*, Fall 1996.

21. Ferrara, Joe and Johnson, Collie. "Institutionalizing Integrated Product Teams- DoD's Commitment to Change," *Program Manager*, Nov-Dec 1995.

22. Gansler, J.S. *History of Defense Acquisition.* Memorandum for Assistant Secretary of the Army (Acquisition, Logistics and Technology) et al., 5 Jan 2001.

23. Garamone, Jim. "Rumsfeld Details DoD Goals, Objectives in Testimony- Speeding up Research, Development and Acquisition One of Rumsfeld's Five Key Objectives," *Program Manager*, Jan-Feb 2001.

24. General Accounting Office. *Acquisition Reform- DoD Faces Challenges in Reducing Oversight Costs.* GAO/NSIAD-97-48. Washington D.C.: 29 Jan 1997.

25. Hasson, Felicity et.al. "Research Guidelines for the Delphi Survey Technique," *Journal of Advanced Nursing*, 2000.

26. Hawthorne, Skip. "Evolutionary Acquisition Update and the DoD 5000 Revision," OUSD(AT&L) Briefing, November 20, 2002.

27. Jones, Wilbur D. Jr. *Arming the Eagle: A History of U.S. Weapons Acquisition Since 1775.* Fort Belvoir Virginia: Defense System Management College Press, 1999.

28. Kaminski, Paul G., Under Secretary of Defense for Acquisition and Technology "The End of the Beginning." Speech given to Department of Defense professional acquisition workforce. Pentagon Courtyard, Washington D.C. 31 May 1996. *Program Manager,* Sept-Oct 1996.

29. Kerr, Malcom. "The Delphi Process" Rarari Internet Site http://www.rararibids.org.uk (November 2001)

30. Lindstone, Harold A. and Turoff, Murray. *The Delphi Method: Techniques and Applications*. Murray Turoff and Harold A. Linstone,

31. Ludwig, Barbara. "Predicting the Future: Have you considered using the Delphi Methodology?" *Journal of Extension* 35 (October 1997)

32. Mitchell, V.W. "The Delphi Technique: An Exposition and Application," *Technology Analysis & Strategic Management*, 1991.

33. Neal, Monroe, Capt, USAF. *Establishing a foundation to capture the Cost of Oversight for a Major Defense Program within the Information Technology (IT) Acquisition Community.* MS thesis, AFIT/GCA/04M-07

34. Roche, James R. *Re-delegation of Milestone Decision Authority for DoD Space Systems*. Memorandum or the Under Secretary of the Air Force, 14 Mar 2002.

35. Rumsfeld, Donald. *Missile Defense Program Direction*. Memorandum for Deputy Secretary of Defense et al., 2 Jan 2002.

36. Scheibe, M., Skutsch, J., and Schover, J. "Experiments in Delphi Methodology," *The Delphi Method: Techniques and Applications*, IV.C (Ref 30)

37. Scott, William F., et al. "Project Kaizen Looks at Congressional Oversight of Defense Acquisition Programs," *Acquisition Review Quarterly*, Winter 1995.

38. Spinelli, Teri. "The Delphi Decision-Making Process" *The Journal of Psychology*, 113:73-80 (1983)

39. Teets, Peter B. *Exemption and Waiver to DoDI 5000.2 and Related Guidance for Air Force Program Executive Officer for Space (AFPEO/SP) Space Programs*. Memorandum for the Program Executive Officer for Space, 20 Mar 2003.

40. Tompkins, Michael L. "The Cost of Losing Control: Perceptions Belie Facts-and the Public's Perception is DoD Wastes Money," *Program Manager*, Mar-Apr 1995.

41. USAF Raw Inflation Indices, Base Year 2003, OPR SAF/FMCEE, 28 Jan 03

42. Webster's New International Dictionary 2nd Edition Unabridged. G&C Merriam Company, Springfield Mass, 1934.

43. Williams, Patricia L. and Webb, Christine. "The Delphi Technique: A Methodological Discussion," *Journal of Advanced Nursing*, 1994.

44. Wolfowitz, Paul. *Cancellation of DoD 5000 Defense Acquisition Policy Documents*. Memorandum for Director, Washington Headquarters Services, 30 Oct 2002.

Vita

Capt Rousseau graduated from Portsmouth High School in Portsmouth, New Hampshire. He entered the military, as an enlisted member, in 1991. Through various assignments, Capt Rousseau attended several different universities, between deployments and other operational mission demands. His educational pursuit culminated with earning a Bachelor of Arts in Business Administration from St Leo College at Langley AFB, Virginia, in June, 1997.

Capt Rousseau worked in many areas as a security specialist. These include; missile field security, elite gate guard section, and Air Combat Command Command Guard. It was these experiences that led him to the decision that he wanted to earn a commission through Officer Training School, which he graduated from in April, 1998.

Capt Rousseau became a Budget Analyst at the 509th Bomb Wing, Whiteman AFB, Missouri, immediately upon graduation from Officer Training School. In August, 1999, Capt Rousseau became the Financial Services Flight Commander as well as the Deputy Disbursing Officer. In October, 2000 he became the Financial Analysis Flight Commander. In August, 2002, he entered the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to the Aeronautical Systems Center, B-2 System Program Office at Wright-Patterson, AFB, Ohio.

REPORT DOCUMENTATION PAGE	*Form Approved* *OMB No. 074-0188*

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to an penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From – To)*
23-03-2004	**Master's Thesis**	Aug 2002 – Mar 2004

4. TITLE AND SUBTITLE A COMPARATIVE ANALYSIS OF THE COST OF OVERSIGHT OF MAJOR DEFENSE ACQUISITION PROGRAMS STRICTLY UNDER THE DIRECTION OF THE DEPARTMENT OF DEFENSE 5000 SERIES OF INSTRUCTIONS	**5a. CONTRACT NUMBER**
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) Rousseau, Gary P., Capt, USAF	**5d. PROJECT NUMBER**
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S) Air Force Institute of Technology Graduate School of Engineering and Management (AFIT/EN) 2950 Hobson Way, Building 641 WPAFB OH 45433-7765	**8. PERFORMING ORGANIZATION REPORT NUMBER** AFIT/GCA/ENV/04M-09
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Defense Acquisition University Defense Systems Management College School of Program Management 9820 Belvoir Rd, Building 226, Room 115 Ft. Belvoir, VA 22060-5565 Attn: Lt Col John Driessnack	**10. SPONSOR/MONITOR'S ACRONYM(S)**
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The United States Department of Defense has been caught in a continual cycle of acquisition reform since its inception over two hundred years ago. The goal of acquisition reform has always been to find the perfect balance between the amount of program oversight and the amount of flexibility in which program managers are allowed to manage their programs. The only truth learned throughout this process is that defense acquisition does need oversight and that there is no cookie cutter pattern for oversight that will fit all types of acquisition programs equally well. That being said, the focus of this thesis will be to explore the foundations of oversight for programs following Department of Defense Directive 5000-the defense acquisition bible and employ Delphi survey techniques to then develop an estimate for the actual cost of oversight for defense acquisition programs that are under the guidance of the DoDD 5000.

The real value in this research will then be to compare the oversight cost estimate for programs under the DoDD 5000 to oversight cost estimates developed using the exact same methodology but examining programs with different types of oversight. Specifically, space acquisition and communications acquisition have been operating under a different oversight format over the last few years and the interest is in determining if the changes have made defense acquisition any more efficient and any less costly.

15. SUBJECT TERMS

Cost of Oversight, Total Oversight Cost Drivers, Cost Savings in the Oversight Process
Delphi Method, Cost Savings for Oversight Process

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON** Michael A. Greiner, USAF (ENV)
REPORT **U**	**ABSTRACT** **U**	**c. THIS PAGE** **U**	**UU**	116	**19b. TELEPHONE NUMBER** *(Include area code)* (937) 255-3636, ext 4588, e-mail: michael.greinier@afit.edu