



**COST AS AN INDEPENDENT VARIABLE:  
A STUDY OF ITS CONTINUED USE BY AERONAUTICAL SYSTEMS  
CENTER'S PROGRAMS AND THEIR CONTRACTORS TO SET AND MAINTAIN  
COST OBJECTIVES**

**THESIS**

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## **Abstract**

The purpose of this research was to assess whether Aeronautical Systems Center's (ASC's) acquisition professionals believe Cost as an Independent Variable (CAIV) has enabled their programs and contractors to set and maintain cost objectives. The three major objectives of this thesis are to answer the following questions: First, Do ASC's acquisition professionals believe their programs are setting and maintaining cost objectives? Second, Do ASC's acquisition professionals believe their contractors are setting and maintaining cost objectives? Last, what is the practitioners' perspective of CAIV? This research identified CAIV as being well received by DoD. It also identified that ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. Through synthesis of the interview answers, a few unexpected practitioners' perspectives emerged as conclusions. First, there are no incentives for DoD programs to implement CAIV. Second, limited accountability is placed on programs to utilize CAIV. Third, CAIV has lost most of its momentum. Fourth, DoD has substituted "budget" for "cost" in CAIV. Last, a window of opportunity might be on the horizon to reintroduce a new and improved CAIV.

This research adds to the body of work being done to comprehend the ever-changing DoD acquisition system, enhancing the knowledge base of DoD acquisition professionals. Additionally, this study provides insight into a long serving DoD initiative that has been relatively successful considering the political DoD budgetary system.

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## Table of Contents

	Page
Abstract.....	iv
Acknowledgments.....	v
Table of Contents.....	vi
List of Figures .....	ix
List of Tables .....	x
I. Introduction.....	1
Background .....	1
Problem Statement.....	3
Research Objectives.....	3
Research scope.....	5
Methodology .....	6
Implications.....	6
Preview .....	6
Summary .....	7
II. Literature Review.....	8
Introduction.....	8
Historical Perspectives.....	8
Pre-Civil war .....	8
Civil War .....	9
World War I (WWI) .....	9
World War II (WWII) .....	10
Cold War .....	11
Post Cold War to Present .....	13
Environment Leading up to CAIV.....	13
Political.....	14
Merge or die “last supper” .....	15
Mil Specs Elimination .....	15
Lack of results to date .....	16
Organization Change: DoD early to mid 1990s.....	16
CAIV and its Principles .....	19
Cost Performance Integrated Product Team (CPIPT).....	20
Realistic but Aggressive Cost Objectives .....	20
Risk Management.....	21
Appropriate Metrics .....	21
Provide Incentives .....	21

CAIV's Flagship Programs Summary .....	22
ATACMS BAT P31 (Block IIA) .....	24
Crusader .....	24
AIM-9X .....	25
MIDS .....	26
SBIRS .....	27
JASSM .....	28
EELV .....	29
JAST “now know as” JSF .....	30
CAIV's Greatest Challenge .....	31
AF Lightning bolt 10 .....	32
Lean Aerospace Initiative (LAI) .....	32
Advanced Concept Technology Demonstrations (ACTDs) .....	32
Evolutionary Acquisition (EA) .....	33
Summary .....	33
 III. Methodology .....	34
Introduction .....	34
Research Strategy .....	34
CAIV Metrics and Observables: Program Office .....	35
CAIV Specific Interview Questions .....	36
CAIV Specific Sample Interview Questions .....	37
Data Collection .....	37
Data Analysis .....	39
Instrument Validation .....	39
Limitations of Methodology .....	40
Summary .....	41
 IV. Data Analysis .....	42
Introduction .....	42
Demographics .....	42
Data Analysis .....	42
Research Objective 1 .....	43
Research Objective 2 .....	47
Research Objective 3 .....	49
Summary .....	54
 V. Conclusions and Recommendations .....	55
Introduction .....	55
Conclusions .....	55
Research Objective 1 .....	55
Research Objective 2 .....	56

Research Objective 3.....	56
Recommendations.....	62
Limitations of this Research .....	64
Recommendations for further research.....	64
Discussion.....	65
 Bibliography .....	66
Vita.....	69

## List of Figures

Figure	Page
1. Major DoD Reform Commissions .....	17
2. Major Acquisition initiatives .....	18
3. CAIV's Feasible Region .....	19
4. Antitank Pre-Planned Product Improvement .....	24
5. Crusader and Re-supply Vehicle .....	25
6. Air-to-Air Missile Upgrade.....	26
7. Multifunctional Information Distribution System: Low Volume Terminal .....	27
8. Space Based Infrared System Architecture.....	28
9. Joint Air to Surface Standoff Missile.....	29
10. Evolved Expendable Launch Vehicle.....	30
11. Joint Strike Fighter.....	31

## List of Tables

Table	Page
1. OSD's CAIV Metrics and Observables Structured for DoD .....	5
2. DoD Reform Initiatives.....	14
3. CAIV's Flagship Programs SAR Information.....	23
4. Relevant Situations for Different Research Strategies.....	34
5. Questions Formatted from CAIV's Metrics and Observables .....	36
6. Are DoD Programs Setting and Maintaining Cost Objectives Themes.....	56
7. Are DoD Contractors Setting and Maintaining Cost Objectives Themes .....	56

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## **I. Introduction**

### **Background**

It is common knowledge the Department of Defense (DoD) acquisition process is plagued by cost and schedule overruns. DOD is facing a cascading number of problems in managing its acquisitions. Cost increases incurred while developing new weapon systems mean DoD cannot produce as many of those weapons as intended nor can it be relied on to deliver to the warfighter when promised (GAO, 2005). To counter this problem, numerous initiatives have been developed and deployed. About 10 years ago, one of the most publicized initiatives came about, Cost as an Independent Variable (CAIV).

Between 1986 and 1995 there was an approximately 30% decrease, in 2005 constant dollars, in DoD's budget (Defense Authorization and Appropriations Bill, 2005). This fact forced DoD to take actions to improve its acquisition efficiency, making every dollar count. With the introduction of CAIV, all participants in the acquisition system are expected to recognize the reality of fiscal constraints and take action to reduce cost. Cost in this context refers to Lifecycle cost, which according to CAIV principles should be treated as equally important to performance and schedule (DoD Directive 5000.1, 2003).

CAIV is a methodology for reducing Total Ownership Cost (TOC). It involves developing, setting, and refining aggressive unit production cost objectives and Operation and Sustainment (O&S) cost objectives while meeting warfighter requirements. To

achieve the best outcome for all parties, it is essential to involve the user community in the tradeoff process from the earliest concept development activities. But like any good investment, applying CAIV is not free. It is necessary to invest resources to perform the tradeoff analyses required in the up-front requirement generation process. One of the most important aspects of making CAIV a success is investing in the training of key personnel and making sure the CAIV process is understood (Cost as an Independent Variable, 2002).

Former Under Secretary of Defense for Acquisition, Technology, and Logistics (USD AT&L) E.C. Aldridge established CAIV's implementation as one of his key metrics under his first acquisition goal, "achieve credibility and effectiveness in the acquisition and logistics support process." Under this goal, he approved a metric that required, by the end of FY02, 100% of defense programs to incorporate a CAIV plan and to have an evolutionary acquisition or spiral development plan in place. These plans are discrete parts of each Acquisition Category One (ACAT I) program's acquisition strategy and will be executed and updated throughout the acquisition cycle.

CAIV is not just for ACAT 1 programs, it applies to all programs and throughout all acquisition phases including modifications and upgrades. However, the greatest single point of leverage for CAIV to positively influence program requirements, TOC, schedule, and performance is at the beginning of a program's life. CAIV requires the user and requirement communities to jointly explore cost, performance, and schedule tradeoffs in an effort to reduce Live Cycle Cost (LCC). Efforts having potential benefits should be refined as the program progresses (Cost as an Independent Variable, 2002) The fundamental purpose of CAIV can be summed up as providing program managers, with

the blessing of all stakeholders, the flexibility to make sensible trade-offs between the major acquisition cornerstones of cost, schedule, and technical performance to produce a system with reduced LCC.

## **Problem Statement**

Though DoD put forward several cost saving techniques, few have been exceptionally successful. Over the years, the acquisition community implemented Design to Cost (DTC), Performance-Based Service Acquisition, and CAIV initiatives. DTC became a well established initiative in DoD acquisition in the early 1970s. It is summarized as “a process utilizing unit cost goals as threshold for managers and as design parameters for engineers” (Joint Design to Cost Guide, 1973). With not much success as a cost saving initiative, DTC met its end in 1995 as a result of the dramatic cancellation of military standards and DoD’s new focus on cost. In many circles, DTC is considered to be the forerunner to CAIV. The Under Secretary of Defense for Acquisition and Technology, Dr. Paul Kaminski formally introduced CAIV in a 1995 memorandum to the Secretaries of the Military Department.

This research assesses whether Aeronautical Systems Center’s (ASC’s) acquisition professionals believe CAIV has enabled their programs and contractors to set and maintain cost objectives. It also tries to get a glimpse into the practitioners’ perspective of CAIV

## **Research Objectives**

The three major objective of this thesis are to answer the following questions. First, Do ASC’s acquisition professionals believe their programs are setting and maintaining cost objectives? Second, Do ASC’s acquisition professionals believe their

contractors are setting and maintaining cost objectives? Last, what is the practitioners' perspective of CAIV?

To accomplish the first two objectives, ASC's employees were interviewed using a reformatted version of an instrument created by the Office of the Secretary of Defense (OSD). "CAIV's Metrics and Observables" were developed by the CAIV working group, commissioned by Dr. Kaminski through the Defense Manufacturing Council. This tool was designed to identify important and observable steps which should be implemented in setting aggressive production and O&S cost objectives and then managing for their achievement (Kaminski, 1995). The instrument does this by asking the following questions: 1) Are cost objectives defined and consistent with requirements programmed and projected fiscal resources? 2) Is DoD managing to achieve cost objectives? 3) Are contractors managing to achieve cost objectives? These questions were written to analyze CAIV's success at the DoD level (see Table 1).

CAIV specific questions were developed to gain insight into the third objective. Given that we are approximately 10 years beyond the formal introduction of CAIV to DoD, the time is right to conduct this study to see if CAIV has enable programs to set and maintain cost objectives.

Table 1. OSD's CAIV Metrics and Observables (Kaminski, 1995)

Are cost objectives defined and consistent with requirements programmed and projected fiscal resources?	<ul style="list-style-type: none"> <li>- Out-year resources identified? (\$)</li> <li>- Production and O&amp;S cost objectives included in the RFP?</li> <li>- Key tradeoff issues addressed? (e.g., in COEA)</li> </ul>
Is DoD managing to achieve cost objectives?	<ul style="list-style-type: none"> <li>- RFP contains a strict minimum number of performance specifications? (#)</li> <li>- CP-IPT functioning; tradeoff space identified in program baseline and RFP?</li> <li>- Risks to achieve cost objectives identified and program steps to address these defined? (risk plan)</li> <li>- Incentives for achieving cost objectives included in the RFP and contract? (%) relative to total contract \$'s)</li> <li>- Mechanism for contractor suggestions to reduce production and O&amp;S costs in place and operating?</li> <li>- Allocation of cost objectives provided to IPTs and key suppliers</li> <li>- Measurement and estimation of reliability and maintainability</li> <li>- Robust contractor incentives plan in place?</li> </ul>
Are contractors managing to achieve cost objectives?	<ul style="list-style-type: none"> <li>- Providing appropriate tools for cost-performance tradeoffs (including incentives for corporate management) and participates in cost-performance tradeoff process</li> <li>- Identifying (and when appropriate implements) new technologies and manufacturing processes that can reduce costs</li> <li>- Identifying procedural/process impediments to cost reduction measures</li> <li>- Establishing strong relationship with vendor base, including sound incentives structure</li> </ul>

### Research scope

This research focuses on whether ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. Hopefully, this

undertaking will enhance the knowledge base of senior OSD and Air Force leaders and program managers within the acquisition field.

## **Methodology**

This is a qualitative research. Data were collected using interviews and literature review. Consistent with OSD's CAIV Metrics and Observables, the interviews focused on whether ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives and also the practitioners' perspective of CAIV in general. The preferred method for conducting interviews was in person, however, there were occasions where the telephone worked best. Literature review was conducted to provide historical synopsis of DoD acquisition, present CAIV's principles, provide a description of CAIV's flagship programs, and explore what I have found to be CAIV's greatest challenge. The literature reviewed consisted of books, DoD instructions, the Internet, periodicals, briefings, and reports.

## **Implications**

In addition to the research objectives of the thesis, I hope inferences can be made to see if CAIV was a fad that has suffered the same fate as several past DoD initiatives, or has it become a valuable institutional tool. This will add to the ongoing studies attempting to improve the DoD acquisition system.

## **Preview**

Chapter two is used to build the foundation from which this research is launched. The first section of chapter two focuses on the historical perspective of DoD acquisition. The second section discusses the environment from which CAIV was born. The third explores CAIV's principles. The fourth provides a description of CAIV's original

flagship programs. To conclude the literature review, I will present CAIV's greatest challenge. Chapter three discusses the methods used to gather and analyze the data collected. It also illustrates the limitations of the model used to interpret the data collected. Chapter four provides a report of the research findings. Chapter five provides conclusions, recommendations, and limitations as they apply to the stated research objectives.

## **Summary**

This chapter provided an introduction to the world of CAIV. The primary focus of this research is to determine if ASC has fully adopted CAIV by seeing if ASC's acquisition professionals believe their programs and contractors are managing to set and maintain cost objectives. This research also seeks to capture the practitioners' perspective of CAIV. To complete these tasks, ASC's employees were interviewed using the reformatted version of "CAIV's Metrics and Observables" and the questions specifically developed to capture the practitioners' perspective of CAIV. Interviews and literature review will be the primary instruments used to gather information, which carries certain assumptions and limitations.

## **II. Literature Review**

### **Introduction**

This chapter presents a synopsis of topics important to this research. It begins with a historical perspective of DoD acquisition. Within this section, the background from which current acquisition practices and CAIV came from is shown. Second, we will take a look at the environment leading up to the initiation of CAIV. Third, we narrow the focus of this research by taking a close look at CAIV and its principles. Fourth, a description of each of CAIV's original flagship programs is presented. Last, we will explore CAIV's greatest challenge.

### **Historical Perspectives**

This subchapter presents an historical overview of US military acquisition. Since the beginning of recorded history, nations have wrestled with acquiring technology to protect their interest (borders, natural resources, etc). This responsibility is usually undertaken by the warfighting component. Not surprisingly, we have seen this occur within the US and the following paragraphs seek to divide US military acquisition history into identifiable periods.

#### **Pre-Civil war**

It is evident from a number of pre-civil war military biographies that the major military mission during this time was pioneering (opening the West for settlement). Soldiers needed firearms, uniforms, transportation, and lodging to undertake this endeavor. The government provided funds and quartermasters expended the appropriations. The Navy made large purchases during this period, for example, the procurement of six frigates in 1794.

## **Civil War**

During this period there were several military developments, which still impact the way we currently acquire systems. At the beginning of the Civil War, both sides were evenly matched and knew each other's tactics. This provided the perfect environment and need to develop instruments of war. The military mindset, at this time, was to bring overwhelming firepower to the battlefield to subdue the enemy. This mentality ensured the development or improvement, and acquisition of balloons, ironclad ships, breach loaders, cartridge rounds, repeating rifles, gatling guns, and submarines for military purposes. The cost of the civil war attributed to both governments (north and south), estimated by Goldin and Lewis (1975), in 1860 dollars totaled \$3.3 billion. With that much money in circulation and a way of life at risk, the prices the military paid were increased significantly from pre-war levels. Vendors became aware of the fact that the military would pay incredibly high prices for equipment they badly needed.

## **World War I (WWI)**

WWI "The Great War" ushered in several alterations to weapon system acquisition. The most influential was the use of cost-plus fixed fee contracts. This contract type came about after the government tried using cost-plus percentage of cost, which was abused by some industry partners. The offenders inflated their raw material cost ensuring a greater percentage of fee and therefore profit. On the war front, US and Allied troops faced newly developed Axis weapons. This required acquisition personnel to understand the threats and develop/acquire counter systems, which in most cases had to be mass-produced. Mass production of airplanes, tanks, ships, and other major weapon systems became a key factor in sustaining and finally winning the war.

## **World War II (WWII)**

Leading up to WWII most civilian and military leaders saw the need to enhance the US Military air power. The US Army Air Corps, at this time, was significantly inferior to its European counterparts. The resulting transformation of the Air Corps posed a significant challenge to military acquisition. Prior to WWII the aircraft industry was immature and produced highly customized military planes. In fact, in 1939 most of the planes with which the United States would fight with in WWII had not even been developed (Wilbur, 1999). Expanding the Air Corps became an even more stressful task to the acquisition community when Congress authorized the procurement of up to 6000 aircraft along with necessary logistics. There was even talk by President Roosevelt that the US was going to produce 50,000 planes a year. In addition to procuring planes for the Army Air Corps, military acquisition personnel were busy developing new ships for the Navy and tanks for the Army.

WWII provided the acquisition community with two noteworthy challenges. First, there was a conscious effort by acquisition personnel to equip troops with the latest technology. Several industry leaders suggested achieving the goals set forth by President Roosevelt and Congress was only achievable if aircraft designs were completely locked down -- no changes would be permitted. DoD recognized this could be a detriment to troops because they would not have the latest technology at hand. How could production demands for the war be met while allowing changes to be made on the production line? A compromise was made in the form of modification lines. After a plane came off the standard production line it was then sent to a modification area where it was updated with the latest technology.

Second, aeronautical research became a focus within the US. Before the war, no significant research was accomplished to further aviation technology within the US. The National Advisory Committee for Aeronautics did a small amount of work to advance fundamental research prior to the war. It was appropriated \$2 million each year, and had 500 employees (Wilbur, 1999). This investment in aeronautics research during and after the war later enabled the US Air Force to become a prime power within Air and Space.

### **Cold War**

The Cold War is often cited as lasting for 41 years, from the late 40s to the early 90s. The nation had just exited WWII and military and civilian leaders realized the conversion of “plowshares” into “swords” during time of war would no longer be sufficient to deter potential enemies. It was also apparent that the ad hoc methods used by acquisition professionals to get the job done during the war could not be maintained. There needed to be a robust and efficient acquisition system with standardized procedures. However, money was still being authorized to develop almost any new defense system that appeared capable of giving the United States a performance advantage over any potential adversary (Acker, 1993). The Cold War period was inundated with reforms and initiatives because of the need for a strong defense industry and sound acquisition policy coupled with the significant increase in defense spending. One of the first major changes occurred when the 1947 National Security Act transformed the “National Military Establishment” which consisted of the Departments of the Army and the Navy into the DoD.

During the sixties, DoD underwent numerous acquisition reforms, which are still playing an important role in today’s environment. Most of these initiatives were

introduced by then Secretary of Defense, Robert McNamara a former industry executive. First, the Five Year Force Structure and Financial Plan, now known as the Future Years Defense Program (FYDP), was put in place to provide a fiscal summary of resources associated with DoD programs. Serving as the pivot point of the entire defense programming system, it grouped all military forces and all defense systems according to their principal missions, without regard for Service affiliations (Acker, 1993). Second, the Planning, Programming, Budgeting System, now known as the Planning, Programming, Budgeting and Execution (PPBE) Process, provided foundational processes necessary for the FYDP to work. The Defense Acquisition Guidebook states, “the purpose of the PPBE process is to allocate resources within the Department of Defense.” Establishment of the FYDP led to an integrated and organized DoD financial management system.

When one thinks of the Cold War, nuclear weapons and their devastating power comes to mind. However, it also marks the origin of today’s acquisition system. The acquisition community played a significant role in the jousting match between the US and the Soviet Union. They had the responsibility to conceive, develop, produce and store nuclear weapons. During this period, acquisition professionals also witnessed the dramatic increase in military spending to support development of revolutionary new supersonic fighter aircraft, nuclear powered ships, and ballistic missiles. With all this activity, acquisition professionals developed many processes and policies, which are still being utilized.

## **Post Cold War to Present**

This period started off with the military being asked to do more with less. The acquisition workforce stepped up to the challenge and demonstrated capabilities they had in development. New stealth technology, Unmanned Aerial Vehicles, Global Positioning System, and Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems allow the military to perform current operations with considerably fewer resources than a few decades ago. Today's acquisition initiatives are focused on reducing the development to deployment cycle time by continuing reliance on commercially developed items, and maintaining the utilization of evolutionary acquisition and spiral development.

## **Environment Leading up to CAIV**

DoD acquisition has seen great growth over the last 50 years. This has made the system more bureaucratic, which is evident in DoD's acquisition work force focus on policy, rules, centralization, and procedures. Between 1949 and 1993 no less than 16 major DoD reform commission\initiatives were implemented in an attempt to provide more structure and efficiency to the process.

Below is a list of major commissions that have looked at DoD's acquisition process.

**Table 2. DoD Reform Initiatives (Reeves, 1996)**

1949	Hoover I
1953	Rockefeller Committee
1953	Hoover II
1961	McNamara initiatives
1970	Fitzhugh Commission
1972	Commission on Government Procurement
1976	OMB Circular A-109
1978	Defense Science Board Acquisition Cycle Study
1981	Defense Acquisition Improvement Program
1983	Grace Commission
1986	Packard Commission
1986	Goldwater-Nichols
1989	Defense Management Review
1993	Section 800 Panel
1993	National performance review

The environment leading up to CAIV was shaped by several factors. The pressure on the acquisition system to improve provided the perfect window of opportunity for launching a cost saving agenda. The following paragraphs illustrate several stressors within the DoD acquisition environment at the time CAIV was implemented.

### **Political**

The early years of the 90s saw a major push by political leaders to reduce government spending and DoD took the brunt of the assault. Then Presidential Candidate, Bill Clinton used the reduction of military spending as a platform item. Once in office, President Clinton's Secretary of Defense, Les Aspin ordered a "bottom up review" of the military. The review put forward a reduced (less expensive) military structure still capable of conducting two major conflicts simultaneously. The Administration also created a Deputy Under Secretary position for acquisition reform to

implement sweeping changes. Politicians tend to gravitate towards the popular ideas within their constituencies and it was especially true during the early 90s when the need for a large standing military was far from popular.

With the Cold War over, America looked forward to receiving a significant return on the tremendous investment made during the war. This “peace dividend” was to come from reduced military spending.

### **Merge or die “last supper”**

At a 1993 dinner hosted by then Secretary of Defense Les Aspin, DoD contractors were told to consolidate or face extinction. With the breakdown of the Soviet Union, DoD officials recognized the budget they enjoyed would slowly fade away. Carrying a large defense industry was no longer practical and consolidation was seen as the way to maintain critical infrastructure while reducing the overall number of contractors.

### **Mil Specs Elimination**

Leading up to the elimination of military specifications and standards there were approximately 30,000 MILSPEC and MILSTD documents (McNally, 1197). These specifications and standards were used to ensure performance of military equipment, especially when the lives of service members were at risk. In 1994, former Secretary of Defense, William Perry distributed a memorandum titled “Specifications and Standards--A New Way of Doing Business,” which along with other publications spelled the death of unique military specifications and standards. DoD leadership also saw this as an opportunity to save money, which complemented their political agenda. This removal of military specifications and standards was in response to the nation’s unwillingness to continue to pay “whatever it cost” for military performance. As a result, the civilian

sector made many improvements to established commercial standards. Following this initiative DoD was able to provide form, fit, and function requirements and contractors were able to commence development using the most cost effective methods and latest technologies available.

### **Lack of results to date**

During the decades leading up to CAIV, DoD made several attempts to improve its acquisition system. Rarely had these attempts at reform been long lasting or effective. With frustrating regularity, they failed to fully achieve the desired effect. Yet, the Pentagon indeed is witnessing critical and exceptional changes to the way in which it buys its weapons (Harokopus, 2000).

### **Organization Change: DoD early to mid 1990s**

The number one factor that dictated change within DoD during the 90s was the fact that the United States did not see the need to maintain a large military. This belief was supported by the collapse of the Soviet Union and the superior war winning technologies demonstrated in the first Gulf War. As noted above, the nation had made huge investments to attain this position in the world and was now ready to collect “peace dividends.”

Kurt Lewin’s (1951) organization change model (unfreeze, change, refreeze) applies perfectly to DoD’s transformation during this period. Through literature review, this section of work superimposes Lewin’s (1951) organization change model over the period out of which CAIV was produced. Lewin (1951) proposed that organizations undergo change in three distinct stages. These stages are similar to the physical property of water that allows it to go from solid to liquid and visa versa.

The first stage of “unfreeze” gets the organization ready to accept change. This process is essential, without it, organizations will instinctively resist change similarly to a block of ice. One approach to unfreezing an organization is to start where the status quo is widely looked on as not the way to continue doing business. Go where there is some feeling that things aren't working out right. That is where it will be more likely that change will be accepted (Kent, 2001).

How did DoD get the organization ready to change and unfreeze the current organization? From the literature reviewed it appears that DoD went after the acquisition branch, the segment within DoD where people felt things were not going so well. Along with, several overspending and mismanagement scandals the acquisition community faced cost, schedule, and performance problems. This first stage of organizational change was evident in the number of committees chartered to look into the acquisition process. Within DoD, the unfreezing stage begun with the 1986 Packard Commission. Note, approximately 38% of major DoD commissions looking at DoD reform from 1949 to 1993 took place in the seven short years between 1986 and 1993. During this period DoD was looked at from all angles, conclusions were drawn and recommendations made.

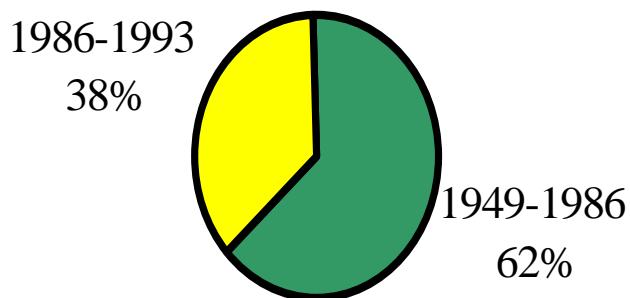


Figure 1: Major DoD Reform Commissions (Chart built from Reeves, 1996)

Toward the latter part of the unfreezing stage, within DoD, there was a transition towards the second stage of Lewin's (1951) organization change model, "change." Within this stage, the solutions proposed to the problems in the first stage became initiatives. This was evident especially in the acquisition world. During the change stage (1993-1996), the acquisition community saw approximately 78% of all major acquisition initiatives between 1966 and 2001.

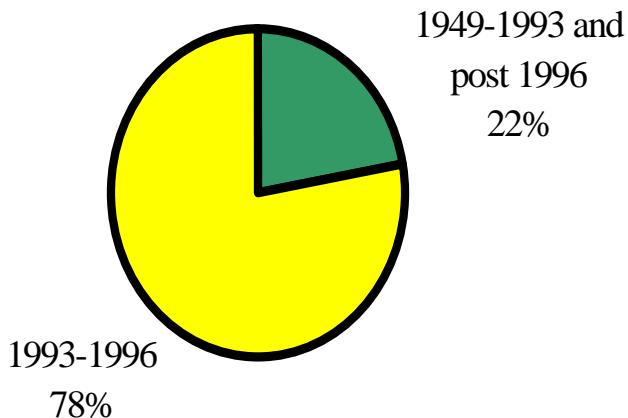


Figure 2: Major Acquisition Initiatives (Chart built from Hanks, 2005)

A key, but most often overlooked, stage of Lewin's (1951) organization change model is "refreezing". Refreezing is the final stage within the model and deals with doing something to the organization so the changes (initiatives) from stage two become a permanent part of its operation (Kent, 2001). Refreezing is often overlooked, but it would appear DoD gave it considerable thought with respect to the initiation of CAIV. DoD established appropriate metrics to assess CAIV's accomplishments. They were developed to ensure that CAIV's principles would become a part of the acquisition communities' operating procedures. By now, you should have realized that the CAIV Metrics and Observables are a central part of this research. They will be reformatted and

used to evaluate whether ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives.

### CAIV and its Principles

The background presented in chapter one gives the corporate definition of CAIV. This section will provide a synthesized account of what I believe CAIV is about. CAIV attempts to provide acquisition professionals a feasible region "the set of points or values that the decision variable can assume and simultaneously satisfy all the constraints in the problem (Ragsdale, 2004)" from which to make decisions to satisfy cost and performance limitations placed on the project by its stakeholders.

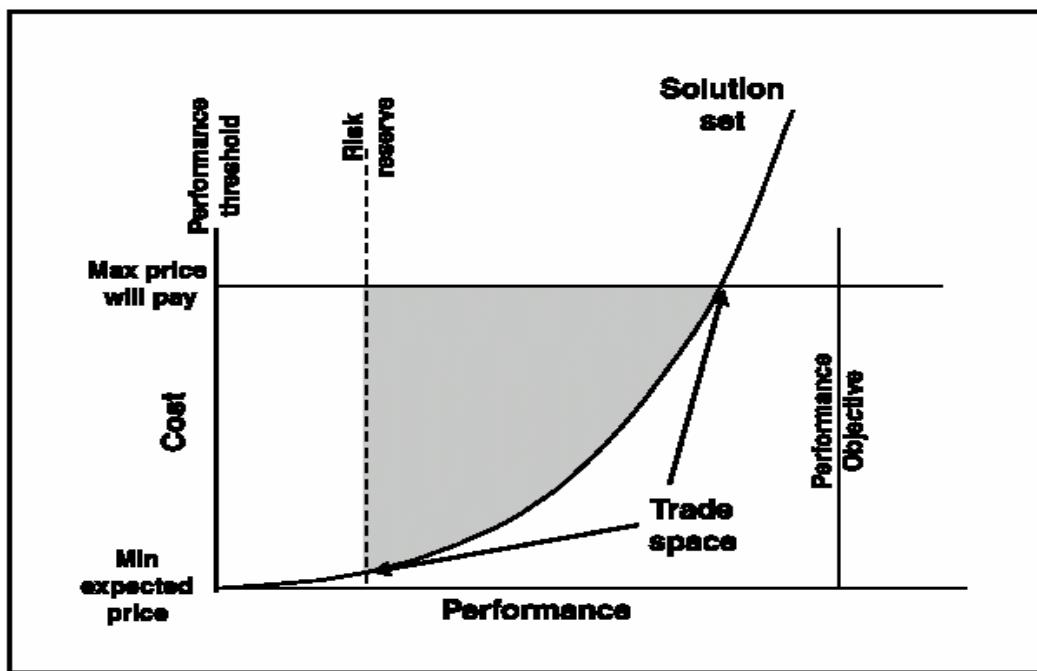


Figure 3. CAIV's Feasible Region (Kaye et al, 2000)

CAIV represents a shift within DoD from seeing performance as king to more as an equal to cost and schedule. Prior to the CAIV initiative, Users would convey their requirements in terms of performance. User requirements drove design, which then determined cost and schedule. This process usually resulted in programs being over

budget and behind schedule. With the inception of CAIV, government/industry requirement and acquisition professionals now work together to determine how much performance the program can afford. Requirements and cost objectives are considered simultaneously and then used to determine design. For all practical purposes, this concept should produce a positive effect on cost and schedule.

To fully understand CAIV, one should know the principles on which it is based. For CAIV to be successful, according to the December 1995 memo from Dr. Kaminski to the Secretaries of the military Departments and Defense Agencies and several other key CAIV documents, it has to emphasize the following principles:

### **Cost Performance Integrated Product Team (CPIPT)**

Program managers must create a strong team representative of all government and industry players. The CPIPT is chartered with the responsibility of making sure all decisions concerning cost and performance are made with team concessions. With that said, each team member must possess the authority to make or support critical decisions. Most important, the CPIPT must make it a priority to hold regular meetings throughout the program's lifecycle to ensure stability.

### **Realistic but Aggressive Cost Objectives**

It is of utmost importance that cost objectives are established early in the acquisition process. However, caution must be taken not to underestimate. We have come to understand Pereto's Principle as it pertains to system development. Approximately 80 percent of a program's lifecycle cost is decided within the first 20 percent of its life. Therefore, sub par estimates may lead to program failure. The CAIV plan should include cost goals for unit production cost and operating and support costs.

The unit production cost goal typically would be established for a specified quantity of systems and a specified peak production rate. The O&S cost goal typically would be an annual cost per deployable unit (e.g., battalion or squadron) or individual system (e.g., ship or missile) (DoD Directive 5000.2, 2003). Unfortunately, these goals often change due to decreased production rates or quantities. CAIV objectives need to be updated as program changes are implemented.

### **Risk Management**

Risk management must be an integral part of a program's activity to achieve cost, performance, and schedule objectives set forth by CAIV. Program partners must jointly identify, analyze, and prioritize critical program risks, then periodically review the mitigation plan progress (Kaye et al, 2000). In addition to periodic reviews, risk management should be tied to traditional program milestones. This ensures cost objectives established earlier remain feasible as risks are mitigated or realized.

### **Appropriate Metrics**

Metrics are used for tracking progress in setting and achieving cost objectives. Keeping good metrics allows the program to utilize collected data to make insightful, knowledge-based decisions. Metrics should show relationships between CAIV objectives. This allows programs to optimize objectives that are being met and react to the ones drifting away from desired results.

### **Provide Incentives**

Providing motivation for government and industry managers to achieve program objectives is tremendously important. The program manager must take steps to put in place incentives to reduce cost throughout a system's lifecycle. Incentives to contractors

should follow the direction set forth by federal regulations in the form of incentive fees, award fee, and favorable performance reports. Programs must also consider providing appropriate incentives, because an incentive that works well for one group may not work for another. Therefore, incentives must be diverse and tailored to fit the situation. For example, a company might prefer award fees vis-à-vis sharing the savings.

To ensure program success, incentives must also be provided to government program managers. I tried to understand how this is done using literature review. However, not much is written on this topic. Incentives primarily come in the form of performance appraisals and future assignments. On the other hand, rewards come in the form of recognition ceremonies, plaques, and letters.

### **CAIV's Flagship Programs Summary**

A cursory review of the flagship programs led to the conclusion that several external factors have impacted their implementation of CAIV. Most of the flagship programs became victims of their status, because they were seen as CAIV flagship programs they continued despite cost, schedule, and performance shortfalls.

DoD releases cost, schedule, and performance details on major defense acquisition programs to Congress on a quarterly basis. These details are presented in the Selected Acquisition Reports (SARs). The latest release of this report, September 2005, featured six of the eight flagship programs, Air-to-Air Missile Upgrade (AIM-9X), Multifunctional Information Distribution System (MIDS), Space Based Infrared System (SBIRS), the Joint Air to Surface Standoff Missile (JASSM), the Evolved Expendable Launch Vehicle (EELV), and the Joint Advanced Strike Technology (JAST) now known

as the Joint Strike Fighter (JSF), or F-35. The information below will provide a synopsis of the information contained in the SAR for each of the six programs.

The report shows the following (fiscal year 2005 in millions)

**Table 3. CAIV's Flagship Programs SAR information**

Program	Change in Cost	Change in Quantity	% Cost Change adjust for Quantity	Development Cycle
AIM-9X	-\$194.40	93	-6.6	Production
MIDS	\$263.70	117	12.3	Production
SBIRS	\$6,490.80	0	154.8	Production
JASSM	-\$337.70	-453	0.2	Production
EELV	\$14,426.50	-43	179.5	Production
JAST/JSF, F-35	\$25,617.60	-408	24.8	System Development

As Table 3 shows, AIM-9X seems to be the only program of the reporting flagship programs with a positive cost relationship. The others appear to be failing. To provide insight into the flagship programs' capabilities a description of each is presented below.

The programs selected to be DoD's CAIV flagships were done so to serve as change agents. These pilot programs had the task to demonstrate how this initiative could contribute to the goals and objectives of DoD programs. DoD decided on eight programs, two from the Army, two from the Navy, and four from the Air Force.

The Army programs selected were the Army Tactical Missile System- Brilliant Antitank Pre-Planned Product Improvement (ATACMS BAT P31) and the Crusader (155mm self-propelled howitzer). The Navy programs selected were AIM-9X and MIDS. The Air Force programs selected were SBIRS, JASSM, EELV, and F-35.

## ATACMS BAT P31 (Block IIA)

ATACMS BAT P31 provides an autonomous deep-attack capability for the ATACMS Block II missiles. The Brilliant Antitank (BAT) portion of this weapon provides a self-guided, anti-armor, top attack submunition, which uses acoustic and infrared sensors to autonomously locate, attack, and destroy moving tanks and other operating armored vehicles. The Pre-Planned Product Improvement (P3I) portion provides enhanced acquisition capability and an improved warhead for use against an expanded target set to include moving, stationary, hot, or cold targets.

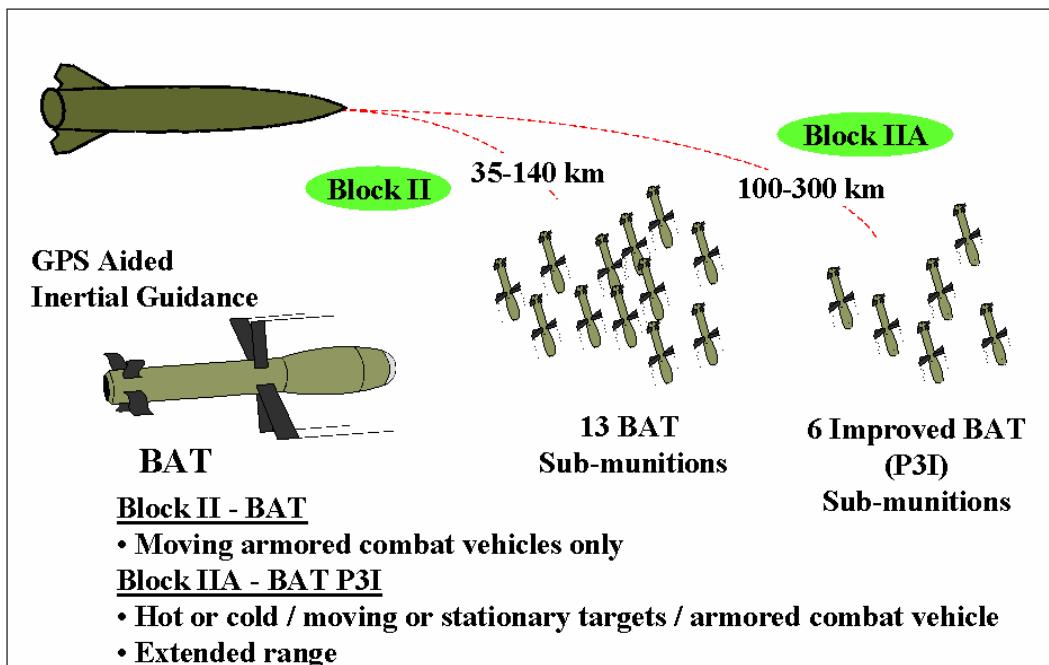


Figure 4. ATACMS BAT P3I (United States Army Field Artillery School)

## Crusader

The Crusader or Advanced Field Artillery System encompasses a 155mm self propelled howitzer and a re-supply vehicle. The primary mission of this weapon system is to provide artillery fire on targets identified by various sensors. It automatically propels 155mm rounds, at a rate of 10-12 per minute, up to 50km. The Crusader can hit a

target with eight rounds almost simultaneously by using its digital firing system to calculate the firing solution for each round.

DoD canceled Crusader in 2002 after eight years and about \$2 billion invested. The main reason for the cancellation, as cited by numerous news articles, was its weight. In an interview with Terence Smith of “News Hour with Jim Lehrer”, Secretary Rumsfeld stated, “I asked how many C-17s it would take to move 18 Crusader tubes into a battle. And the answer was 60 to 64 C-17's to move 18 Crusader tubes into a battle. That's a bucket. That's half of the entire C-17 fleet.”



Figure 5. Crusader and Re-supply Vehicle (Federation of American Scientists)

### **AIM-9X**

The AIM-9X is the most recent variation of the Sidewinder missile. The AIM-9X Sidewinder is an air-to-air, supersonic, heat-seeking missile, carried by fighter aircraft. The AIM-9X has four main parts, an infrared homing guidance section, an active optical target detector, a high-explosive warhead, and a rocket motor. It is compatible with the

Joint Helmet Mounted Cueing System, which enhances target acquisition and reduces pilot exhaustion.



Figure 6. AIM-9X (Raytheon)

## MIDS

The MIDS is a communications terminal that provides Link 16 digital data link, digital voice, and tactical air navigation capabilities for fighter aircraft when integrated into the host platform. Link 16 is a Joint and allied digital data link that operates on an anti-jam waveform and uses standardized message sets to exchange theater tactical information such as air tracks, engagement orders, targeting information, and platform status (Director, Operational Test and Evaluation, 2003).



Figure 7. MIDS: LVT Low Volume Terminal (rockwellcollins)

## **SBIRS**

As stated in the program's June 2005 Selected Acquisition Report, SBIRS is intended to satisfy key requirements delineated in the SBIRS Operational Requirements Document dated August 15, 1996, within the available budget and schedule. SBIRS is an integrated system consisting of multiple space and ground elements, with incremental deployment phasing, simultaneously satisfying requirements in the following mission areas: Missile Warning, Missile Defense, Technical Intelligence, and Battlespace Characterization. The baseline architecture for SBIRS includes two Highly Elliptical Orbit sensors and five Geosynchronous Earth Orbit satellites (four operational and one spare), in addition to the following ground elements: a CONUS-based Mission Control Station and backup, overseas Relay Ground Stations, Multi-Mission Mobile Processors, and associated communication links. The first increment of the SBIRS ground system

was certified for operations in December 2001 for the legacy Defense Support Program system satellites.

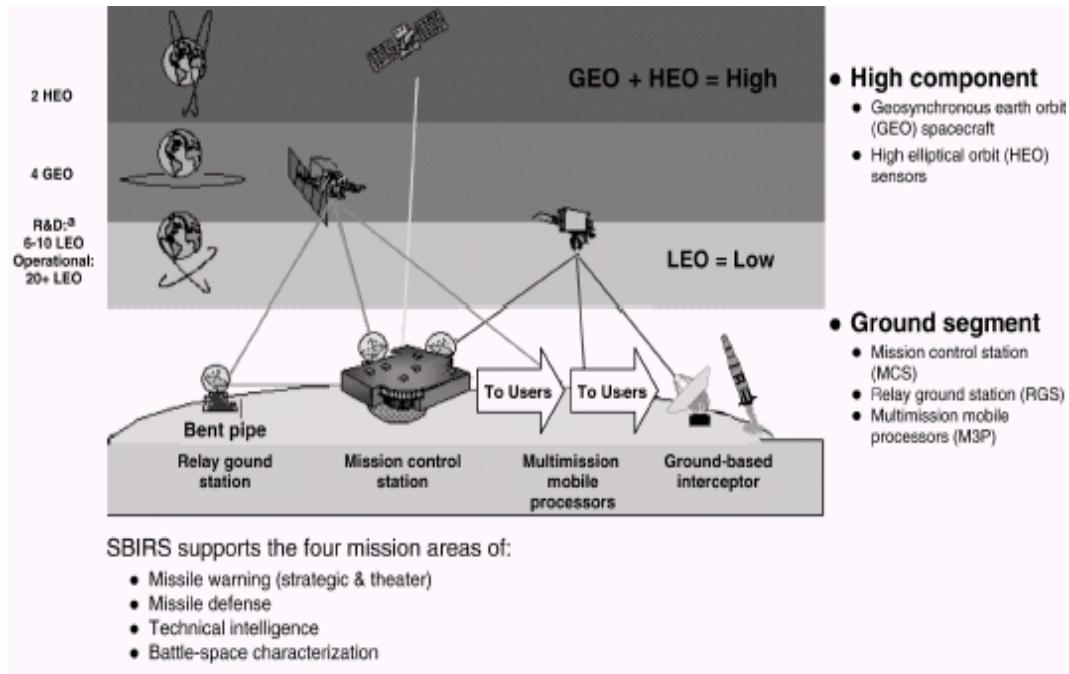


Figure 8. SBIRS Architecture (United States Air Force)

## JASSM

JASSM is a joint program with the Air Force as lead. It is a stealthy air to ground, autonomous, long-range, conventional, cruise missile. This missile provides the military the ability to attack both permanent and moveable targets deep within enemy territory without putting aircrews in danger. Global positioning and inertial navigation systems provide JASSM the capability to locate designated target within adverse weather.

Note: JASSM replaced the Tri-Service Stand-off Attack Missile, which was canceled due to escalation of program cost.



Figure 9. JASSM (Lockheed Martin)

### **EELV**

The EELV program seeks to reduce government cost to launch space vehicles by 25 percent. A key component to the cost savings is the use of common booster and engines and simplified launch pads and procedures. The EELV system includes the launch vehicles, infrastructure, support systems, and interfaces. EELV consists of two families of vehicles, the Delta IV and the Atlas V, that include a full range of medium, intermediate and heavy-lift vehicles. EELV is supporting military, intelligence, and civil mission requirements in the National Launch Forecast (NLF) through 2020 previously serviced by Titan II, Delta II, Atlas II, and Titan IV (Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, 2005).



Figure 10. EELV (United States Air Force)

#### JAST “now known as” JSF or F-35

The JSF Program will develop and field an affordable, highly common family of next-generation strike aircraft for the United States Navy, Air Force, Marine Corps and allies. The three variants are the F-35A Conventional Takeoff and Landing (CTOL); F-35B Short Takeoff and Vertical Landing (STOVL); and the F-35C Aircraft Carrier suitable Variant (CV). The CTOL will be a stealthy multi-role aircraft, primary air-to-ground for the Air Force to replace the F-16 and A-10 (Service intent) and complement the F-22A. The STOVL variant will be a multi-role strike fighter aircraft to replace the AV-8B and F/A-18A/C/D for the Marine Corps, and replace the Sea Harrier and GR-7 for the United Kingdom Royal Navy and Royal Air Force, respectively. The CV will provide the Navy a multi-role, stealthy strike fighter aircraft to complement the F/A-18E/F (Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, 2005).



Figure 11. JSF (United States Air Force)

### **CAIV's Greatest Challenge**

The greatest threat to CAIV is the current focus on initiatives that are driven by schedule. McNutt (1998), PhD dissertation highlighted this challenge to CAIV, “While there has been a flurry of acquisition reform activity in recent years, little of this effort has been aimed primarily at reducing development time. The primary aim of the current acquisition reform efforts has been focused on lowering costs.” The 1986 Packard Commission acknowledged that, “Unreasonably long acquisition cycles -- ten to fifteen years for major weapon systems is a central problem from which most other acquisition problems stem.” The CAIV working group overlooked this fact some nine years later, evident in its 1995 CAIV Working Group Report. The report reads, “CAIV, meaning that, once the system performance and objective cost are decided (on the basis of cost-performance tradeoffs), the acquisition process will make cost more of a constraint, and less of a variable, while nonetheless obtaining the needed military capability of the

system.” Clearly, schedule was not viewed as important as cost and performance. However, since CAIV’s implementation numerous initiatives have been established both at the DoD and Service levels to confront the cost is king mentality. These initiatives seek to establish schedule as a dominant player within DoD acquisition.

### **AF Lightning bolt 10**

Former Assistant Secretary of the Air Force for Acquisition, Mr. Arthur Money, initiated AF Lighting bolt 10, which suggested the reduction of weapon system acquisition schedule by 50 percent, in 1996. This attempt to reduce cycle time quickly lost steam and was reworded to focus on reducing the contracting period of the acquisition process.

### **Lean Aerospace Initiative (LAI)**

The Lean Aerospace Initiative is playing a tremendous part in bringing schedule to the forefront of DoD acquisition. One of the major research streams of the LAI is product lifecycle, which according to its charter is, “Pushing the envelope in the area of designing and developing aerospace products in a complex system-of-systems environment to shorten cycle time, reduce cost and increase delivery of best lifecycle value.”

### **Advanced Concept Technology Demonstrations (ACTDs)**

The Office of the Secretary of Defense established ACTDs to get vital weapon systems as expeditiously as possible into the hands of joint and coalition military personnel. The Office of Advanced Systems and Concepts attempts to meet this goal according to their website by:

- Speeding the discovery, development, and delivery of technology and concepts

- Partnering with Services, Agencies, and Coalition elements
- Seeking the very best technical and operational concept solutions from Defense, industry and academic sources
- Leveraging “try before you buy” demonstrations, exploiting “test to procure” initiatives, and forging partnerships to create new technology and operational concept solutions
- Operationalizing innovative solutions better than anyone else

### **Evolutionary Acquisition (EA)**

The EA strategy is used to provide mature, easily developed portions of a capability to the field. Developers are encouraged to provide less than the 100 percent solution to DoD within a specified timeframe and then provide the remaining capability in increments, as it becomes available. This came about because the acquisition world was spending about 80 percent of development time trying to get the last 20 percent of a capability operational. Think Pareto’s Principle. As the other 20% mature and new requirements developed they are transitioned in to the program in future increments.

### **Summary**

In this chapter, we looked at a synopsis of the material believed important in researching CAIV. It started off with a historical synopsis of DoD acquisition. A background was given to show where today’s acquisition process came from. Second, we looked at the environment leading up to CAIV. Third, we focused on CAIV’s principles. Fourth, a description of CAIV’s eight original flagship programs was presented. Lastly, we explored CAIV’s greatest challenge.

### **III. Methodology**

#### **Introduction**

The information provided in chapter two proves CAIV's principles to be a major DoD initiative. It crosses all branches of the military and as the flagship programs have shown, a number of different weapon platforms. In addition, it has been the most formidable test to performance centric acquisition. Continuing the journey, this chapter talks about the method and research strategy used to evaluate the research objectives.

#### **Research Objectives**

1. Do ASC's acquisition professionals believe their programs are setting and maintaining cost objectives?
2. Do ASC's acquisition professionals believe their contractors are setting and maintaining cost objectives?
3. What is the practitioners' perspective of CAIV?

In addition to the research strategy used, the upcoming paragraphs will discuss how the data were collected, analyzed, and the limitations of the method selected.

#### **Research Strategy**

**Table 4. Relevant Situations for Different Research Strategies (Yin, 2003)**

<b>Strategy</b>	<b>Form of Research Question</b>	<b>Requires Control of Behavioral Events?</b>	<b>Focuses on Contemporary Events?</b>
Experiment	how, why?	Yes	Yes
Survey	who, what, where, how many, how much?	No	Yes
Archival Analysis	who, what, where, how many, how much?	No	Yes/No
History	how, why?	No	No
Case Study	how, why?	No	Yes

Identifying a research strategy is probably the most important aspect of doing research. According to Yin (2003), one must consider the following when deciding which strategy to use. First, the type of research question posed. This research falls in the “how and why” grouping of Yin’s model because of its exploratory nature. The research is focused on how ASC’s acquisition professionals view their programs and contractors in respect to setting and maintaining cost objectives. Second, the extent of control an investigator has over the event being studied. The interviewer within this study has no control over CAIV or the individuals being interviewed. Last, the degree of focus on contemporary as opposed to historical events. This study is focused on real-time events to decide if ASC acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. Yin (2003) lists the research strategies available as experiment, survey, archival analysis, history, and case study.

This research is a qualitative case study. This method was selected with the three conditions and the strategies Yin mentioned in mind. This approach allowed a comprehensive analysis of the information provided by interviewees. Interviewees were selected from an assortment of programs to ensure the information, from a relatively small number of programs, would facilitate generalized conclusions.

### **CAIV Metrics and Observables: Program Office**

As stated in chapter one of this research, CAIV Metrics and Observables were created to identify important and observable steps which should be implemented in order to set and maintain aggressive production and O&S cost objectives. The DoD created Metrics and Observables were reformatted into questions that could be used to explore the first two research objectives. This provided the instrument necessary to evaluate

whether ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives.

The tables below demonstrate the transformation. It shows the questions fashioned from CAIV's Metrics and Observables used to explore the first two research questions.

**Table 5. Questions Formatted from CAIV's Metrics and Observables**

1. Do ASC's acquisition professionals believe their programs are setting and maintaining cost objectives?	a. Did the RFP(s) contain a strict minimum number of performance specifications? b. Was the trade space (cost performance tradeoffs) identified in the program RFP or program baseline? c. Is there a risk plan that identifies risks to achieve cost objectives? d. Were incentives for achieving cost objectives included in the RFP and contract? (% relative to total contract \$'s)? e. Are there mechanisms in place and operating for contractor suggestions to reduce production and O&S costs? f. Are cost objectives provided to IPTs and key suppliers? g. Are there measurement and estimation of reliability and maintainability?
2. Do ASC's acquisition professionals believe their contractors are setting and maintaining cost objectives?	a. Do they provide appropriate tools for cost-performance tradeoffs (including incentives for corporate management) and participate in the cost-performance tradeoff process? b. Do they identify (and when appropriate implement) new technologies and manufacturing processes that can reduce costs? c. Do they identify procedural/process impediments (barriers) to cost reduction measures? d. Do they establish strong relationships with the vendor base, including sound incentives structure?

### **CAIV Specific Interview Questions**

Specific interview questions were developed to understand the practitioners' perspective of CAIV. For example, what do they consider to be the reason(s) for the implementation of CAIV? What do they believe to be CAIV's strengths and

weaknesses? Do they believe CAIV was properly implemented and what improvements would they make? These represent the type of questions used to explore the third objective of this research.

### **CAIV Specific Sample Interview Questions**

1. What do you think was the single most important reason for CAIV?
2. In your opinion, what are CAIV's strengths?
3. In your opinion, what are CAIV's weaknesses?
4. Do you believe CAIV was properly implemented?
5. In your opinion, is CAIV being utilized within DoD?
6. What impact(s) do you believe CAIV had within DoD?

### **Data Collection**

Data were collected using the questions formatted from CAIVs Metrics and Observable, and the ones specific to CAIV. Semi-structured interviews allowed for the gather of individual perceptions about CAIV and on whether ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. Present and past situations were capture, which aided in the validity of this research. The interview format offered control over the type of questions and also provided interviewees the flexibility to clarify a few perspectives.

Before data were collected, steps were taken to ensure the right questions were being asked. This is where pilot testing the interview questions came in handy. Pilot testing was conducted using Air Force employees with different acquisition backgrounds. Also, individuals from outside the acquisition community helped with question

formulation and structure. The pilot tests provided feedback that were admitted, reworked, or rejected based on further clarification.

With a refined set of questions, approval was required to conduct real interviews. Acquiring this came in two forms. First, interview questions were submitted to the Air Force Institute of Technology Human Subjects Research department. As stated in their own words “All investigations, including surveys that involve the collection or use of information about Human Subjects must be reviewed.”

Second, approval was needed from individual program offices to conduct interviews. Programs believed, through research, to contain the workforce that would provide substantial input to this investigation were contacted. No specific permission was necessary to conduct interviews as long as the program offices recognized that the interviews were gathering information for research. The front offices of the programs contacted were asked to provide contact information for acquisition professionals (Engineer, Scientist, Acquisition Manager, Contacting Manager, or Financial manager) within their program that would be able to assist me concerning my research.

A network of individuals willing to be interviewed was constructed. This was done using the above technique, in conjunction with referrals from interviewees as to who else within the community should be able to help. Most of the interviews were conducted face-to-face at the interviewee’s workplace. However, the telephone was utilized whenever scheduling or real world situations became a factor. Interviewees were assured that the information they provided would only be seen by a limited number of people, mainly my research committee and myself.

With their permission, interviewees' responses were recorded. Also, a significant amount of notes were taken, which were often read back to interviewees to ensure their views were accurately captured. Transcription was accomplished as soon as possible after an interview, limiting lost meaning due to time. Interviewees were shown appreciation for taking time to help with this research. With an abundance of transcriptions, data analysis was the next logical undertaking.

## **Data Analysis**

There is no single "right" way to analyze data in a qualitative study (Leedy, 2005). However, Creswell's (1998) data analysis spiral provides an outstanding approach to analyzing a large amount of qualitative data. Creswell's spiral provides the following steps. First, organization: Organize the data using any of the many means available (databases, binders, containers, etc). Second, perusal: Systematically examine all data collected to get an understanding of the collection as a whole. Third, classification: In this step, patterns start to emerge as a result of recognizing common trends. Fourth, Synthesis: This is where collected data are fused making it presentable to intended readers. This step might include offering propositions or hypotheses that describe relationships among the categories (Leedy, 2005). The spiral was used to review gathered data several times.

## **Instrument Validation**

The validity of a measurement instrument is the extent to which the instrument measures what it is actually intended to measure (Leedy, 2005). There are different ways to gage instrument validity. Of these ways, two were considered most important to this research. First, face value; how relevant is the instrument to what it was designed to

measure at first glance. Face value increases when experts within the community of interest endorse the measurement instrument and when accepted measurements are used. As for this research, I believe face value is established by using CAIV's Metrics and Observables to develop the interview question.

Second, content validity; how pertinent are the questions to the community being measured? Content validity is important when trying to assess people's achievement in some area. A major portion of this research is to gauge, from the interviewees' perspectives, the achievements of ASC's programs and contractors to set and maintain cost objectives. A significant portion of the instrument used in this research was developed from identifiable indicators that illustrate whether programs and contractors are managing to set and maintain cost objectives.

### **Limitations of Methodology**

In addition, to the benefits stated earlier, the qualitative case study format carries several limitations. Case studies cannot be controlled, which is a significant threat to internal and external validity. Concrete conclusions cannot be made concerning the relationship between an event and its cause. Specifically to this research, one might ask two questions. Were the right people selected as interviewees, and was the researcher able to interpret and synthesize the knowledge gain from the data collected?

First, were the right people contacted? To minimize the impact of this limitation, interviewees were taken from different acquisition backgrounds. Being an acquisition professional was the only requirement, which is considered necessary to conduct a study of this type. Second, did the researcher accurately interpret the data? To minimize the

disruption here, other researchers were asked to verify that the analysis and synthesis of the data were acceptable.

## **Summary**

This chapter provided the methods used within this research to get a grasp on the research objectives. This research was accomplished using the qualitative case study approach. Interviews and Creswell's spiral were used to collect and analyze data respectively. Acquisition professionals were selected to serve as interviewees through referrals. In addition to CAIV specific questions, interview questions were also formatted from CAIV's Metrics and Observables. With data collected, the next steps are to identify themes and report findings.

## **IV. Data Analysis**

### **Introduction**

Chapter three presented the methodology used within this research to collect relevant data. This chapter builds on previous chapters by identifying and grouping the overall themes expressed in the interviews into common ideas. Creswell's (2003) spiral, described earlier, provided the structure for data analysis. This chapter provides a foundation from which the interview questions can be synthesized to support the overall conclusions presented in five.

### **Demographics**

The acquisition professionals interviewed include ASC's military and government civilian employees. The military members ranged from the rank of Captain to Colonel. The civil servants ranged from General Schedule (GS) grade13 to 15. The acquisition experience of both groups spans from two to 34 years with an average of 15.5 years. These professionals worked in programs of various sizes (acquisition level). Limited demographics were collected because the purpose of this research is directed toward the overall perspectives of ASC's acquisition professionals and not to draw conclusions based upon differences between participants.

### **Data Analysis**

Analysis of the first two parts of this section classified themes into a positive or negative category in respect to the investigative questions. This was done to determine if ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. Also, some interviewees' viewpoints are presented if they

provide further insight into the research questions. The result from the analysis of each question is presented below the research objective it supports.

The final part of this section will discuss themes developed from the analysis of participants' responses to the questions used to understand the practitioners' perspective of CAIV.

**Research Objective 1: Do ASC's acquisition professionals believe their programs are setting and maintaining cost objectives?**

To provide an answer to the question above, interviewees were asked questions focused on indicators, which showed whether they believe their programs are setting and maintaining cost objectives. Again, these indicators were identified by the CAIV working group and developed into CAIV's Metrics and Observables.

The first question (Table 3, question 1a) within this section focused on whether programs are minimizing the amount of specific performance parameters by providing only form, fit, and function requirements to contractors. This approach allows DoD contractors to use the most cost effective methods and newest technologies available during system development. As discussed in chapter two, having unique military requirements may suggest the military is willing to pay any amount for a particular capability.

Analysis of question (1a) showed roughly 92% of all interviewees believed attempts have been made to limit detailed performance specifications, moving more towards capability based acquisition. While, 8% of the participants believed programs are not limiting the amount of specific requirements imposed on contractors.

The second question (Table 3, question 1b) was developed to identify if programs are establishing the trade space between cost and performance early within its lifecycles. One interviewee stated, “I have come to understand this (cost-performance trade space) as the options available to us based on cost. Just as in purchasing a car, each model provides different capabilities and it is up to the buyer to make the appropriate tradeoffs.”

Analysis of question (1b) showed about 70% of all interviewees believed program stakeholders understand the trade space in respect to cost and performance. As one interviewee stated, "Even though they [Users] know and want the current state of the art capabilities for their systems, they understand only some will be doable considering cost." On the other side of the coin, 30% believed there is not a noticeable attempt by programs to identify the cost-performance trade space.

The third question (Table 3, question 1c), used to support whether ASC's acquisition professionals believe their programs are setting and maintaining cost objectives, focused on risk management. As discussed in chapter two, risk management is one of CAIV's most visible principles. In addition to a positive or negative theme, the analysis of this question provided several important professional viewpoints, which illustrated how risk is managed at the program level. The number one perspective interviewees expressed was the belief programs that manage risk successfully, by being proactive and staying within cost, fear losing their savings to poorly managed/failing programs. The second viewpoint interviewees put forward is the belief that risk planning has become much more common over the last ten years. The third illustrates the importance of cost within the risk management process. One interviewee stated “if cost is red [program is over budget] then the entire program is red...cost is now king”

Analysis of question (1c) showed approximately 73% of all interviewees believed programs have developed adequate risk plans, which identify pitfalls to achieving cost objectives. Whereas, 27% of the individuals interviewed believed programs are failing to manage risk associated with cost.

The fourth question (Table 3, question 1d) focused on the ability of programs to provide appropriate incentives to contractors to achieve cost objectives. Analysis of this question exposed that programs that are failing to develop creative incentives to get work done within constraints. One interviewee explained, “the government pays contractors regardless, five years turn into 10, at which point contractors blame requirement creep for the overruns in cost and schedule.” This interviewee and many like him believed contractors have little to no incentive to develop and field a system within cost or on schedule.

Analysis of question (1d) showed just about 62% of all interviewees believed DoD programs are providing appropriate incentives for defense contractors to achieve cost objectives. Whereas, 38% believed programs are not providing appropriate incentives to ensure capabilities remain affordable.

The fifth question (Table 3, question 1e) used in the interviews tried to understand if programs have mechanisms for contractors to make suggestions that could reduce production, operations, and sustainment costs. A very positive example came from the analysis of this question. There seems to be a continued drive by contractors to locate common configurations between systems. These commonalities allow the use of common parts and procedures, reducing overall cost. One interviewee pointed to a

situation where his contractor identified a part being developed for the Navy could also be used as an Air Force system component.

Analysis of question (1e) showed approximately 89% of all interviewees who answered this question believed programs have mechanisms in place, which allow contractors to put forward suggestions that could reduce production and operations and sustainment cost. While, 11% believed the opposite is true, programs are not providing avenues for contractors to suggest ideas that could reduce these costs.

The sixth question (Table 3, question 1f), employed to determine whether ASC's acquisition professionals believe their programs are setting and maintaining cost objectives, tried to ascertain whether programs are providing cost objectives to their Integrated Product Teams and key suppliers.

Analysis of this question (1f) suggested about 75% of the individuals interviewed believed cost objectives are provided to product teams and key suppliers, either actively or passively. One interviewee pointed to the cost cutting drills, the Air Force periodically conducts, as one of the delivery tools used by upper management to get cost objectives down to product teams and eventually to suppliers. The other 25% believed programs do not provide cost objectives to IPTs and key suppliers.

The last question (Table 3, question 1g) in this segment strived to understand if ASC's programs are estimating and measuring reliability and maintainability of their systems. Several of the interviewees pointed to the fact ASC along with DoD have finally realized that the majority of a program's cost is realized in the latter years of its lifecycle. To reduce this expense, a renewed focus has been placed on understanding the cost associated with reliability and maintainability through the use of improved

measuring and estimating tools and practices. While analyzing this question, one such practice became a recognizable viewpoint, staggered reliability, this is educating Users to the fact that obtaining 95% reliability off the production line is very unlikely and an evolutionary or spiral approach should be used.

The analysis of question (1g) showed 86% of the interviewees responded positively to whether programs are accomplishing measurements and estimations of their systems' reliability and maintainability. While 14% believed the opposite is true.

**Research Objective 2: Do ASC's acquisition professionals believe their contractors are setting and maintaining cost objectives?**

The analysis above strongly indicates that ASC's acquisition professionals believe their programs are setting and maintaining cost objectives. However, what about ASC's contractors? Are they managing to set and maintain cost objectives as seen by the acquisition professionals within ASC? To obtain answers to these questions, interviewees were asked questions which focused on indicators that point to whether ASC's contractors are setting and maintaining cost objectives.

The first question (Table 3, question 2a) of this section focused on whether contractors have the right tools to conduct appropriate cost-performance tradeoffs and if they participate in the cost-performance tradeoff process. The viewpoints which became most visible, from the interviewees' responses to this question, was the massive amount of effort contractors put forward when they realize the government is serious about cost. As one interviewee declared, "the "A Team" is usually assigned to participate in cost-performance tradeoffs if the budget is capped."

Analysis of question (2a) showed roughly 86% of all interviewees believed contractors have the right tools to conduct appropriate cost-performance tradeoffs and participate in the cost-performance tradeoff process. While, 14% believed the opposite is true, DoD contractors do not possess the tools to conduct cost-performance tradeoffs and they do not participate in the cost-performance tradeoff process.

The second question (Table 3, question 2b), used to support whether ASC contractors are managing to set and maintain cost objectives, tried to discover if contractors are identifying new technologies and manufacturing processes that may reduce costs.

Analysis of question (2b) showed about 68% of all interviewees believed contractors understand the importance of identifying cost reducing manufacturing processes. Interviewees mentioned that contractors are introducing manufacturing management techniques and new technologies early in the acquisition process. On the other side of the coin, 32% of the interviewees collectively believed contractors only watch their bottom line. How much profit can we make? Therefore, they think that contractors will utilize the manufacturing practices and technologies, new or old, which provide them the greatest chance for potential profit.

The third questions (Table 3, question 2c) focused on ASC's contractors' ability to identify procedures/processes that impede cost reduction measures. A participant perception, which came through during analysis of this question, was the use of information technology has enabled the reduction and in some cases the elimination of outdated and underutilized government imposed processes and procedures. The analysis

of this question also revealed that contractors are pushing to reduce and or combine the number of formal (procedural) system tests.

Analysis of question (2c) suggested just about 73% of all interviewees believed ASC contractors are identifying procedures/processes that impede cost reduction measures. Whereas, the other 27% believed contractors are not identifying barriers to cost reduction measures.

The final question (Table 3, question 2d) in this section sought to understand whether contractors have established strong relationships with their vendor base. An observation made while analyzing this question was a majority of ASC's contractors have established an open line of communication with their suppliers. As one interviewee stated, "They [ASC's contractors] work well with third parties. They understand that communication is important and push constantly to make sure it is kept open."

The analysis of question (2d) showed about 78% of the interviewees responded positively to whether contractors are establishing strong relationships with their vendor base, while, the other 22% responded negatively.

### **Research Objective 3: What is the practitioners' perspective of CAIV?**

The first two research questions used indicators from CAIV's Metrics and Observables to investigate whether ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. Within this section, the analyses and findings associated with the interview questions developed to obtain the practitioners' perspective of CAIV are discussed. A practitioner of CAIV is an individual who utilizes some or all of CAIV's principles on a regular basis.

As stated in chapter three, data were collected using semi-structured interviews and analyzed with Creswell's (2003) spiral model. The data from the interviews generated themes, which are listed below each finding in order of frequency. The main theme that emerges from each interview question is reported as a finding. A finding is used as a building block to support the overall conclusion of the practitioners' perspective of CAIV in chapter five.

**Finding One: Most practitioners report budget constraint as the single most important reason for the implementation of CAIV**

One of the questions asked during the interviews focused on what practitioners believed was the most important reason for DoD's implementation of CAIV. Analysis of this question brought to light three main themes.

Budget Constraints was the number one reason reported as to why CAIV was implemented. As one interviewee stated "Everything was costing too much money and cost was still growing. CAIV was the tool which was needed to take control of cost, as does the civilian sector." A few interviewees mentioned requirement creep and unique military specifications were the main contributors to the soaring costs before CAIV's implementation.

The second theme, which came up as a reason for the implementation of CAIV, was the disappointing success rate of traditional programs. Pre-CAIV attitudes supported pursuing the last five to 10% of a system's performance to the detriment of the program.

The last major reason for implementing CAIV, as reported by interviewees, was to formalize the cost-performance process that was already being done by program

managers. Interviewees who presented this theme believed CAIV is just codified common sense.

**Finding Two: Practitioners report CAIV's most significant strength is its ability to force stakeholders to look at the entire program upfront**

Practitioners were asked to express what they believed to be CAIV's strong points. These answers are important because it identifies positive features of a major DoD initiative. The analysis of this question showed that CAIV's primary strength is its ability to compel stakeholders to take an early look at the entire program. One interviewee summarized her thoughts with the following, "CAIV makes you take an early look at the system's lifecycle requirements. Users now fully understand the cost and not just requirements. CAIV forces them to look at the cost of their requirements"

The theme that manifested itself as CAIV's second strongest strength is its ability to provide program insight to IPT members. One interviewee stressed he firmly believes IPTs are the best thing DoD has established within the last 10 years. IPTs are seen as important because they include all stakeholders and give the program manager and their supporting staff the go ahead to use their intellect. All program issues are placed on the table and openly discussed.

The other less frequent themes, which surfaced as CAIV's strengths, are its capacity to provide the government leverage with contractors and its ability to set operating boundaries.

**Finding Three: Practitioners report CAIV's greatest weakness is the expectation it will fix all problems within a program**

To understand the weaknesses of CAIV, interviewees were asked to identify what they consider to be CAIV's weak points. The most frequently reported weakness is the expectation by program stakeholders that CAIV will remedy all issues. As one practitioner stated, "CAIV is expected to fix all problems, but the concept does not work without communication. The saying is now "we are going to CAIV this away" whenever problems occur." Another made the point by saying "CAIV is used as a walking stick. It does not work the same way for all programs. It must be tailored and not viewed as a substitute for perfection."

The other prime perceived weaknesses of CAIV were reported with almost equal frequency. These include, (1) lack of ability to rapidly deploy new technology, (2) providing contractors with a tool to trim capabilities, and (3) not capitalizing on its initial momentum.

**Finding Four: Most practitioners report CAIV as properly implemented**

The fifth question, used to obtain the practitioners' perspective of CAIV, focused on whether they believe it was properly implemented or not. Analysis of the answers to this question showed 38% of all interviewees believed CAIV was properly implemented. Leadership support played a large part in CAIV implementation success. A mid-level civil servant expressed this when he stated, "because they [DoD senior leadership] knew we had to do something [about the acquisition process] CAIV became the central focus." On the other side of the coin, 29% of the interviewees believed CAIV was not properly implemented. 5% believed the implementation depended on the size of the program.

One senior military program manager summed it up well when he said, “CAIV is properly implemented on small programs but not on bigger ones. Large programs with the political backing are not willing to give up capability for cost. These programs seem to be immune to cuts, while smaller programs are seen as bill payers for large programs overruns.” Lastly, 29% of the participants had no comment regarding this question.

**Finding Five: Most practitioners report CAIV as being utilized within DoD**

The sixth question within this section attempted to determine the practitioners' views of whether CAIV is being utilized within DoD. If CAIV's practitioners believe it has lost its utility, then other tools must be developed to set and maintain DoD cost objectives.

Analysis of this question showed 57% of participants believed CAIV is being utilized within DoD. However, a few pointed to the reality CAIV is less recognizable by name. On the other hand, 29% of interviewees believed CAIV is not being utilized by DoD as a whole, it is only used by a small number of programs which are tightly constrained by their budget. 14% of the practitioners interviewed had no comment on this question.

**Finding Six: Most practitioners report CAIV has significantly impacted the way programs view cost management**

The seventh question, employed to gauge practitioners' perspective of CAIV, was designed to capture the noticeable impacts of CAIV on the DoD. Three main themes became apparent and are listed below in frequency of occurrence.

Participants reported making programs more conscious of cost management as CAIV's number one impact on the DoD. As one middle manager stated, “CAIV brought

to light that the DoD acquisition process is driven by cost... you can easily make five days into 10 and reduce mach 2.5 to 2, however you can not make one million into two. Money is our most limiting resource.”

The next distinct theme that presented itself, as a significant impact of CAIV on DoD, was CAIV’s ability to tie all the phases of a program’s acquisition lifecycle together. For example, one practitioner said, “CAIV makes us look at the program as a whole not in segments. It has allowed us to get away from the old mentality which made the acquisition community believe development had nothing to do with sustainment.”

The third theme that came up, during analyzing the answers for this question, was that CAIV has impacted the DoD by providing it with a bumper sticker slogan. Interviewees pointed to its memorable name and how this small acronym attempts to simplify the gigantic DoD’s acquisition process.

## **Summary**

This chapter synthesized the data collected into overall themes and findings. Through analysis of the questions formatted from CAIV’s Metrics and Observables, it appears there is a positive likelihood that ASC’s acquisition professionals believe their programs and contractors are setting and maintaining cost objectives.

Six findings surfaced from the analysis of the interview questions developed to gain a glimpse into the practitioners’ perspective of CAIV. These findings along with the themes identified in the first two sections and my personal observations and synthesis of the information collected will provide the foundation to develop the conclusions and recommendations presented in chapter five.

## **V. Conclusions and Recommendations**

### **Introduction**

The objectives of this research are to determine whether ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. Also, this work seeks to understand the practitioners' perspectives of CAIV. This chapter presents the conclusions drawn based on assessment of the themes and findings identified in chapter four. It also provides recommendations, which will hopefully improve the CAIV process. Lastly, recommendations for future research and limitations to this research are presented.

### **Conclusions**

This section is divided into three parts. The first two discuss the conclusions drawn from the answers given by participants to determine if ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. The third part illustrates the conclusions drawn from the questions developed to gauge CAIV's practitioners' perspectives.

#### **Research Objective 1: Do ASC's acquisition professionals believe their programs are setting and maintaining cost objectives?**

To provide a conclusion to research objective one, we looked at the results obtained from the analysis of the investigative questions. This was done to determine if there were positive or negative trends, which might suggest whether or not ASC's acquisition professionals believe their programs are setting and maintaining cost objectives. Based on the total number of positive to negative responses to the

investigative questions (see Table 4), it appears a majority of ASC's acquisition professionals believe their programs are managing to set and maintain cost objectives.

**Table 6. Are DoD Programs Setting and Maintaining Cost Objectives Themes**

<b>Total number of questions answered by interviewees</b>	<b>150</b>	
<b>Total Number of Positive Reply</b>	<b>117</b>	<b>78%</b>
<b>Total Number of Negative Reply</b>	<b>33</b>	<b>22%</b>

**Research Objective 2: Do ASC's acquisition professionals believe their contractors are setting and maintaining cost objectives?**

As was done above, the answers to the investigative questions presented in chapter four were looked at to determine if there were positive or negative trends, which might suggest whether or not ASC's acquisition professionals believe their contractors are setting and maintaining cost objectives. Based on the total number of positive to negative responses to the investigative questions (see Table 5), it appears a majority of ASC's acquisition professionals believe their contractors are setting and maintaining cost objectives.

**Table 7. Are DoD Contractors Setting and Maintaining Cost Objectives Themes**

<b>Total number of questions answered by interviewees</b>	<b>86</b>	
<b>Total Number of Positive Reply</b>	<b>66</b>	<b>77%</b>
<b>Total Number of Negative Reply</b>	<b>20</b>	<b>23%</b>

**Research Objective 3: What is the practitioners' perspective of CAIV?**

The following paragraphs provide conclusions based on interpretation of the information participants provided during the interview process. First, a conclusion of CAIV's practitioners' perspectives is presented. Last, a discussion of several conclusions that presented themselves during synthesis of the collected data is presented.

## **Practitioners' Perspectives of CAIV**

The following information was gathered from the findings presented in chapter four. They represent the acquisition professionals' perspectives of CAIV. This research concludes that CAIV's practitioners perceive CAIV to be beneficial with proper implementation and support. They understand CAIV's creation was due to a time when reform was necessary. The Cold War had ended and the nation did not see the need to maintain a military with the capabilities needed during that war. Simply, cuts had to be made and CAIV provided the principles for this task. Practitioners validated this occurrence by reporting budgetary constraints as the number one reason for the implementation of CAIV. CAIV is recognized as providing program offices the opportunity to include all stakeholders in the acquisition process, forcing them to understand the consequences of their decision over the life of the program. It also provides the boundaries in which system acquisition is done. Funding has become a greater concern over the last 10 years and CAIV has challenged industry to provide war-winning capability under tough budget constraints. The practitioners interviewed also perceive CAIV as having several weaknesses. The greatest weak point presented by interviewees was the expectation that CAIV will fix all issues within a program. This has negatively affected CAIV's image because, as practitioners reported, there seems to be a tendency by programs to apply the CAIV bandage without tailoring it to specific situations, which might make problems worse. Practitioners perceive CAIV to be properly implemented. CAIV has filtered down to every appropriate level within the DoD acquisition system. This is evident by the majority of interviewees', from three years to 34 years of acquisition experience, awareness of CAIV and its general purpose.

Most practitioners perceive CAIV as being utilized within DoD based on the significant impact it made on the way programs view cost management. Given the budget constraint of the 90s, CAIV provided programs the principles necessary to set and maintain cost objectives in an attempt to keep weapon systems affordable. CAIV has been well received by DoD acquisition professionals, evident in the findings presented in chapter four. However, through observation and synthesis of the interview responses, a few unexpected practitioners' perspectives presented themselves as conclusions.

First, there are modest incentives for DoD programs to implement CAIV; the funds saved are used to pay bills not associated with the program that realized the savings. Second, limited accountability is placed on programs to utilize CAIV; no liability is attributed to programs, which goes against CAIV's principles. Third, CAIV has lost most of its momentum; even though the principles are in use as demonstrated by research objectives one and two, it seems the name is becoming an empty shell. Fourth, the DoD substitutes "budget" for "cost" in CAIV. Programs usually start out using sound CAIV principles but after the initial funding, programs usually erode into build to budget due to funding cuts. In this situation, programs are provided a budget based on funds available and not on the requirements to successfully execute. Last, a window of opportunity might be on the horizon to reintroduce a new and improved CAIV. Current world engagements are very expensive. How long will the American public continue to support the redirection of funds from domestic programs to pay for capabilities necessary to conduct the Global War on Terrorism? Also, a renewed cost focused initiative is needed to prevent cuts to the military's forces to pay for modernization.

### **There are no incentives for DoD programs to implement CAIV**

During the interviews, participants pointed out the apparent disincentives to employ CAIV's principles within their programs. Many mentioned occurrences where the projected cost savings were seized from the program and given to other under funded or mismanaged programs. In some cases, the savings didn't materialize leaving the program office short. Interviewees also reported that some programs annual budgets were reduced by the exact amount of cost savings realized the year prior. There seems to be a substantial disincentive associated with cost reduction efforts within the DoD.

### **Limited accountability placed on programs to utilize CAIV**

CAIV seems to be missing the accountability piece, which is necessary to make an initiative totally successful. Programs will disregard the downward directed CAIV requirements placed on them if these requirements are not actively managed for accountability. A senior GS employee stated, "I have not seen a CAIV plan within the years I have been here and you would think it would be a main requirement for programs to transition to the next phase in the acquisition cycle."

### **CAIV has lost most of its momentum**

The majority of interviewees believe the introduction of CAIV to DoD was well received and supported by senior leadership. Several of the senior employees interviewed mentioned the abundance of training opportunities and workshops, which existed during the first few years of CAIV's initiation. A few of these interviewees were responsible for briefing and communicating the importance of CAIV to their organizations. These activities show the intensity of CAIV's initial momentum. However, a number of the interviewees believe CAIV has failed to maintain its original

momentum. As one interviewee declared, “It [CAIV] has not capitalized on its initial momentum. Currently it is losing the grasp it had on the acquisition community.” Another stated, “It [CAIV] has lost its momentum, it no longer holds the engineering and acquisition communities together.”

### **DoD programs have substituted Budget for the Cost in CAIV**

The current DoD budget process became a central discussion within many of the interview sessions. Several practitioners pointed to how DoD allocates funds. They believe DoD allocates funds based on the budget they have available and not on the estimates/cost developed by stakeholders utilizing CAIV’s principles. This type of budgetary practice reduces the leverage gained by program offices during the negotiation and interaction with contractors and stakeholders. Programs are forced to manage the system with the budget available and not the funding necessary to effectively reap the benefits of the tradeoffs made earlier. One interviewee expressed, “CAIV is being used informally by Program Managers as a tool to put a cap on cost while failing to follow the entire CAIV process.”

The following paragraph provides a simplified description of how a funded program ends up building to a DoD imposed budget. The request for funds commence when a Major Command identifies needed capability. The Major Command then submits a request to the DoD, which is flowed up into the President’s budgets and then to Congress. Congress authorized and appropriated funds which are provided to the DoD on an annually basis. The money is flowed to the program office chartered, by the requesting Command, to develop a system that provides the needed capability.

The distance between Congress and the program office is where this problem occurs. By the time the funds reach the program office it has gone through several levels of bureaucracies each with “unexpected bills” that need to be paid. Therefore, the original cost that was sent up to Congress after several layers comes back as a budget below what is necessary to properly manage the program.

**A window of opportunity might be on the horizon to reintroduce a new and improved CAIV**

The current Global War on Terrorism is very expensive and budget constraints might lead to renewed interest in CAIV. As chapter two illustrated, the need for CAIV came after the nation was no longer willing to finance the military at Cold War levels and senior military leadership had to devise a technique to maintain capabilities with less funding. This might be the reality we are exposed to again in a few years. How long can the nation sustain the current war effort? The signs to look for were also mentioned in chapter two, Kurt Lewin’s (1951) organization change model (unfreeze, change, refreeze). First, unfreeze; Congress and the military will form several commissions to understand if DoD is expending funds in the most efficient manner. Second, change; there will be several changes proposed to assist DoD with its perceived spending inefficiency. This is where a new and improved CAIV should be reintroduced to DoD. Last, refreeze; attempts will be made to solidify the changes through the use of training, workshops, and leadership support. The precursors to change within DoD are becoming visible. Several interviewees pointed to Congress shifting its stands from commercial-off-the-shelf procurement to military development due to recent scandals. This illustrates legislators dissatisfaction with the way DoD is currently conducting business. A senior

Program Manager expressed his thoughts on the change to come as, “we might be going back towards unique military requirements and away from commercial practices.”

This opportunity might also present itself to aid in the modernization of US military forces. Modernization is also expensive and the trend to accomplish this is usually reducing end-strength. Reintroducing a program like CAIV will focus the military to look at not only reducing the end strength but also the cost effectiveness of current high dollar programs.

### **Recommendations**

This subchapter will provide recommendations as they pertain to the five unexpected practitioners’ perspectives mentioned above. These recommendations are geared toward DoD leadership with the authority to make changes to policies and procedures. The ideals put forth within this study are done so with the optimism they will make improvements to the well-received CAIV initiative.

First, how to provide incentives for programs to use CAIV’s principles to achieve savings? The suggestion that comes to mind is to change the impression that a program’s savings often benefits some other organization. This can be accomplished by giving the program, which realized the savings, the option to use all or a percentage of the funds within their program or offer the savings to another cause. This approach empowers the program and the contractor because it plays a significant role in the decision of how the savings are utilized. If a program selects to retain the savings, it will be able to contribute additional funds toward the completion of the system, which will get new capabilities to the field earlier than predicted. This “incentive money” can also be expended to pay for approved but unfounded requirements.

Second, how can accountability be designed into the CAIV process?

Policymakers must hold program managers responsible by developing rigorous and comprehensive guidelines that are employed annually to assess a programs' ability to set and maintain cost objectives. This should be a key portion of Air Force and DoD inspections. Inspectors should use the guidelines as a checklist to see if programs are utilizing CAIV principles. Additionally, a program's ability to set and maintain cost objectives should be a major factor in determining if it is ready to transition to the next phase within the acquisition cycles.

Third, how can CAIV regain lost momentum? The reduced momentum is a result few incentives and no accountability in combination with faltering leadership support. Implementing the recommendations above for incentives and accountability along with increased senior leadership support will swing the momentum back toward CAIV. Once programs see the new changes and focus, they will begin to employ CAIV's principles, which will result in the recovery of the lost momentum.

The fourth recommendation, if accepted, will be the hardest to implement because of established procedures and the level changes will need to take place. The way DoD appropriates its acquisition budget must be overhauled for programs to achieve the full benefits of CAIV. Funds must be appropriated based on the level determined by stakeholders during the initial cost-performance trade-off working groups. If a program cannot be continuously funded then it might be prudent to delay until the appropriate funding is available. This guaranteed funding would provide programs additional bargaining power and leverage with their contractors.

Last, how can CAIV take advantage of the approaching window of opportunity for a cost focused initiative? The recommendation here is to form a partnership between CAIV and other currently high profile initiatives, such as Evolutionary Acquisition and Spiral Development. A hybrid of these initiatives can be easily created, by combining the sound program management and cost aspects of CAIV with the schedule focused characteristics of Evolutionary Acquisition and Spiral Development. CAIV's alliance with its greatest challenge, schedule/cycle-time, will benefit DoD because this union will force DoD acquisition professionals to focus on system cost and schedule in relation to performance.

### **Limitations of this Research**

Above the limitations of the methods used to collect data, discussed in chapter three, there are limitations to this research as a whole. First, the interviewees were all from one of DoD's many product centers. This might introduce findings that are localized and cannot be generalized to the entire acquisition community. Second, the sample size is a relatively small portion of DoD's acquisition professionals. Third, the outsider perspective from other stakeholders within the acquisition process such as contractors and individual users was not solicited. These professionals might have a different perspective regarding the research questions.

### **Recommendations for future research**

While conducting this research, it became apparent additional study will need to be undertaken to finish the portrait this work started. First, quantitative research tools should be developed to provide additional support to the findings and conclusions this research found. Second, this study should be conducted within other DoD product

centers to determine if the findings and conclusion are supported by other DoD organizations. Third, perform a detailed analysis of CAIV's original flagship programs to understand the external forces that might be responsible for their seemingly poor performance. Last, interview DoD contractors for their perspective on CAIV and other cost saving DoD initiatives.

## **Discussion**

This research was developed to understand if ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. It was also conceived to present the practitioners' perspectives of CAIV. This work used literature to illustrate the foundation of today's acquisition system to, discuss the environment from which CAIV was born, explore CAIV's principles, provide a description of each of CAIV's flagship programs, and recognize CAIV's greatest challenge. Data were collected and analyzed using proven well-researched methods such as Creswell's (2003) analysis spiral.

This research adds to the body of work being done to comprehend the ever-changing DoD acquisition system, enhancing the knowledge base of DoD acquisition professionals. Additionally, this study provides insight into a long serving DoD initiative that has been relatively successful considering the political DoD budgetary system.

## Bibliography

- Acker, David D. *Acquiring Defense Systems: A Quest for the Best.* Defense Systems Management College, Fort Belvoir, Virginia, July 2003.
- Department of Defense. *Cost as an Independent Variable: CAIV Templates.* Washington: GPO, June 2002.
- Creswell, J. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (2nd Edition). Thousand Oaks CA: SAGE Publications, 2003.
- Department of Defense. *Defense Acquisition Guidebook.* Revised 17 October 2004. 22 November 2005 <http://akss.dau.mil/dag/DoD5000.asp?view=document>.
- Carter, Linwood B. and Thomas Coipuram. *Defense Authorization and Appropriations Bill: A Chronology, FY1970-FY2006.* Washington: The Library of Congress, 23 May 2005.
- Department of Defense. *Director, Operational Test and Evaluation: FY 2003 Annual Report.* 2003.
- Department of Defense. *DoD Directive 5000.1: The Defense Acquisition System.* Washington: GPO, 12 May 2003.
- Department of Defense. *DoD Instruction 5000.2: Operation of the Defense Acquisition System.* Washington: GPO, 12 May 2003.
- Department of Defense. *Joint Design to Cost Guide, Department of the Army, the Navy, and the Air Force,* 3 October 1973.
- Federation of American Scientists. [www.fas.org](http://www.fas.org). 22 September 05.
- General Accounting Office. *DoD Acquisition Outcomes: A Case for change.* GAO-06-257T. Washington: GPO, 15 November 2005.
- Goldin, Claudia and Frank D. Lewis. "The Economic Costs of the American Civil War: Estimates and Implications," *Journal of Economic History*, 35 (1975): 299-326.
- Goldin, Claudia and Frank D. Lewis. "The Post-Bellum Recovery of the South and the Cost of the Civil War: Comment," *Journal of Economic History*, 38 (1978): 487-492.
- Hanks, Christopher H. and others. *Reexamining Military Acquisition Reform: Are We There Yet?* Santa Monica: RAND Corporation, 2005.

- Harokopus, Kimberly A. *Transforming Government: Creating the New Defense Procurement System*. Boston College, Massachusetts, April 2000.
- Henningsen, David. *Cost as an Independent Variable Implementation Issues*. MS thesis. Naval Postgraduate School, Monterey, CA, March 1997 (ADA3318791).
- Jones, Wilbur D. *Arming the Eagle: A history of U.S. Weapons Acquisition Since 1775*. Defense Systems Management College, Fort Belvoir, Virginia, 1999.
- Kaminski, Paul, Under Secretary of Defense Acquisition and Technology: policy on Cost Performance Trade-offs. Memorandum, 19 July 1995.
- Kaminski, Paul. Under Secretary of Defense Acquisition and Technology: Reducing Life Cycle Costs for New and Fielded Systems. Memorandum, 4 December 1995.
- Kent, Robert H. *Installing Change: an executive guide for implementing and maintaining organizational change* (2<sup>nd</sup> Edition). Winnipeg: Pragma Press, Inc., 2001.
- Leedy, P. and J. Ormrod. *Practical Research* (8<sup>th</sup> Edition). Upper Saddle River NJ: Merrill Prentice Hall, 2005.
- Lewin, K. *Field Theory in Social Science*. New York NY: Harper, 1951.
- McNally, William P. *Will Commercial Specifications Meet Our Future Air Power Needs?* Research paper. Air University, Maxwell AFB, AL, 1997.
- McNaugher, Thomas L. *New Weapons Old Politics: America's Military procurement Muddle*. Washington DC: The Bookings Institution, 1989.
- McNutt, Ross T. *Reducing DoD Product Development Time: The Role of the Schedule Development Process*. PhD dissertation. Massachusetts Institute of Technology, Boston MA, 1998.
- Michael A. Kaye, Mark S. Sobota, David R. Graham, and Allen L. Gotwald. Cost as an Independent Variable: Principles and Implementation. *Acquisition Review Quarterly*, 353-372 (Fall 2000).
- Nagle, James F. *A History of Government Contracting*. George Washington University, 1992.
- NewsHour. Prod. Lester Crystal. Public Broadcasting System. May 16, 2002.

Office of the Director, Program Analysis and Evaluation. *Future Years Defense Program (FYDP) structure Handbook*. DoD 7045.7-H. April 2004.

Office of the Secretary of Defense. Advanced Concept Technology Demonstrations. 7 August 2005 [www.acq.osd.mil/actd/](http://www.acq.osd.mil/actd/).

Office of the Under Secretary of Defense for Acquisition, Technology and Logistics. *Defense Acquisition Management Information Retrieval*. 01 October 2005 [www.acq.osd.mil/damir](http://www.acq.osd.mil/damir).

Patten, Michael T. *Qualitative Research and Evaluation methods* (3<sup>rd</sup> Edition). Thousand Oaks: Sage Publications, Inc., 2002.

Petit, Carey E. *Development of Measures of Success for Corporate Level Air Force Acquisition initiatives*. MS thesis, AFIT/GAQ/ENV/04M-09. School of Engineering and Management, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, March 2004.

Perry, William J. Specifications and Standards – A New Way of Doing Business. DoD Memorandum. Washington D.C., 29 June 1994.

President's Blue Ribbon Commission on Defense Management. A Formula For Action: A Report to the President on Defense Acquisition (The Packard Commission Report). Washington D.C., June 1986.

President's Blue Ribbon Commission on Defense Management. National Security Planning and Budgeting. A Report to the President on Defense Acquisition (The Packard Commission Report) Washington D.C., June 1986.

Reeves, Stephen V. *The Ghosts of Acquisition Reform: Past, Present and Future. Executive Research Project*. National Defense University, Fort McNair, Washington, D.C., 1996.

Riegert, Paul M. *A Case Study: Acquisition Reform and the New V-22 Osprey Program*. MS thesis. Naval Postgraduate School, Monterey, CA, March 1998 (ADA344702).

Department of Defense. *2005 Selected Acquisition Report*. Washington: GPO, 14 November 2005.

United States Army Field Artillery School. *Division Multiple Launch Rocket System (MLRS) Battalion Operations*. January 1999.

Yin, Robert K. *Case Study Research Design and Methods* (3<sup>rd</sup> Edition). Thousand Oaks: Sage Publications, Inc., 2003.

## Vita

Captain Kevin W. Codrington graduated from Hackensack High School in Hackensack, New Jersey. He entered the United States Air Force and served at Kessler Air Force Base (AFB), Mississippi as an Optometry Technician. While at Kessler, Captain Codrington graduated from Faulkner University with a B.S. in Business Administration and was commissioned in July 2001.

His first assignment after his commission was at Hanscom AFB where he served as an acquisition officer. It is from this assignment Captain Codrington entered the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to the C-17 System Group, Aeronautical Systems Center, Wright-Patterson AFB, Ohio.

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<b>13. SUPPLEMENTARY NOTES</b>				
<b>14. ABSTRACT</b> <p>The purpose of this research was to assess whether Aeronautical System Center's (ASC's) acquisition professionals believe CAIV has enabled their programs and contractors to set and maintain cost objectives. The three major objectives of this thesis are to answer the following questions: First, Do ASC's acquisition professionals believe their programs are setting and maintaining cost objectives? Second, Do ASC's acquisition professionals believe their contractors are setting and maintaining cost objectives? Last, what is the practitioners' perspective of CAIV? This research identified CAIV as being well received by DoD. It also identified that ASC's acquisition professionals believe their programs and contractors are setting and maintaining cost objectives. Through synthesis of the interview answers, a few unexpected practitioners' perspectives emerged as conclusions. First, there are no incentives for DoD programs to implement CAIV. Second, limited accountability is placed on programs to utilized CAIV. Third, CAIV has lost most of its momentum. Fourth, DoD have substituted budget for the cost in CAIV. Last, a window of opportunity might be on the horizon to reintroduce a new and improved CAIV.</p>				
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