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Case analysis of the U.S. Army Warfighting Rapid Acquisition Program: Bradley Stinger Fighting Vehicle -- Enhanced weapon system

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THESIS

CASE ANALYSIS OF THE U.S. ARMY WARFIGHTING RAPID ACQUISITION PROGRAM: BRADLEY STINGER FIGHTING VEHICLE -- ENHANCED WEAPON SYSTEM

by

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June 1996

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With the Department of Defense's budget continuing to be reduced, Army acquisition managers must acquire superior weapon systems within shorter time periods with less resources. One effective way to accomplish this with relatively small, urgently needed acquisition programs is through the Army's Warfighting Rapid Acquisition Program (WRAP).

This thesis uses a case study of the Bradley Stinger Fighting Vehicle-Enhanced (BSFV-E) air defense system to determine the impact of the WRAP upon accelerated acquisition. WRAP transitions compelling US Army Training and Doctrine Command Battle Lab successes into rapid acquisition successes. Lessons learned from the BSFV-E case are identified which might be used by other acquisition managers to effectively manage programs which emerge as Battle Lab experimentation successes and are approved for rapid acquisition through the WRAP process.

One lesson learned is that BSFV-E's streamlined acquisition process permitted a significant reduction in the administrative and procedural requirements which typically burden systems development. Also, this case study identified that lack of funding for WRAP programs such as the BSFV-E can potentially transform a rapid acquisition effort into a business-as-usual program. This study concludes that the BSFV-E is an excellent acquisition streamlining role model.

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With the Department of Defense's budget continuing to be reduced, Army acquisition managers must acquire superior weapon systems within shorter time periods with less resources. One effective way to accomplish this with relatively small, urgently needed acquisition programs is through the Army's Warfighting Rapid Acquisition Program (WRAP).

This thesis uses a case study of the Bradley Stinger Fighting Vehicle-Enhanced (BSFV-E) air defense system to determine the impact of the WRAP upon accelerated acquisition. WRAP transitions compelling US Army Training and Doctrine Command Battle Lab successes into rapid acquisition successes. Lessons learned from the BSFV-E case are identified which might be used by other acquisition managers to effectively manage programs which emerge as Battle Lab experimentation successes and are approved for rapid acquisition through the WRAP process.

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I. INTRODUCTION

A. BACKGROUND

Just as the document "From the Sea" has shaped the way the United States Navy will fight in the future, the Army's "Force XXI Campaign" provides that Service's current overarching vision. Force XXI is the Army framework which balances today's operational challenges with an understanding of what capabilities are needed to meet future challenges. In light of the rapidly increasing rate of change in both technological advancements and the strategic global environment, the Army must enter the business of "changing the way it changes." [Ref. 1]

In May 1992, the United States Army Training and Doctrine Command (TRADOC) Battle Laboratories (Battle Labs) were founded to help identify the components needed by the Army to stay at the forefront of this wave of change. These TRADOC organizations were charged with the mission of cataloging and experimenting with warfighting concepts and requirements for new doctrine, training, leader development, organizations, materiel and soldier systems (DTLOMS). By addressing DTLOMS, Battle Labs streamlined the inter-relationships between concept development, generation of requirements, development of solutions, and operational testing. In addition to concentrating on the areas traditionally sponsored by TRADOC agencies such as tactics, techniques, and procedures, Battle Labs also focused upon the potential benefits provided by both mature and newly emerging technologies in the field of materiel development.

One example of a streamlined materiel development tool which developed from this Battle Lab warfighting experimentation is the Army's Warfighting Rapid Acquisition Program (WRAP). WRAP was implemented to transition Battle Lab warfighting experiment successes into successful streamlined acquisition programs.

This thesis examines the effectiveness of WRAP through a case analysis of the development of the BSFV-E (Bradley Stinger Fighting Vehicle-Enhanced), or Bradley Linebacker, air defense system. The BSFV-E program is one of the Army's first WRAP ventures. Many lessons have been learned from analysis of the BSFV-E program. However, because the BSFV-E program constitutes only one data point, it is impossible to

say that the lessons learned from the BSFV-E case study have general applicability to all other systems and Battle Labs in the Army.

B. OBJECTIVE

The purpose of this thesis is to examine the impact that the Army's Warfighting Rapid Acquisition Program had upon acquisition streamlining using a case analysis of the BSFV-E program. Lessons will be identified that may help other acquisition managers to more effectively manage similar programs and help students studying acquisition management.

C. RESEARCH QUESTIONS

The following primary research question asks: what impact has the Army's Warfighting Rapid Acquisition Program had in influencing acquisition streamlining as evidenced by a case study of the BSFV-E program?

The subsidiary questions are:

- What significant role do the Battle Labs play in the Army today?
- Is the BSFV-E program a good example of proven acquisition reform? Why?

D. SCOPE

This thesis covers only those aspects relating to the BSFV-E program, WRAP and TRADOC Battle Labs' Advanced Warfighting Experiments. Additionally, because this thesis focuses primarily on the program management and not on technical aspects, classified aspects of the BSFV-E will not be included.

E. LITERATURE REVIEWS AND METHODOLOGY

Background research was obtained from periodicals, reports, papers, DoD documents, and US Army manuals obtained from the Defense Technical Information

Center (DTIC), the Defense Logistics Studies Information Exchange (DLSIE), and the Naval Postgraduate School Library. The Forward Area Air Defense (FAAD) Project Office at Redstone Arsenal, Alabama was the primary source of information on the BSFV-E. Interviews with current and former BSFV-E program personnel were conducted and program documents were examined. Additional program information came from:

- Boeing Aerospace, Missiles & Space Division of the Boeing Defense & Space Group, Huntsville, Alabama
- Hughes Missile Systems Company, Tucson, Arizona
- United Defense Limited Partnership, San Jose, California.

For the WRAP and Battle Lab information, interviews were also conducted with personnel from:

- Assistant Secretary of the Army, Research, Development and Acquisition, Washington D.C.
- Commanding General, TRADOC, Fort Monroe, Virginia
- Office of the Deputy Chief of Staff for Combat Developments, Headquarters, TRADOC, Fort Monroe, Virginia
- Battle Lab Integration, Technology, and Concepts Directorate, TRADOC, Fort Monroe, Virginia
- Program Management and Policy Division, Headquarters, TRADOC, Fort Monroe, Virginia
- Directorate of Combat Developments, US Army Air Defense Artillery School, Fort Bliss, Texas
- Forward Area Air Defense TRADOC System Manager, Fort Bliss, Texas
- Air Defense Lab, US Army Air Defense Artillery School, Fort Bliss, Texas.

F. DEFINITIONS AND ACRONYMS

Concepts used in this thesis are based upon DoD and Army definitions and acronyms relate to aspects of acquisition management, the Battle Labs, and BSFV-E

program. Definition of acquisition and program terms are provided throughout the thesis where needed. Appendix A provides a consolidated list of acronyms.

G. ORGANIZATION

The organization of this thesis includes an introduction, three development chapters and a final chapter of conclusions and recommendations. Chapter II provides a brief review of how the Army's Warfighting Rapid Acquisition Program (WRAP) has developed from the Army's Force XXI vision and TRADOC Battle Labs. Chapter III provides an analysis of the acquisition strategy used in the BSFV-E acquisition program. Chapter IV examines the effectiveness of WRAP and other acquisition streamlining measures used in the BSFV-E program. Chapter V presents conclusions and recommendations. Thesis organization is graphically depicted in Figure 1-1.

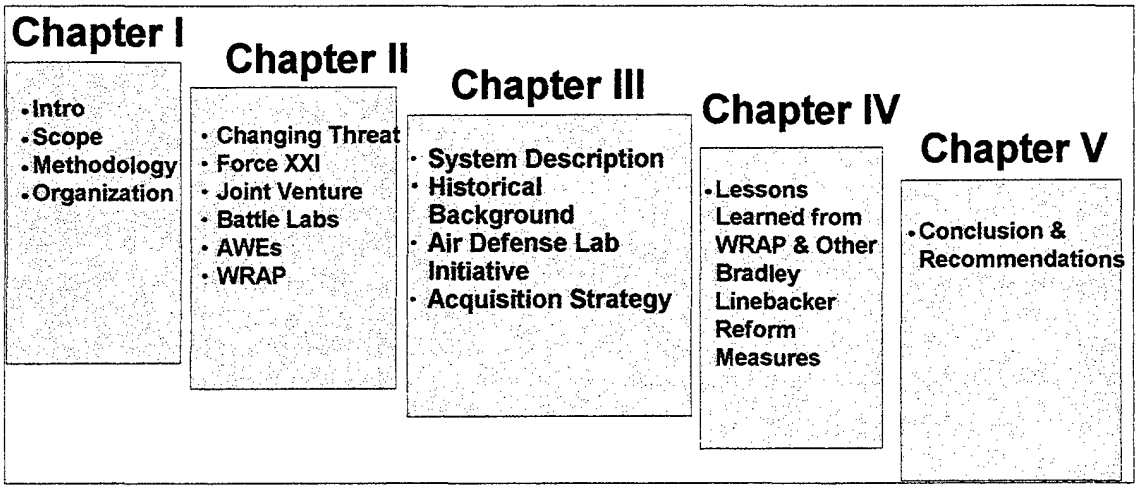

Figure 1-1. Thesis Organization

II. WRAP: TRANSITIONING BATTLE LAB SUCCESSES INTO STREAMLINED ACQUISITION

A. INTRODUCTION

This chapter will review the Training and Doctrine Command (TRADOC) Battle Lab program and will highlight one of the materiel development tools TRADOC provides to the Army to accomplish acquisition reform. This tool, the Warfighting Rapid Acquisition Program (WRAP), will be described in detail. In order to understand this WRAP process, one will need to know the components preceding it; these components are illustrated in a "waterfall" design which is depicted below in Figure 2-1. To accomplish this goal of describing WRAP, this chapter will begin by describing the nature of today's changing threat environment and how the Army has developed the current Force XXI concept to address the threat. Discussion will include highlighting how the Army uses doctrine, digital technologies and simulations to enhance Force XXI capabilities. This will be followed by an examination of Force XXI's Joint Venture program, TRADOC's program to transition the Army's operational forces into Force XXI, followed by a discussion of the Battle Labs themselves. Discussion of the Battle Labs will highlight their significant role within the Army today, especially one form of Battle Lab experimentation: the Advanced Warfighting Experiment (AWE). Although Battle Labs are involved in many different types of experiments besides these AWEs, this thesis will only discuss AWEs because the WRAP process relies upon accelerating the procurement of AWE-proven systems, specifically. Finally, Chapter II concludes with a discussion of the WRAP process itself and how it is linked to the Battle Lab warfighting experimentation found in AWEs.

Most of this discussion will not expressly address the BSFV-E weapon system; rather, it will provide a foundation for understanding some of the processes which influenced the development of the BSFV-E program. The relationship between WRAP and the BSFV-E program will not be specifically addressed until later in Chapters III and IV.

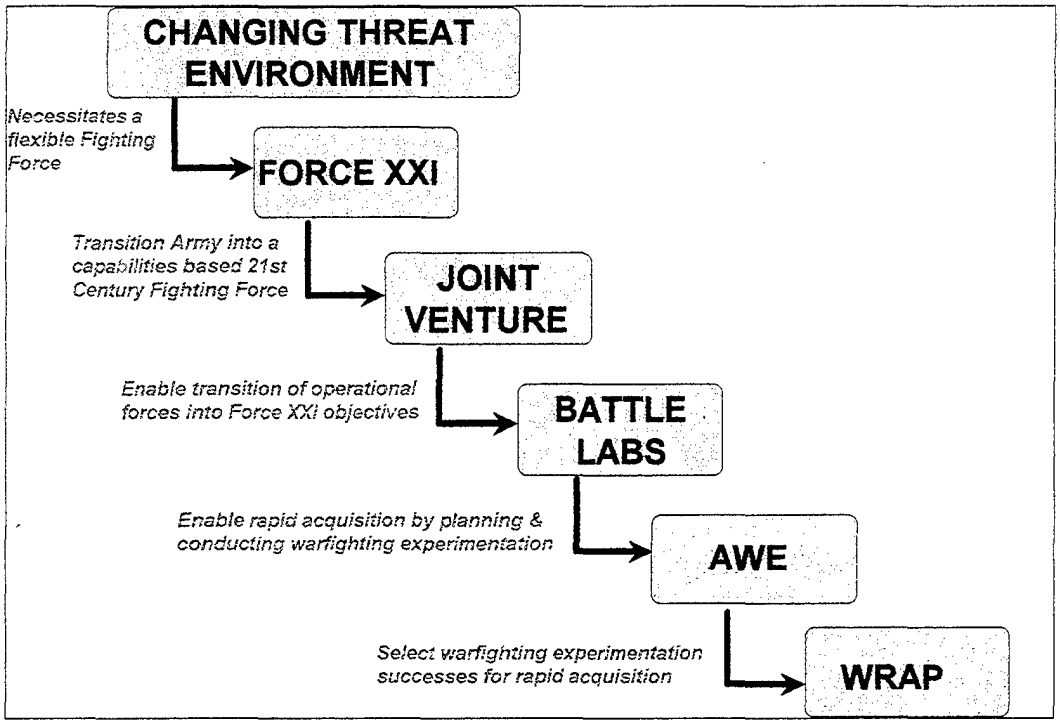

Figure 2-1. Chapter II Framework [Developed by Researcher]

B. CHANGING THREAT ENVIRONMENT

The Army has completed its transition from a Cold War fighting force primarily focused on the Soviet threat in the central European theater, to that of a power projection Army based primarily in the United States. Instead of facing a single organized threat which has been under American scrutiny for nearly half a century, this nation's military is now confronted with an environment where the only certainty is that the threat of today and tomorrow is not well known and is not likely to remain static. While facing an adversarial Soviet Union in the past may have fostered great tension, there was a certain solace in knowing who the enemy was. This certainty does not exist in today's global environment. Before the collapse of the Soviet Union, the science and technology developmental efforts of America's military-industrial complex were able to focus on a single enemy. Military strategy and supporting weapons research and development were primarily threat driven and relatively focused. Contemporary budget constraints and America's adoption of a two, near-simultaneous, medium regional conflict (MRC) based

national military strategy have resulted in a shift from the forward-deployed military presence strategy of the past.

Further complicating this ambiguity is an ever increasing global availability of threatening technology. In the past, the technology used in developing weapons of mass destruction was only possessed by a handful of countries. Now, the proliferation of relatively cheap yet effective technology, such as that found in ballistic missiles, is widely available to any nation who can pay for such a capability. This wide availability also presents a problem because it is difficult to discern just who has what threat capability now. Also contributing to this challenge is the rapid pace at which this technology advances today.

This dynamic change in today's environment presents a more difficult challenge to the Army than that posed in the past when America's military focused on getting inside the Soviet Union's military decision cycle to head off the threat. The ability to turn inside an opponent's decision cycle is significantly hampered when the Army does not even know whose decision cycle it should be concentrating against. The current TRADOC Commander, General Hartzog [Ref. 4], recognizes this change in the Army's environment; he states that America's Army will be required to deploy globally and should be prepared to conduct any land operations across the operational continuum -- the Army must be prepared for:

- Warfighting
- Deterrence
- Peacetime contingency operations
- Domestic support
- Overseas presence
- Conflict prevention.

The Army is confronted with the need to change in the face of such global realities as shifts in the international balance of power, explosive growth of high technology and changing US national priorities. All of these factors combine to challenge the Army with a

fundamental shift in what constitutes the environment. The changing way the Army looks at this threat is depicted in Figure 2-2.

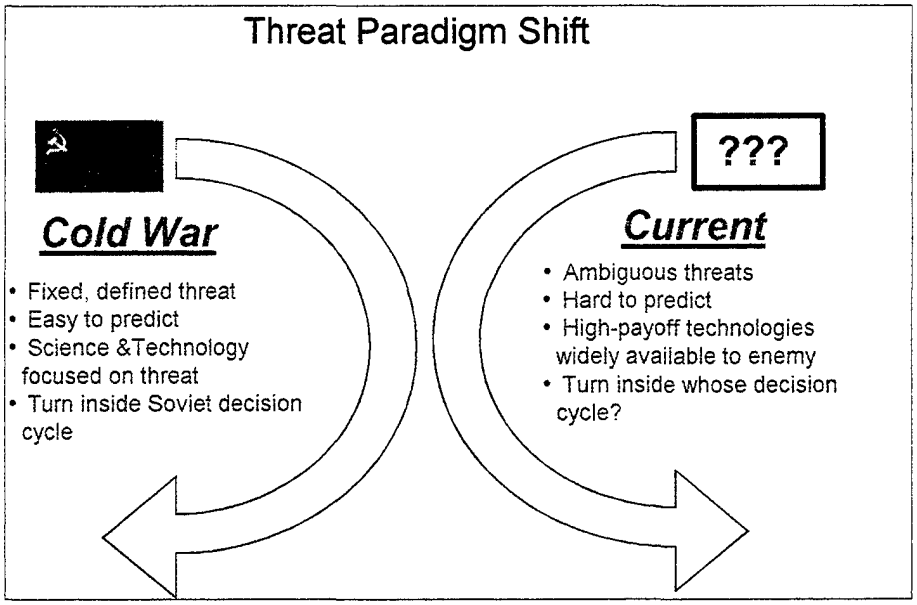

Figure 2-2. Threat Paradigm Shift After Ref. [3]

C. FORCE XXI

The Army's senior leadership has recognized the changing nature of today's threat. To address the uncertainties of this dynamic environment, the Army's leadership realized that the Army's way of thinking about warfighting had to change and be as flexible as the threat it had to counter. To face this threat and prepare itself for the changing environment, the Army developed a framework which would capitalize on a flexible and capable force which would be effective well into the 21st century. The framework of this capabilities-based Army became known as the "Force XXI Campaign" plan.

By committing to this profound and critical transformation towards the Army of the future, the Army has built a strong, flexible stance from which to address the changing nature of future threats. Furthermore, in adopting this new stance, the Army has also recognized the related need to design an Army for the 21st Century around information technology. At the core of this transition remains the Army's need to stay trained and

prepared in order to meet the needs of the country during a time of dwindling resources. [Ref. 2]

According to the principal architect, former Army Chief of Staff, General Sullivan, the mission of Force XXI is for: " the US Army (to) design the 21st century force ... to achieve related fielding and support decisions by the year 2000 in order to fully field the total Army force that is capable of meeting our Nation's 21st century challenges ... from foxhole to factory and front to rear." [Ref. 7]

Force XXI has been called America's Army for the 21st Century. It is the rethinking and reinvention of the force at all echelons so that the Army will be ready to perform whenever called upon in this ever-increasingly volatile and dynamic world. Crucial to this design is the structure of Force XXI around information and information technologies. One critical factor of this new plan is the capability to exploit information in innovative ways. Information, the reliance upon microprocessors and the myriad digital technologies emerging today, will be integrated in such a way that future capabilities will result in greatly enhanced coordination, accuracy and target destruction. [Ref. 2]

Force XXI significantly streamlines the process of fielding new capabilities through the horizontal integration of warfighting requirements and development of multiple solutions at the same time. In the Force XXI framework, information serves as the mechanism through which the leaders and soldiers of the Army are empowered to be more effective. This is a new way to think about controlling an army. Force XXI concentrates on building the Army around information management instead of killing systems [Ref. 9].

Force XXI is best characterized as a continual learning process which is always subject to revision. This necessitates an environment where enhancements can be experimented with and the future can be explored in innovative, integrated ways. General Sullivan's underlying assumption in his vision for Force XXI was that no final solution would ever be presumed; instead, he used the notion of a "rolling baseline" in which operational and experimental experiences would be melded with study and doctrinal research. The results would then continue to be interpreted by senior Army leadership in order to determine where the Army should focus its efforts. [Ref. 2]

To implement this process, General Sullivan envisioned the use of "doctrine as the engine of change" which entailed using doctrinal standards to drive the Army's training, combat development, and investment strategy in the brave new world of the Information Age. General Sullivan further noted that doctrine was a reflection of technology, or what he called the "tools of war." Doctrine and technology serve as the conceptual sources from which the Army's schoolhouses construct the tactics, techniques, and procedures for the units comprising the Force XXI Army. [Ref. 2]

This rethinking of the Army is the result of several significant factors in America today:

- A shift from a singular, clearly defined threat to facing countless poorly defined threats
- A shift from an anti-Soviet defense model rooted in the Cold War to a national military strategy founded upon force projection
- The progression of America from the industrial era to the information age.

The transition of today's Army into Force XXI is based upon the Army implementing changes in the following three areas:

- Doctrine
- Digital Technologies
- Simulations.

1. Doctrine

Innovative doctrine for the 21st Century affects how the Army thinks, acts, and ultimately, what it becomes. In light of this, the service has been aggressively developing new doctrine and revising existing manuals. In 1993, the Army significantly updated its keystone warfighting text, Field Manual 100-5, *Operations*. Publication of FM 100-5 marked the adoption of a doctrine of full-dimensional operations. It stressed the principles needed to maintain the edge in future theaters of war and showed how the art of battle command applied to those principles in a wide range of battlefield scenarios. This doctrine

was a fundamental shift from the narrower, more deterministic approach of the Cold War, with its focus on Central Europe.

Even more recently, the Army released Training and Doctrine Command Pamphlet 525-5, *Force XXI Operations,* which provides the conceptual framework for changing the Army from a power projection force to an information age, full-dimensional force for the 21st Century. It is apparent that one of the Army's advantages for the future will rest on its ability to master information operations. *Force XXI Operations* examines the impact of information age technologies on the operational environment of the future. It also suggests crucial battle dynamics to be used if America is to continue to have the most powerful Army on earth. Perhaps most importantly, *Force XXI Operations* provides a clear direction for the future of Army operations on the joint battlefield of tomorrow. [Ref. 8]

2. Modernization and Digital Technologies

Another method for increasing capabilities in the Army force is to enhance equipment already in the field. The Army expects to accomplish this through the application of advanced computer technologies across existing weapon systems. By improving the information component of these families of systems, this activity (known as horizontal technology insertion) will produce synergistic improvements in equipment capability, performance, and total combat power. For example, in the spring of 1994, the Army's first digitized National Training Center (NTC) combat unit rotation 94-07, Operation Desert Hammer, at Fort Irwin, California, demonstrated that the digitization of an armored task force could significantly improve its lethality and survivability. Horizontal technology insertion across today's weapon systems is a potentially cost-effective means to achieve the objectives of Force XXI and dominate the 21st Century battlefield. [Ref. 5]

These Force XXI Modernization Objectives [Ref. 6:p. 13], later referred to as Army Modernization Objectives, include the five following enhanced capabilities:

- Winning the information war
- Conducting precision strikes
- Projecting and sustaining combat power

- Dominating maneuver
- Protection of the force.

3. Simulations

When the Army was forced to rely on large scale maneuvers for force development experiments, it looked at what existed at the time and imagined the rest. Now, the Army uses modern simulation systems to evaluate the possibilities for today, tomorrow, and the future. Nearly any option conceived today can be simulated.

The advent of the high performance microprocessor allows the military planner to:

- Replicate through simulation battlefield engagements using current tactics with current equipment
- Simulate combat systems that do not exist yet
- Run simulated battlefield scenarios over and over, varying different aspects.

The Army classifies simulations into three categories. The first category is live simulations which are those conducted with real equipment and soldiers in a training environment that mimics combat conditions. Classic examples include the Army's training rotations at the National Training Center (NTC) and other Combat Training Centers (CTCs).

Virtual simulations comprise the second category. Typically, these simulations are conducted with electronic mock-ups of real weapon systems which use computers to replicate on-board systems and the external combat environment. Flight and tank gunnery simulators are illustrative of these kinds of simulations.

The final category consists of constructive simulations which replicate combat in the form of computer modeled war games. In some of these, the computer provides the participants with a graphical representation of the operational situation, allowing them to influence the situation. These models allow the Army to exercise in war games against a competent and active opponent. Other simulations run independently of human interaction once initial parameters and data are established.

All three forms of simulation have proven to be extremely effective training and developmental tools. They provide the military with a rich variety of combat scenarios and offer a means to customize training and development to the desired level. Today, simulations are used routinely and are combined in innovative and important ways. Perhaps most importantly, they serve as the principal tool of the Army Battle Labs and are increasingly useful in assisting the service to evolve into tomorrow's Army. [Ref. 6:p. 11]

The Army has organized its efforts to achieve the 21st century force to best capitalize on these doctrinal changes, digital technologies and use of simulations. It has formulated its "Force XXI Campaign Plan" [Ref. 7] to achieve an enormous transformation based upon three axes, or programs (refer to Figure 2-3):

- The redesign of operational forces -- i.e., the units assigned to the unified commands (what General Sullivan referred to as the Little "a" Army) -- Joint Venture
- The redesign of the Institutional Army -- (Big "A" Army)
- The development and acquisition of information age technologies and capabilities (under the auspices of the Army Digitization Office, ADO).

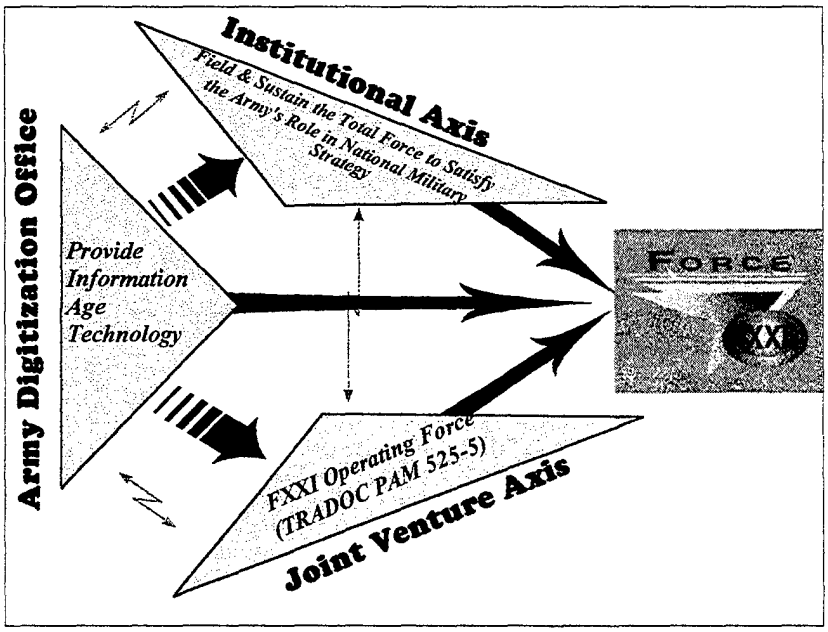

Figure 2-3. Three Axes comprising Force XXI Campaign
[Developed by Researcher]

Each of these axes interrelates with the other two. All these axes provide feedback between one another, but the ADO axis serves as a driver for the Join Venture and Institutional axes. Most importantly, when combined, these three axes represent a single purpose: the redesign of the Army for the 21st century.

Through the utilization of an iterative series of rapid experimentation, learning, and decision making along these three vectors, Force XXI provides the necessary critical components, processes, and change needed for fielding America's 21st century Army. General Sullivan intended to "control the power of information and technology and incorporate unprecedented battle command capabilities in order to ensure increased capabilities for a more lethal, more mobile, and more survivable fighting force by exploiting the Army's modernization focus." Force XXI provides a tightly woven series of cyclical actions which identify and incorporate design tools and experiments to reach interim solutions. [Ref. 7]

D. JOINT VENTURE

Joint Venture is a TRADOC Force XXI program which plans, develops and executes change of the Army's operational forces through an iterative cycle of concept development, force design and experimentation. [Ref. 3]

The reengineering of the operational forces found in the unified commands is called Joint Venture because it frames a partnership or teaming of all the Army's major commands with the Army staff while concurrently exploring new concepts previously unknown. Headed by the TRADOC Commander who is responsible for its overall coordination, Joint Venture is based upon design principles which were intended by General Sullivan to symbolize the best judgment of the four star commanders on how to "organize around information."

Joint Venture provides the means to reengineer operational concepts, units, and the Army's sustaining base to achieve victory on tomorrow's battlefields. The experimental process has been developed to gain insights into improved performance measured against relevant mission requirements of the future. Whenever possible, this experimentation is

designed to be fully integrated and synchronized, but it can be sequential when necessary. Joint Venture takes the best of what the Army has today by way of values and culture and integrates these into the Force XXI of tomorrow. The personnel involved in Joint Venture recognize that the quantum leaps in effectiveness wrought by Force XXI via the discovery of successful "nuggets" will be accompanied by ineffective measures as well. Though it seeks to achieve real discovery, it also has accounted for and accepts the occurrence of some false leads and failures.

E. BATTLE LABS

Battle Labs are TRADOC organizations which plan and conduct the Army's warfighting experiments to provide senior Army leadership with additional battlefield insights.

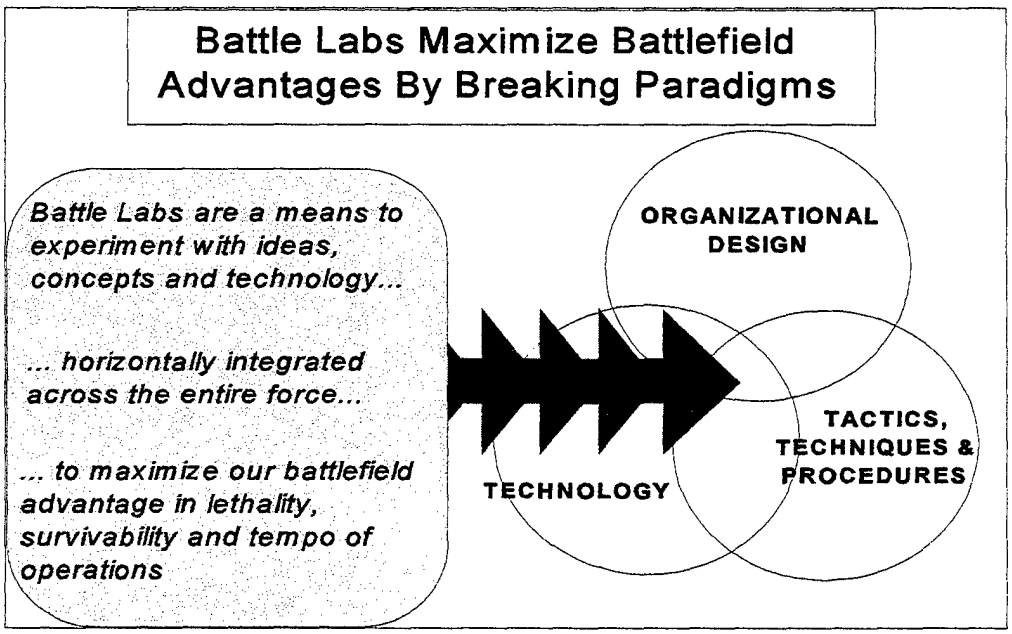

Figure 2-4. Battle Labs Maximize Battlefield Advantages After Ref. [3]

Organized in April 1992, Battle Laboratories are a TRADOC-led innovation to evoke the image of soldiers experimenting with warfighting concepts in order to generate battlefield insights. They were created as a means of preserving the US Army's edge in contemporary strategic, policy, threat, and technology environments. Battle Labs provide a focused TRADOC effort to institutionalize new warfighting ideas, technologies, and techniques and are designed and organized to rapidly modify/improve battlefield capabilities through experimentation. Battle Labs were created to prevent the generation of requirements in a vacuum. Figure 2-4 above depicts how Battle Labs maximize the Army's combat effectiveness by implementing changes in organizational design, technology and tactics, techniques and procedures (TTP).

As a National Performance Review Reinvention Laboratory, Army Battle Labs support TRADOC's Joint Venture effort [Ref. 6:p. 4] by providing a flexible means to identify better ways to conduct warfighting. As hosts of an exchange between the Army and industry's technology, research and development communities, Battle Labs identify which technology has the greatest warfighting potential and follow this up with insights for future resourcing decisions. "TRADOC established six Battle Labs to identify, develop and experiment with new warfighting concepts and capabilities offered by emerging technologies. They are the test beds for the major Force XXI experiments." [Ref. 14]

Battle labs examine changing the nature of warfighting through the use of battlefield dynamics concepts by involving the Army staff, Army Materiel Command (AMC), Operational Test and Evaluation Command (OPTEC), operational forces around the world, and other Services in their activities. Battlefield dynamic concepts comprise the organizational structure of TRADOC's Battle Labs and include:

- Depth and Simultaneous Attack (DS&A)
- Early Entry, Lethality and Survivability (EELS)
- Battle Command (BC)
- Combat Service Support (CSS)
- Dismounted Battle Space (DBS)
- Mounted Battle Space (DBS).

The Battle Labs are involved in the following types of experiments in order to facilitate the exploration of new warfighting concept:

- Simulations
- Advanced Technology Demonstrations (ATDs)
- Advanced Concepts in Technology Demonstrations (ACTDs)
- Advanced Warfighting Experiments (AWEs)
- Experimental Force (EXFOR).

Simulations furnish "proof of principle" by exercising prototyped organizations, technology, and doctrine. The maturity of these technologies can then be assessed by the ATDs and ACTDs. The application of technology to the Army's warfighting organizations can be rigorously tested through AWEs. Finally, the EXFOR allows real soldiers and units the opportunity to confirm the changes found by the analysis and simulation. The resulting synergy from the combination of these five components produces a product which identifies, acquires, and assimilates emerging technologies, then integrates this technology with organizational/doctrinal changes swiftly and accurately [Ref. 10]. Only one of these five components will be addressed in detail later in the chapter because the others are outside the scope of this thesis. This thesis will be limited to a discussion of the Advanced Warfighting Experiment because it is this Battle Lab initiative which enables the Warfighting Rapid Acquisition Program (WRAP) to provide a means of accelerated acquisition for the Army.

Within TRADOC, Battle Labs report directly to the TRADOC Commander, but they are not subordinate to any service school, center, or other TRADOC activity. Each of these labs has a general officer, chartered by the TRADOC Commander, who is responsible for the overall direction, oversight, and integration of actions regarding their respective battlefield dynamic area. Battlefield dynamic areas include all related combat and force development efforts across the doctrine, training, leader development, organizations, materiel and soldier systems (DTLOMS) spectrum. Staffed with multi-disciplinary personnel that represent the combined arms and services teams, they are supported by operations research and systems analysis (ORSA) and Acquisition Corps

personnel. In addition to the actual Battle Labs, all TRADOC service schools and centers have Battle Lab Support Elements (BLSEs) in their respective headquarters organizations which manage service school/center involvement in Battle Lab experiments. Since the nature of the experimentation calls for a horizontal insertion across the Army, Battle Labs are also supported by representatives from AMC, Research Development and Engineering Centers (RDECs), OPTEC, and the Army Science Board (ASB). Finally, the TRADOC Office of the Deputy Chief of Staff for Combat Developments serves as the Battle Labs Program executive agency. [Ref. 11] The various Battle Labs are explained below. The Battle Lab process is depicted in Figure 2-5; it illustrates how Battle Labs can be used by the Army to examine concepts to determine if they need to be:

- Experimented with further
- Revised conceptually
- Fielded to the force
- Discarded.

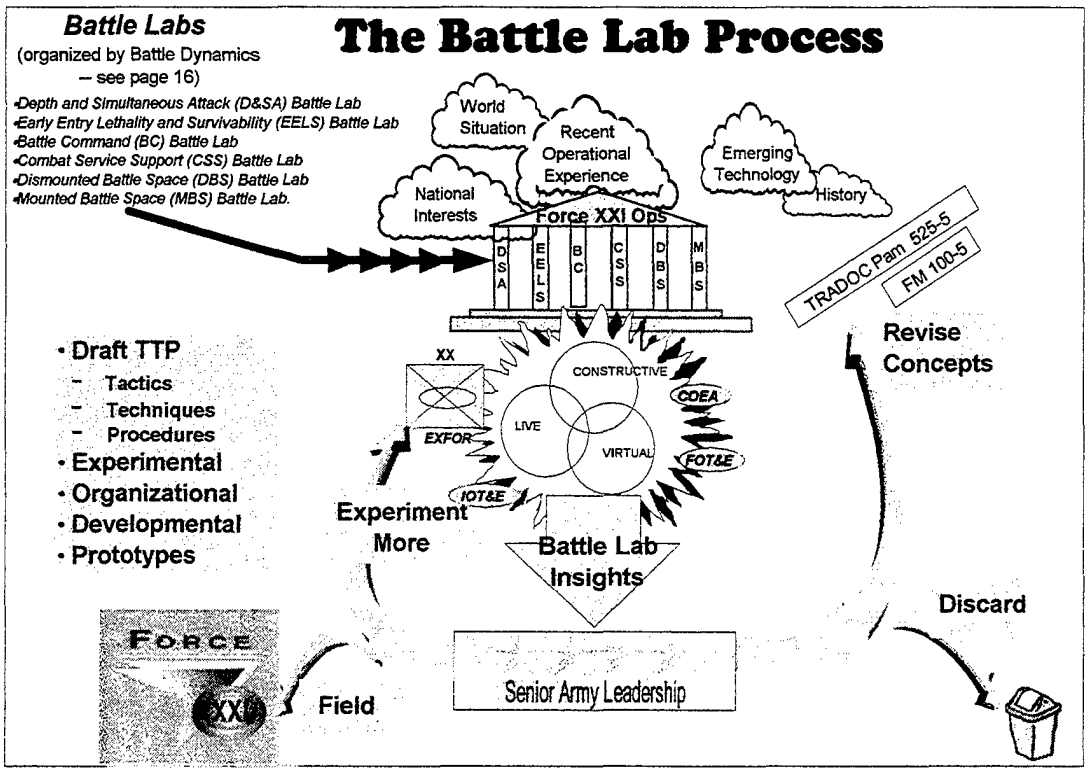

Figure 2-5. Battle Lab Process After Ref. [3]

There are currently six operational TRADOC Battle Labs which correspond to the battle dynamics. They are described below.

The Depth and Simultaneous Attack (DS&A) Battle Lab, located at Fort Sill, Oklahoma, explores how to:

- Refine requirements to detect and identify enemy forces throughout the depth of the battlefield
- Transfer that message in near-real-time from sensors to enagagement systems
- Conduct unilateral and joint strikes to defeat them.

The Early Entry Lethality and Survivability (EELS) Lab, based in Fort Monroe, Virginia, concentrates its efforts on how to:

- Enhance projection planning, preparation and execution capabilities to speed up timetables to quickly deploy/redeploy forces
- Experiment with existing, future, and alternative means to improve strategic mobility
- Integrate the unique capabilities of other Services and the special operations forces (SOF).

The Battle Command (BC) Battle Lab has elements at Fort Leavenworth, Kansas; Fort Gordon, Georgia; and Fort Huachuca, Arizona. Together, all three elements integrate TRADOC activity which involves the art and science of battle command and information warfare. The Battle Command Battle Lab experiments with:

- The "art of command"
- Issues regarding the technical methods of command and communications
- Issues concerning intelligence collection and dissemination.

The charter of the Fort Lee, Virginia-based Combat Service Support (CSS) Battle Lab is to provide the overall direction and horizontal integration for the combat service support battlefield dynamic area which entails getting the right resources to the right place at the right time, every time.

Located at Fort Benning, Georgia, the Dismounted Battle Space (DBS) Lab is chartered with integrating all TRADOC activities which deal with soldiers operating in the dismounted battle space.

The final TRADOC Battle Lab, the Mounted Battle Space (MBS) Battle Lab, which is based at Fort Knox, Kentucky, is charged with the responsibility of preparing the Army to win in the mounted battle space.

The Battle Lab locations are depicted in Figure 2-6.

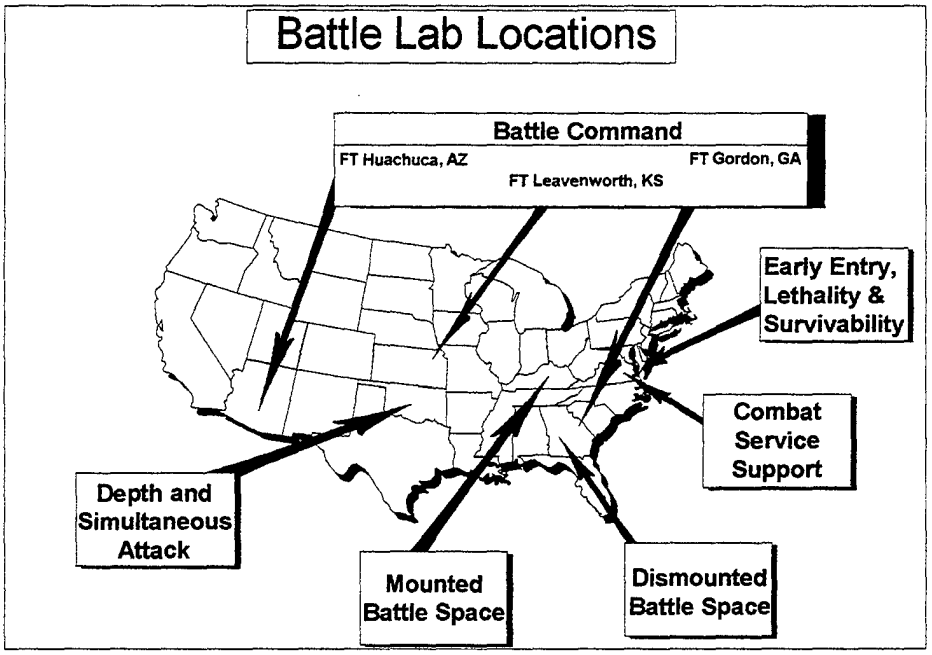

Figure 2-6. TRADOC Battle Lab Locations After Ref. [6]

The foremost focus of the Battle Lab process is the development of today's Army into the 21st Century Army. This focus includes all five of the Force XXI objectives espoused by General Sullivan in his "Army Modernization Objectives," listed earlier in this chapter on page 11. Battle Labs are charged with the responsibility for using interactive Advanced Warfighting Experiments to support the crucial decisions the Army must make about future DTLOMS issues. [Ref. 6: p.13]

F. ADVANCED WARFIGHTING EXPERIMENTS

Advanced Warfighting Experiments are Battle Lab conducted experiments using field soldiers, real units and relevant scenarios to provide Army leadership with ways to increase warfighting capabilities.

One principal tool of the Force XXI Campaign is the experimental methodology established in the Battlefield Laboratories Program. The digitized Army of the 21st Century will depend upon experiential data provided by Advanced Warfighting Experiments (AWE) conducted by the Battle Labs. The AWEs are warfighting exercises in which new technology is put through its paces, and new doctrine and unit designs are tested. Conducted in a series of iterative cycles, these experiments take place from company to corps level and provide the information for interim design decisions and future experiments. Warfighting experimentation is depicted in Figure 2-7.

These resource intensive, Chief of Staff of the Army approved exercises are supported by multi-disciplinary integrated concept teams (ICTs). The ICT methodology is to "brainstorm concepts from both visionary and practical perspectives with the goal of shortening the requirements determination 'event' by providing better early focus [Ref. 12]." The use of ICTs in AWEs helps Army leaders make better and faster decisions. "Integrated concept teams are partnerships between those who do the warfighting, those who develop and test equipment, and those who buy the equipment [Ref. 4]." Complementing the existing integrated product team (IPT) process used by materiel developers to manage system development, ICTs consist of representatives from [Ref. 12:p. 6]:

- Combat Developers
- Training Developers
- Materiel Developers
- Testers
- Cost Analysts
- Acquisition and Contracting Specialists
- Science & Technology (S&T) agencies

- Academia
- Industry
- Battle Labs.

The policies, procedures, and responsibilities of the Battle Labs are outlined in TRADOC Regulation 11-1. This document identifies AWEs as the center piece of the Battle Lab process. This process begins with the formulation of hypotheses to enhance battle results through improvements in lethality and survivability. A solution is selected based on technology, training, organizational or doctrine change, and that solution is then carried forward to design of experiments. These experiments are then executed through a combination of constructive and virtual simulations. If a hypothesis requires additional validation, Battle Labs conduct AWEs against an opposing force to make the assessment as realistic and rigorous as possible. [Ref. 13]

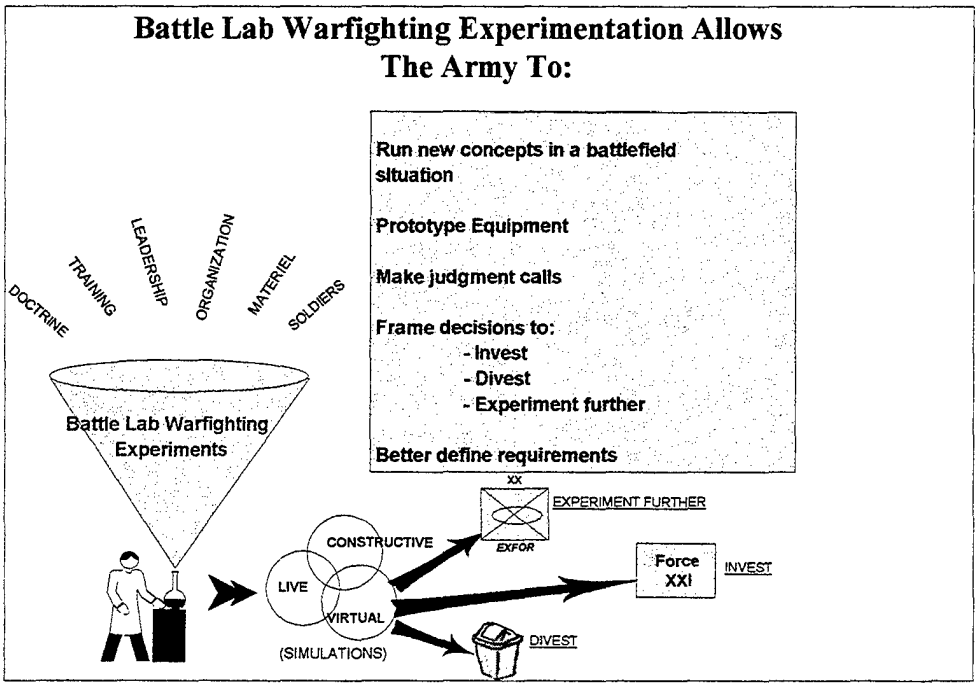

Figure 2-7. Warfighting Experimentation After Ref. [3]

The following two sub-sections provide an illustration of two actual Advanced Warfighting Experiments -- one from the past and one scheduled for the near future. The

first, Operation Hammer, was conducted in the Spring of 1994. The second, Task Force XXI, is scheduled for March 1997.

1. Operation Desert Hammer

One past example of integrating technology and experiments with training occurred at the National Training Center in April 1994 (NTC combat unit rotation 94-07), during an advanced warfighting experiment called Operation Desert Hammer. The purpose of this AWE was to test the following central hypothesis: if digital electronics and developmental systems are horizontally inserted into an existing organization, using current doctrine and tactics, then increases in lethality, survivability, and tempo across the force will be achieved. Operation Desert Hammer was not designed to strictly control for each of the developmental systems and digitization equipment used in this warfighting experiment. Instead, it examined the many information-age technologies used in this experiment in an attempt to gain broad insights on their warfighting benefits and determine where the Army stood in terms of providing doctrine, training, organizations, and equipment for future combat units.

In this Desert Hammer AWE, a battalion task force and its supporting elements became the first formation of that size to be digitized. In two weeks of intense, force-on-force maneuver and live-fire training, deployed units honed their warfighting and leadership skills in the same manner as other combined arms forces that train throughout the year in the desert environment of Fort Irwin, California. What was unique about this event was that the training force was linked with digital technology in a realistic combat environment. Participating Desert Hammer units achieved demanding training objectives while simultaneously experimenting with state-of-the-art equipment and technology.

A platoon of digitized Bradley Stinger Fighting Vehicles (BSFVs) from the Air Defense Artillery (ADA) community participated in this AWE and achieved impressive results. This platoon of BSFVs, comprised of Man Portable Air Defense System (MANPADS) Stinger teams deployed on Bradley Infantry Fighting Vehicles, were equipped with digital forward area air defense command and control equipment for early

warning (cueing)/situational awareness and were joined by a single modified BSFV system called the BSFV-E (Enhanced). This BSFV-E possessed the additional capability of engaging airborne threats with a vehicle mounted Stinger launcher (which obviated the need for the BSFV-E's Stinger team to leave the armored protection of the vehicle in order to fire their Stinger missiles).

Using this complement of BSFVs and BSFV-E air defense weapon systems, air defense personnel set a National Training Center record by registering a more than 80 percent aerial target kill rate. Numbers of air defense engagements made possible by this enhanced information sharing nearly doubled the number of kills made when compared with previous non-digitized NTC rotations. These statistics highlight the increase in air defense lethality gained by the successful sharing of digitized information. This information sharing led to another positive result when Blue force losses to enemy air attack dropped from 2.8 to 1.7 systems per battle during a deliberate attack mission. National Training Center combat unit rotation 94-07 is depicted in Figure 2-8 below. [Ref. 5] [Ref. 12]

Digitized Battlefield: NTC 94-07

Conducted by the Mounted Battlespace Lab

Tested effect of horizontal insertion of developmental items upon lethality, survivability and tempo of existing organizations

BSFV-E prototype participated in ADA C2I cueing and situational awareness exercises:

Air defense fires doubled in number of engagements
Losses to enemy air attack dropped from 2.8 to 1.7 Blue Force systems per battle
Set NTC record by registering an 80+% aerial target kill rate versus the average of 42%

BOTTOM LINE:

Significant increases in lethality and survivability result from application of horizontal insertion.

Figure 2-8. Operation Desert Hammer (NTC 94-07) After Ref. [5]

In addition to exemplifying how digitization of the force can increase lethality, this Operation Desert Hammer AWE also demonstrated the Army's ability to train for combat and experiment simultaneously. Participating units achieved demanding combat training objectives while experimenting with a variety of new equipment and digital systems. This illustrates how Battle Lab conducted AWEs can use training opportunities to achieve Force XXI objectives of providing insights into the future of warfare.

2. Task Force XXI Advanced Warfighting Experiment

Battle Lab contributions to Force XXI objectives will be further demonstrated by the upcoming Task Force XXI AWE. Task Force XXI is an Army warfighting experiment which will use actual soldiers and units in a brigade sized experimental force (EXFOR) being formed from the reorganization of the 4th Infantry Division (Mechanized) at Fort Hood, Texas. Task Force XXI, currently scheduled for operational status in March 1997, will provide an understanding of future division and corps organizations and will serve as the baseline for follow-on experiments throughout the decade. In Task Force XXI, the Army is fielding new equipment and a series of computer systems and other digital equipment that is expected to revolutionize the amount and use of information available at all levels. In this AWE, the Army has committed to experimenting with over 97 new and different concepts. Task Force XXI will also field 87 new or experimental systems to heavy forces and 37 systems to light forces in the EXFOR. Task Force XXI will experiment with 21st century warfighting concepts and technologies which take advantage of information management. This application of information power is expected to provide the Army's EXFOR with a common vision of the battlefield which will be used to dominate and shape that battlefield. Task Force XXI's concept is based on [Ref. 4]:

- Linking strategic, operational and tactical sensors to gain near real-time situational awareness
- Anticipating an accelerated tempo of operations made possible by the passage of continuous, real-time information
- Linking sensors to shooters in an anticipatory rather than reactive manner.

G. WARFIGHTING RAPID ACQUISITION PROGRAM POLICY

1. Tiger Team -- Rapid Acquisition Initiative Background

Battle Lab experimentation involves exploring materiel solutions to fulfill urgent Army needs. Personnel in TRADOC recognized that the AWE process could potentially yield successful materiel systems as well as doctrinal concepts. Presented with this opportunity to capitalize upon AWE successes, the Army initiated a program to assess whether TRADOC could influence the acquisition process through the Battle Labs' AWEs.

This investigation revealed that the requirements generation of the traditional acquisition cycle could potentially be significantly impacted by Battle Lab experimental methodology. TRADOC became particularly interested in identifying obvious Battle Lab successes for expedited fielding. In 1994, the Army Acquisition Executive designated a Rapid Acquisition Tiger Team (RATT) to explore innovative approaches to acquisition streamlining. This Tiger Team approach had been used previously in other Services with varying degrees of success. For instance, the Navy employed a "Tiger Team" to develop the T-45 training aircraft. Similarly, the 1994 Army Tiger Team focused on two aspects: one being oriented on process and the second emphasizing experimental approaches to rapid acquisition. [Ref. 15]

Four Army acquisition programs were subsequently selected by the Secretary of the Army for Research, Development and Acquisition for close study by the Tiger Team in conjunction with Battle Lab support. These programs were:

- Bradley Stinger Fighting Vehicle -- Enhanced (BSFV-E)
- Advanced Precision Airborne Delivery System (APADS)
- Under Armor Auxiliary Power Plant (UAAPU)
- Super High Frequency (SHF) Tri-band Advanced Range Extension -- Terminal (STAR-T).

Resultant studies led to significant recommendations by the Tiger Team. Addressing the Battle Lab Advanced Warfighter Experiment process, the Tiger Team recommended that integrated teams, comprised of testers, trainers, combat and material

developers, analytical experts, acquisition professionals, and industry be more fully utilized in acquisition program planning and development. The Tiger Team also suggested that working groups should manage simulations during conduct of Battle Lab Experiment Plans. These recommendations have since been adopted in the Army's TRADOC Regulation 11-1.

Of the original four programs examined by the Tiger Team, two were successful Battle Lab initiatives which would eventually become Force XXI's initial rapid acquisition ventures. These two systems which continued as TRADOC rapid acquisition programs were the Bradley Stinger Fighting Vehicle - Enhanced (BSFV-E) and the Advanced Precision Airborne Delivery System (APADS). Both programs were approved for limited procurement for additional experimentation by a process which became known as the Army's Warfighting Rapid Acquisition Program (WRAP). The scope of this case study is limited to a discussion of the BSFV-E program. The APADS program encountered significant funding issues shortly after receiving rapid acquisition status which prevented it from progressing as far as the BSFV-E program has [Ref. 45].

2. Warfighting Rapid Acquisition Program Purpose

WRAP is a TRADOC mechanism to accelerate the acquisition of selected operational warfighting enhancements resulting from successful warfighting experiments; WRAP is a link between TRADOC experimentation and the Army's systems acquisition.

The Warfighting Rapid Acquisition Program (WRAP) sought to accelerate the procurement of urgently needed systems which had been identified as overwhelming successes during the Advanced Warfighting Experiments conducted by the Battle Labs. WRAP was formalized as an official Army policy on 11 April 1996 by the Army Acquisition Executive (AAE) after having been proven through the success of its first four candidate test case systems. It started off initially as an experimental effort which eventually became institutionalized by the Army. WRAP operated in a quicker, more cost

effective manner than previously possible under the traditional acquisition system. The WRAP policy is consistent with the Federal Acquisition Regulations (FAR). [Ref. 16]

3. Warfighting Rapid Acquisition Program Process

WRAP furnishes the TRADOC Commander with a vehicle to significantly speed up the acquisition of selected operational warfighting improvements. These enhancements originate from successful Advanced Warfighting Experiments. In accordance with TRADOC Regulation 11-1, *Battlefield Laboratories Program*, these warfighting experiments are accomplished by an integrated concept team (ICT) organization recommended by the 1994 Tiger Team study. This ICT is charged with development of the Battle Lab Experimentation Plan (BLEP), a document which details the objectives, resources and methodology of the Battle Lab warfighting experimentation process for each experiment. Results from the BLEP are subsequently used by the TRADOC Commander to select candidate systems for rapid acquisition which then undergo a review and approval by the governing WRAP Council. This WRAP Council serves in place of the Army Systems Acquisition Review Council (ASARC) found in the traditional acquisition process. [Ref. 16] [Ref. 13]

The linkage between WRAP and Battle Lab AWEs is depicted in Figure 2-9. TRADOC screens promising warfighting concepts for their potential to increase the Army's warfighting capability. Once these concepts are identified, TRADOC's Battle Labs carry out their primary responsibility of planning and conducting Advanced Warfighting Experiments which focus on these selected ideas. After AWEs have concluded, any compelling, successful warfighting ideas are selected as candidates for WRAP consideration. The WRAP Council then decides which of these successful candidates merit Army support as streamlined acquisition programs.

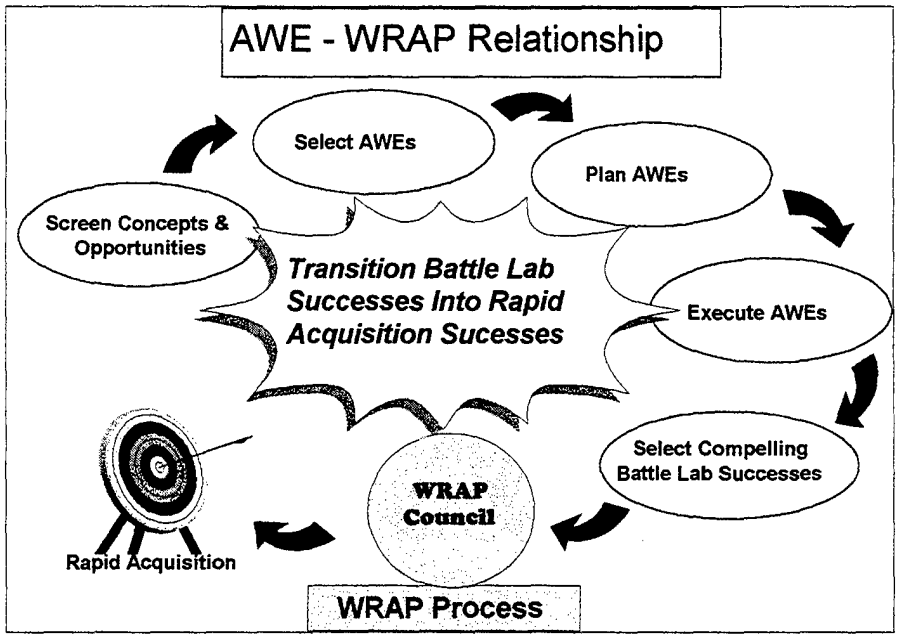

Figure 2-9. AWE - WRAP Linkage [Developed by Researcher]

4. Warfighting Rapid Acquisition Program Documentation

WRAP implements one aspect of acquisition reform by minimizing the program documentation required by the WRAP Council. Documentation, used as the basis for a WRAP decision, consists of a Battle Lab Experimentation Plan (BLEP) [Ref. 16] which includes:

- An urgency of need statement from the user community
- Experimentation results which substantiate compelling success
- An acquisition strategy
- An estimated budget for the proposed program.

In addition to the BLEP, the WRAP Council also requires an Operational Requirement Statement for Rapid Acquisition (ORD) [Ref. 16] which must contain:

- The relevant sections of the latest Defense Planning Guidance (DPG)
- A listing of all threats to the prospective system
- A description of what the system is intended to do operationally

- Any specific parameters which could limit the prospective system's capabilities.

Though these requirements seem abundant, they are generally reduced in comparison to the quantity of documentation required for conventional acquisition programs.

The WRAP Council is comprised of the following members or their representatives:

- Military Deputy to the Assistant Secretary of the Army (Research, Development, and Acquisition), WRAP co-chair
- Assistant Deputy Chief of Staff for Operations and Plans, Force Development, WRAP co-chair
- Deputy Under Secretary of the Army (Operations Research) (DUSA(OR))
- Deputy Under Secretary of the Army (Financial Management and Comptroller)(ASA(FM&C))
- Assistant Secretary of the Army (Installations, Logistics, and Environment) (ASA(IL&E))
- CG, US Army Materiel Command
- CG, TRADOC
- CG, Operational Test and Evaluation Command
- Director, Information Systems for Command, Control, Communications And Computers (DISC4)
- Deputy Chief of Staff for Logistics (DCSLOG)
- Deputy Chief of Staff for Personnel (DCSPER)
- Director, Program Analysis and Evaluation (DPAE).

A WRAP Council determines if a nominated system under consideration is affordable, effective, sustainable, and merits rapid acquisition. In deciding whether or not to apply this accelerated acquisition process to a candidate system, the WRAP Council will [Ref. 16]:

- Review requirement and urgency
- Review affordability
- Review experimentation results
- Approve an acquisition strategy

- Assign management responsibilities to a designated Program Executive Officer (PEO)/ Project Manager (PM) or AMC Advanced Concept Manager
- Assign a milestone entry point as appropriate
- Approve a funding strategy.

It is important to note that nominated systems which have been approved for rapid acquisition are not guaranteed funding just because they have received WRAP approval. Although there is no funding stream attached to WRAP Council decisions as of the time this thesis is being written, the current policy states that approved programs will be funded as prototypes for two years. But without a specified source for funding, this portion of the policy appears to be a weak link of the WRAP process. [Ref. 16] [Ref. 17] [Ref. 18]

H. SUMMARY

Chapter II has examined how the Warfighting Rapid Acquisition Program has evolved from Battle Lab experimentation and the Army's Force XXI initiative. The dynamic nature of the changing environment confronting America today necessitates that its Army develop a flexible, capabilities-based Force XXI, different from the previous approach which focused predominately on a Soviet threat. The Army's Training and Doctrine Command's Joint Venture effort serves as an enabler for the transition of the Army's operational forces into a 21st century fighting force. Capitalizing on revolutionary advances in simulation, TRADOC's Battle Labs experiment with emerging technologies and warfighting ideas to gain battlefield insights. These insights are furnished to the senior Army leadership for information needed to make resourcing decisions. Battle Labs plan and conduct TRADOC Advanced Warfighting Experiments (AWEs) from which come potential rapid acquisition opportunities. Finally, the Warfighting Rapid Acquisition Program transitions successes from these AWEs into accelerated acquisition successes for the Army. WRAP is a bridge linking TRADOC experimentation and Army systems acquisition [Ref. 16].

III. BRADLEY STINGER FIGHTING VEHICLE -- ENHANCED

> The Force XXI Campaign is a mammoth project to redesign, build and equip the Army with the latest and most efficient use of technologies... (it) is the Army's most ambitious overhaul since the early 1940's. It not only encompasses the redesign of tactical units, but of major headquarters, schools and the procurement system. [Ref. 14]

A. BSFV-E SYSTEM DESCRIPTION

One of the two successful Battle Lab initiatives assessed by the first WRAP Council in January 1995 was the Bradley Stinger Fighting Vehicle-Enhanced (BSFV-E) program. Although this weapon system predates the Force XXI transition, Battle Labs, and Tiger Team enterprises, it has been significantly influenced by tremendous political support resulting from AWEs.

Figure 3-1. BSFV-E

The BSFV-E is an acquisition category (ACAT) IV program costing $20.1 million. It is an integration of non-developmental components. The program has been authorized to acquire eight initial prototype platforms for Battle Lab experimentation in support of the Task Force XXI Advanced Warfighting Experiment and concurrent operational testing. Funding has also recently been provided for the fielding of approximately sixty additional BSFV-Es to the 24th Infantry (Mechanized) Division, 1st Cavalry Division, and the 3rd Armored Cavalry Regiment. The program focuses on modifying government furnished equipment (GFE) components such as the Bradley Stinger Fighting Vehicle (BSFV) by mounting a Stinger air defense missile standard vehicle-mounted launcher (SVML) in place of the existing tube-launched, optically tracked wire-guided (TOW) launcher on the M2A2 Bradley chassis. All the normal Bradley functions except the TOW missile system will be retained by the modified system. In addition to replacing the TOW with a four-missile Stinger launcher, enhancements include:

- Forward Area Air Defense (FAAD) Command, Control, and Intelligence (C^2I) target display capability
- Azimuth and elevation cues to the gunner
- Slew-to-cue capability
- Target acquisition-on-the-move and shoot-on-the-move capabilities.

The BSFV-E air defense system will be capable of engaging all threat targets such as aircraft, cruise missiles and unmanned aerial vehicles (UAVs) within the engagement boundaries of the Stinger missile. The system is designed to perform these functions using existing US Army Avenger air defense system hardware and software. Survivability for the crew has been significantly enhanced by performing engagements from inside the armor protection of the vehicle. Critical components of the BSFV-E include: the Standard Vehicle Mounted Launcher with four "fire and forget" Stinger missiles, a 25 mm chain gun and digital communications equipment with the capabilities to acquire targets and "shoot-on-the-move."

The BSFV-E will be crewed by four soldiers and will operate in platoons of five vehicles. However, the platoon leader vehicle in a BSFV-E platoon will not possess any Stinger or slew-to-cue capability but will retain the TOW missile engagement capability of the BSFV. This platoon leader's vehicle will also be augmented by a FAAD C^2I enhancement.

B. HISTORICAL BACKGROUND

Ground-based air defense is a critical battlefield operating system requiring thorough planning and total integration of weapon systems. One of the most challenging roles of any ground-based air defense system is the protection of a large maneuver element such as a heavy mechanized division or an armored cavalry regiment. The development of unmanned aerial vehicles (UAVs), proliferation of cruise missile technology, and the technical increases and sheer numbers of fixed wing and rotary wing threat aircraft require a ground-based air defense system that is lethal, survivable and flexible. The weapon system that continues to be at the heart of America's short range ground based air defense systems is the Stinger surface-to-air missile. When integrated with a capable, armored troop carrier, such as a Bradley Infantry Fighting Vehicle (IFV), the Stinger missile can provide adequate air defense coverage to heavy mechanized units deployed close to the forward line of troops (FLOT).

The United States Army continued to refine its Divisional Air Defense System following the fielding of the Stinger missile throughout the 1980s. After the cancellation of the Sergeant York divisional air defense artillery gun (DIVAD) program in 1985, the Army was forced to take a hard look at the serious deficiencies in meeting its forward area air defense requirements. Of major concern was the potential threat posed by enemy rotary winged (RW) aircraft. The Forward Area Air Defense Working Group at Fort Leavenworth, Kansas, and the Air Defense Artillery Lay down Group at Fort Bliss, Texas, were formed to address these problems and find solutions. The result was the development of the Forward Area Air Defense (FAAD) concept, a system of integrated systems designed for air defense in forward areas. This concept was approved in 1986 by then

Secretary of Defense Caspar Weinberger and was perceived by many to be the solution to fill the void left in wake of the Sergeant York Gun crisis. [Ref. 19] [Ref. 20]

The original FAAD concept system consisted of the following integrated components:

- Line-of-sight Forward Heavy (LOS-F(H)) elements
- Non-line-of-sight (NLOS) component
- Line-of-sight Rear (LOS-R) elements
- Combined Arms Initiative (CAI) which made minor air defense related modifications to existing weapon systems; i.e., adding an air defense sight to armored vehicles such as the M1 Tank or the M2 Bradley Infantry Fighting Vehicle
- Required Command, Control and Intelligence (C^2I) to tie the systems together.

Initial development of the system proceeded rapidly. However, the collapse of the Soviet Union, coupled with declining budgets and political outcry for a so-called peace dividend, dramatically slowed development of the proposed Forward Area Air Defense systems. The Army was still able to procure and test Avenger (LOS-R), prototype Air Defense Anti-Tank System (ADATS) (LOS-F(H)) and prototype Fiber Optic Guided Missile (FOG-M) (NLOS) systems.

Of these, Avenger became the only original FAAD program which would survive and progress into full scale production. This lightweight, highly mobile system (fire unit) incorporates the following components:

- Eight Stinger missiles
- Fire control electronics
- Forward looking infrared (FLIR)
- Laser range finder
- Standard Vehicle Mounted Launcher.

Operated with a 2-man crew, the system can provide twenty-four hour, all-weather air defense protection. The Avenger carries eight Stinger missiles in two launch pods on a

gyro-stabilized turret which provides the ability to "shoot-on-the-move," a critical feature in light of today's mobile battlefield. Currently in production, over 750 fire units have been delivered to the US Army and the USMC by the program's prime contractor, Boeing Defense & Space Group. [Ref. 21]

1. Budget Impacts Upon FAAD

Budget streamlining forced the cancellation of the ADATS program in February 1992; this component had been scheduled to fulfill the LOS-F(H) system requirement in the FAAD system [Ref. 22]. The Army has since fielded the Bradley Stinger Fighting Vehicle, Man Portable Air Defense System (MANPADS), Under Armor (BSFV-MUA) as an interim solution. [Ref. 23] This system is nothing more than a M2A2 Bradley Infantry Fighting Vehicle (IFV) which has been modified to carry a MANPADS Stinger team with 6 Stinger missiles stored in internal stowage racks.

Employing the Stinger missile provides some measure of air defense engagement capability for the BSFV-MUA. However as configured, the system lacks shoot-on-the-move capability, quick reaction times and survivability because the Stinger team must dismount from the vehicle in order to engage air defense threats. These inherent problems greatly reduce the mission capability of the system, especially when employed in a rapidly moving, fluid environment. Presently, Stinger teams riding in Bradleys can keep up with their supported infantry and armor units, at least until they are needed. Then, in the heat of battle, they must dismount to acquire and engage their potential target(s). This practice is inherently flawed because it exposes the dismounted and unprotected Stinger team to direct and indirect fire while the force they are supposed to protect continues to maneuver. Another prime disadvantage of the BSFV-MUA concept is that cueing, or early warning about the direction of incoming threats, is severely limited for the dismounted Stinger team. Once dismounted from the vehicle, the Stinger team will likely find itself exposed on a noisy, threatening and confusing battlefield without a reliable communication link to their air defense early warning network. Under current air defense doctrine, this early warning is

critical, and without it, air defense capability is significantly degraded. Thus the BSFV-MUA configuration clearly suffers from inherent weaknesses. [Ref. 24]

2. Continued Need For Heavy Division Air Defense

The official Mission Needs Statement for the FAAD system was approved in 1986. Although the threat has greatly changed since that time, there remains a need for even better heavy division air defense. The High Mobility Multipurpose Wheeled Vehicle (HMMWV) mounted Avenger (Line-of-Sight Rear, LOS-R) component of the original FAAD systems is not well suited for maneuver with mechanized infantry and armor; it is employed more effectively for static defense of brigade and division rear area assets.

The Bradley Stinger Fighting Vehicle (BSFV) was originally intended to be an interim solution, replacing the venerable Vulcan 20mm air defense gun system's 1960s technology until the LOS-F(H) could be fielded (originally scheduled in the Spring of 1994). However, the temporary solution took on increased significance in February 1992 when the Secretary of Defense terminated LOS-F(H), also known as the Air Defense Anti-Tank System (ADATS). [Ref. 20] A detailed chronology of key events in the development of the BSFV-E program is found in Appendix B.

3. Changing Air Defense Threat

Following the fall of the USSR, the US Army could not justify the cost and extensive capabilities of the complete FAAD system package. The capabilities of this complex system far exceeded a potential enemy's threat in the post-Warsaw pact context. It was more cost effective to place 10 Stinger MANPADS teams on the battlefield in Bradley IFVs for the price of one very sophisticated and expensive LOS-F(H). This quick fix concept, the BSFV-MUA, allowed heavy division Stinger teams to keep up with their combined arms counterparts while providing force protection.

This approach was substantiated by a study commissioned by the United States Army Air Defense Artillery School (USAADASCH). The Division Air Defense Study (DADS) was initiated in October 1992 to revisit the Forward Area Air Defense (FAAD)

system concept to determine what the air defense requirements were for the post-Cold War, force projection Army. An important result of this study was that the Army recognized that the air threat had changed significantly. According to this study, the fixed-wing threat to Army ground forces had declined due to a greater reliance on the US Air Force and other Services to address that threat. While noting that the fixed-wing threat may have decreased, the DADS also recognized that the threat from unmanned aerial vehicles (UAVs) had surfaced as well. [Ref. 25, Nov 93, p. 7]

Current Army doctrine emphasizes the importance of controlling battlefield information. This reliance on information depends upon maintaining the element of surprise; therefore, mission accomplishment is at risk if counter reconnaissance, surveillance and target acquisition missions against UAVs are not successful. Consequently, DADS called for a capability against these UAVs.

While DADS addressed the emerging UAV threat, it also noted that attack helicopters remained the chief threat to maneuver forces in the close battle. The deep attack threat from these aircraft was recognized by the study as well. The DADS recommended that the FAAD concept be revised to include:

- Countering UAVs
- De-emphasizing defense against fixed-wing aircraft
- Enhancing the capability to defend against helicopters.

This USAADASCH study recognized that improvements in lethality and survivability of the Army's Stinger platforms were critical if the Army intended to maintain a credible capability against the helicopter threat. Since the conclusion of DADS, other air defense threats have emerged. Most notable have been the advancements in cruise missile technology. Cruise missiles have become increasingly accessible to many countries and present a growing concern worldwide. Also, the introduction of low observable technology (stealth) has rendered many existing air defense systems either wholly or partially ineffective.

C. AIR DEFENSE BATTLE LAB INITIATIVE

Even prior to the DADS initiation, the Commanding General [Ref. 26] of the US Army Air Defense Center expressed his intent to meld the non-developmental components of the Bradley IFV, the Avenger's Standard Vehicle Mounted Launcher (SVML), and the Stinger missile to achieve the synergism of integrated systems. In September 1992 the Air Defense Lab began developmental testing with industry to come up with the best method to integrate the components. The recommended solution, the Bradley Stinger Fighting Vehicle-Enhanced (BSFV-E), was the least expensive of the alternatives studied [Ref. 28]. The BSFV-E uses the current Bradley Fighting Vehicle turret with some modifications. By December 1992, the BSFV-E prototype had successfully engaged a helicopter with a Stinger launched from an Air-to-Air Stinger (ATAS) rail-mounted on the Bradley's TOW launcher. The Bradley TOW launcher pod is replaced by an Avenger SVML. The associated fire control modifications are minimal and are already fielded with the Avenger.

The prototype demonstrated that the off-the-shelf hardware could be integrated and the crew could successfully use the cueing from sensor systems to engage a target while remaining inside the vehicle. While this highlighted a much needed improvement in survivability, it is important to remember that gains in lethality in the BSFV-E resulted from the leveraging of the FAAD C^2I components. [Ref. 27]

In an article published in the Army Times, LTG Jay Garner, a former Force XXI project officer, identified several key factors of success for Force XXI. The Air Defense Lab's BSFV-E initiative capitalized upon two of LTG Garner's key factors:

- The ability to establish and maintain common situational awareness among the combatants on the battlefield. This situational awareness is shared through vertical and horizontal sharing of digital information.
- The ability to compress data and information into targeting terms rapidly. [Ref. 14]

Focusing on survivability, target acquisition and fire control, the Air Defense Lab demonstrated these warfighting enhancements to the BSFV-E in a three-phased series of experiments [Ref. 25, Nov 93, p.4]. These three phases were:

- Phase I - Successfully engage a target while under armor
- Phase II - Improve target acquisition
- Phase III - Demonstrate an integrated system.

In December 1992, Phase I was conducted as a proof of principle to demonstrate the ability to successfully engage a target with the crew under armor. The prototype system included an ATAS launcher and integrated fire control. In this configuration, the crew remained inside the BSFV while engaging the target. Two missiles were fired and both registered hits on a static target at ranges greater than three kilometers.

Phase II was conducted by the Air Defense Lab in February 1993 to demonstrate the technologies to enhance tracking and acquisition. Improvements included networking with the FAAD C^2I air defense net and the addition of an on-board passive sensor.

Phase III demonstrated system integration and included:

- SVML (replaced ATAS rails)
- Upgraded integrated sight unit (ISU) with forward looking infrared radar (FLIR)
- Televised Video (TV)
- Laser range finder
- Auto tracking
- Automated lead angle and superelevation
- Simplified hand-held terminal unit (SHTU) for linking to the FAAD C^2I net
- Positive navigational device.

Phase III demonstrated the ability to acquire surrogate cruise missile targets as well as fixed and rotary-winged aircraft. Phase III concluded in August 1993 with the successful engagement of three moving helicopters: two QUH1 Hueys at ranges of 2500 and 2700 meters and a QS55 Hind surrogate at 2500 meters. The total RDT&E costs for the three phases of Air Defense Lab BSFV-E experimentation amounted to about $6 million [Ref. 30] and was financed primarily by United Defense Limited Partnership (UDLP) with some supplemental government funding. Figure 3-2 depicts the growth of the BSFV-E over time.

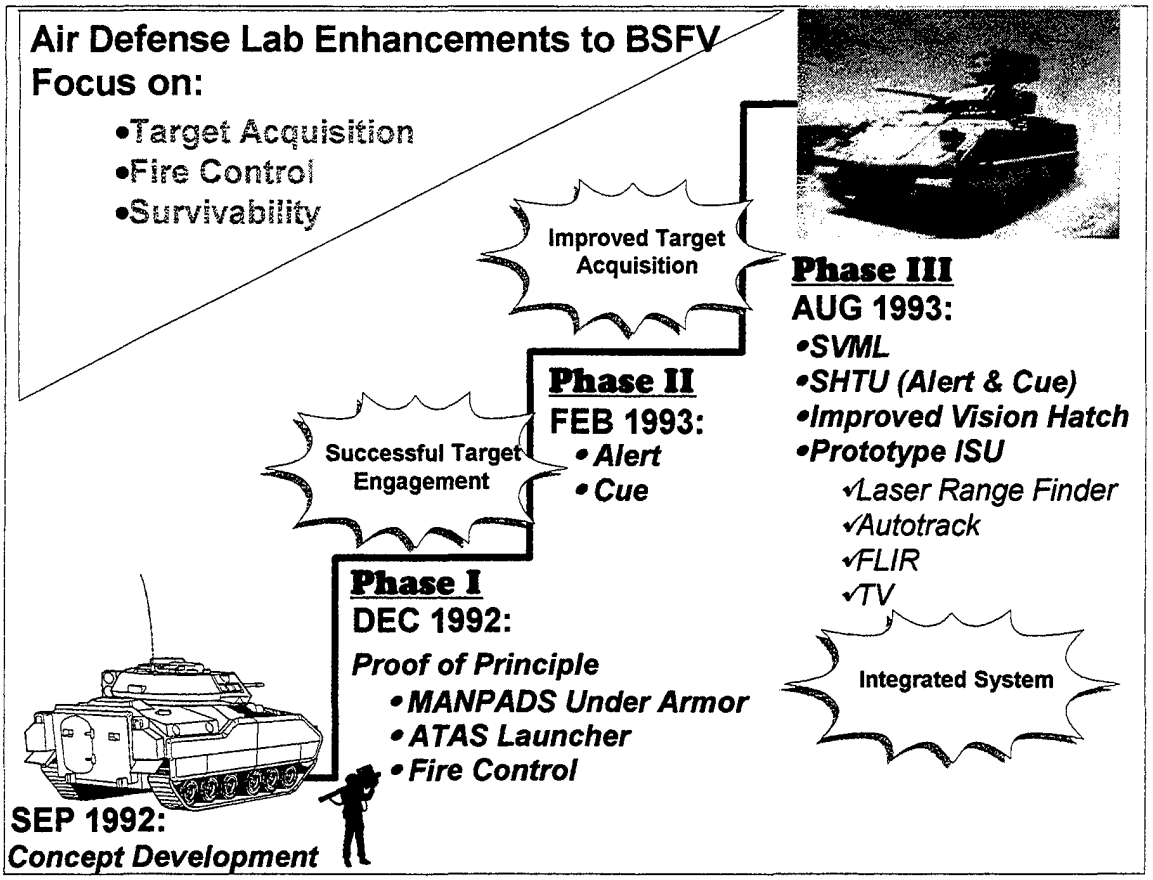

Figure 3-2. Growth Path of BSFV-E During Air Defense Lab Experimentation [Developed by Researcher]

1. Use of Virtual Prototyping

As mentioned in the previous chapter, TRADOC Battle Labs have extensively used simulations to rapidly leverage new technologies. Simulations also facilitate the preparation of tactics, techniques and procedures (TTP) needed to train soldiers in the use of new systems. In addition, tests using simulators can provide insights to determine effectiveness and performance of specific components. This use of simulations can greatly reduce the amount of developmental and operational testing which is usually required in a traditional acquisition program. The Air Defense Branch is responsible for providing key air defense related inputs to the TRADOC Battle Labs and accomplishes this through the efforts of the Air Defense Lab, a TRADOC chartered Battle Lab Support Element (BLSE). The Air

Defense Lab and the TRADOC Battle Labs work together to test developments, future capabilities and future requirements. [Ref. 35]

In November 1992, Congress directed that the Army perform an Air Defense Artillery (ADA) turret study to evaluate contractor proposals to fill the Army's operational need for its Forward Area Air Defense system. The Battle Labs' capability to test in a virtual environment was well suited to fulfill this Congressional directive. With support from the Air Defense Lab, the Forward Area Air Defense (FAAD) Project Manager was assigned responsibility for testing the three contractor (Boeing, Martin Marietta, United Defense [formerly FMC]) proposals which had been submitted in response to the government's request for candidate systems. This ADA turret study evaluated the several incremental solutions for affordability and operational effectiveness using PM FAAD's Virtual Prototype Simulator (VPS). The resulting Virtual Prototype Simulator "shoot off" provided data which later would serve as the basis for a Cost and Operational Effectiveness Analysis (COEA) Report for the BSFV-E. This ADA turret study concluded in December 1994. [Ref. 25, April 94, p.2] [Ref. 35]

In addition to being used by the ADA turret study, VPS was used in the BSFV-E program to create and experience a variety of test scenarios without going to the test range. It immersed users in real-time, interactive environments and permitted:

- Reconfigurable-analysis of different components for effect on system performance
- Development of tactics, techniques and procedures (TTP) prior to availability of hardware
- Training plan development
- Early testing (without hardware), including operational testing.

2. Testing

The largest single time saver in the BSFV-E Program Schedule proved to be the limited testing required. As the chairman of the Battle Lab Experiment Senior Officer Review Committee (BLESOROC), CG TRADOC appointed a Simulations Working

Group (SWG) which was composed of representatives from about a dozen agencies who had an input to, or a requirement from, the use of simulations in this project. PEO Tactical Missiles, Operational Test Command (OPTEC) and the Army Material Systems Analysis Activity (AMSAA) were all represented [Ref. 31] in the SWG when they reached an agreement to primarily test this system through simulation and analysis. This decision was based upon an acceptance of the data gained from the virtual prototyping experiences in the Congressionally mandated ADA turret study. In addition, live fire by analysis of the BSFV-E was approved by AMSAA. Prior Battle Lab Experimentation Plan (BLEP) coordination also resulted in early approval of the Test and Evaluation Master Plan (TEMP). All these factors combined to greatly reduce the amount of developmental and operational testing required of the BSFV-E. This significantly contributed to a shorter acquisition cycle and reduced acquisition costs.

D. BSFV-E PROGRAM ACQUISITION STRATEGY

The Operational Requirements Document (ORD) [Ref. 33] was signed by the Commanding General of the United States Army Air Defense Center in August 1994. This ORD specified near-term required capabilities which were already available commercially off-the-shelf, and which would transform the existing Bradley Stinger Fighting Vehicle - MANPADS Under Armor (BSFV-MUA) variant, making it a more mobile, survivable, and lethal weapon platform. The Commanding General, United States Army Air Defense Center, acting as steward for the Air Defense user community, subsequently nominated the BSFV-E program to TRADOC as its candidate for the Rapid Acquisition Tiger Team (RATT) in an Urgency of Need Statement issued on 16 September 1994 [Ref. 34]. The program was subsequently selected as one of only four programs being evaluated by the Army service-wide. The Battle Lab Experiment Plan (BLEP) [Ref. 35] was prepared by the joint efforts of the Air Defense Lab and the Project Manager-Forward Area Air Defense (PM-FAAD) and encompassed the following documentation:

- Required Operational Capabilities for the BSFV-E
- Urgency of Needs Statement

- Live fire test strategy
- Acquisition strategy for follow-on rapid acquisition which was derived from the previous Congressionally mandated turret study
- Estimate of required funding.

CG TRADOC approved this BLEP on 6 December 1994, after which these documents were presented to the Commanding General of the United States Army Air Defense Center for his consideration as to whether BSFV-E's early Battle Lab success warranted a request for rapid acquisition status.

In December 1994, this ACAT IV, non-developmental item program, for which 90% [Ref. 29] of the required materiel was available off-the-shelf, received its Milestone II approval from Program Executive Officer, Army Tactical Missiles. Approval was given to start work on the request for proposal and performance specifications. The additional support of the Commanding General, MICOM was gained on 29 December 1994, and later proved to be instrumental in providing the needed presence to push this program forward. Additional guidance from the PEO, Tactical Missiles [Ref. 36], to the BSFV-E Product Manager stated that: (1) if possible, award contract without a best and final offer (BAFO) and without negotiations and (2) award contract prior to 1 April 1995; this was driven by the necessity to have prototypes along with trained soldiers ready for Task Force XXI AWE in March 1997. The program operated on the margin and success in AWEs was its only hope of survival [Ref. 36]. A Warfighting Rapid Acquisition Program (WRAP) Council Milestone IIIa decision was reached on 26 January 1995, approving limited production. The principal documentation required for this Milestone IIIa decision included [Ref. 37]:

- BSFV-E Mission Needs Statement
- Battle Lab Experiment Plan (BLEP)
- Abbreviated Operational Requirements Document.

Table 3-1 [Ref. 37] highlights some of the significant events leading up to the award of the contract. A more detailed chronology of program milestones is included in Appendix B.

1. Contracting Milestones

Critical contract milestones (refer to Table 3-2) began with a Commerce Business Daily announcement on 18 January 1995. Proposals were received from the two offerors on 13 March 1995. The contracting officer served as Source Selection Authority and awarded a contract to Boeing Defense and Space Group on 30 March 1995.

BSFV-E Key Events Timetable

BLEP	**6 DEC 1994**
ORD	**11 DEC 1994**
Milestone 0,I,II	**week of 18-22 DEC 1994**
Acquisition Plan	**10 JAN 1995**
Acquisition Strategy Report	**10 JAN 1995**
Justification & Approval	**15 JAN 1995**
Commerce Business Daily Announcement	**18 JAN 1995**
Performance Specification	**20 JAN 1995**
Draft RFP	**25 JAN 1995**
WRAP Council (Milestone IIIa)	**26 JAN 1995**
RFP	**9 FEB 1995**
Proposals Received	**13 MAR 1995**
Proposal Evaluation	**13 - 22 MAR 1995**
Source Selection Authority Decision	**22 MAR 1995**
Contract Award	**30 MAR 1995**

Table 3-1. BSFV-E Key Events Timetable [Ref. 37]

The BSFV-E Product Manager's goal was originally to ensure first unit equipped (FUE) within two years to enable participation in the Army's Advanced Warfighting Experiment with eight BSFV-E configured systems. This BSFV-E project office plan

projects subsequent fielding to Force Package I units after the Task Force XXI AWE is expected to conclude. As of now, funding exists for the first eight fire units which will participate in the AWE and for nearly sixty more weapon systems which will be allocated to Force Package I units plus the training base at the US Army Air Defense Artillery Center at Fort Bliss, Texas. The initial quantity of eight BSFV-Es have already concluded IOTE and will participate in the Task Force XXI AWE in March 1997 [Ref. 29].

BSFV-E Contracting Schedule

Commerce Business Daily Announcement	**18 JAN 1995**
Draft RFP (Given to Offerors)	**25 JAN 1995**
Pre-Solicitation Meeting	**1 FEB 1995**
Issuance of Solicitation (RFP)	**9 FEB 1995**
Receipt of Proposals	**13 MAR 1995**
Technical Evaluation	**13 - 22 MAR 1995**
SSA Analysis	**23 - 29 MAR 1995**
PEO Briefing	**25 MAR 1995**
Complete Evaluation of Proposals	**27 MAR 1995**
Contract Preparation, Review & Clearance	**29 MAR 1995**
Contract Finalization	**30 MAR 1995**
Award Contract	**30 MAR 1995**
Debrief	**3 APR 1995**

Table 3-2. BSFV-E Contracting Schedule [Ref. 37]

2. Competition

The competition for this $20,092,824.00 [Ref. 38] contract (acquiring sixty eight BSFV-Es) was based upon a competitive request for proposal with firm, fixed-price

structure and contractor incentives to meet the eight systems required for participation in the Army's Task Force XXI Advanced Warfighting Experiment. Competing contractors included two consortiums.

- Boeing as a prime contractor and Martin Marietta as a principal subcontractor
- Team comprised of United Defense Limited Partnership (UDLP, previously FMC); Hughes Electro-Optical; Hughes Missile Systems and TRW.

The UDLP/Hughes team possessed the only physically existing prototype which had been used in the Air Defense Lab-sponsored experimentation and NTC combat unit rotation 94-07, the Army's first major digitized field exercise. UDLP/Hughes team came with a broad depth of experience in Bradley Infantry Fighting Vehicle (United Defense) and the Stinger (Hughes) missile systems. Likewise, Boeing brought its work on the Avenger (LOS-R) air defense system and a virtual prototype of BSFV-E to the table. In this competition, there were no negotiations as each contractor's initial bid served as their final offer [Ref. 39].

Although some of the contractors involved lobbied hard for sole source contracts, PM-FAAD made the decision to host a competitive contract. According to the product manager [Ref. 29] and program executive officer [Ref. 36], this ultimately enabled the program office to realize the purchase of substantially more technical capability at a significantly lower price than they could have hoped for otherwise, had it been a sole source situation from the start.

In arriving at the decision on how to conduct the competition for the contract, the program office weighed the benefits of awarding without negotiations against the related disadvantages. Without negotiations, the program would be able to effect the most timely contract, exposing itself to less schedule risk, and award a contract based upon a clear technical winner. Some of the contract risks were that the contract was contingent on unprogrammed funding and there was considerably increased likelihood of a protest. Use of a draft RFP process reduced the risk of serious flaws in the contractual requirements. [Ref. 37]

The program office also considered the advantages that might accrue from the negotiating process, such as possible price reductions and minimized grounds for protest. In comparing both the advantages and disadvantages, the program office concluded that negotiations would escalate program schedule risk, make a best value determination more difficult to arrive at, increase the potential for technical leveling, and possibly result in delays of thirty days or more.

In hindsight, it appears that the program office decision to proceed with competitive proposals and without negotiations served them well. No protests resulted and the program's senior leadership believe they received the best deal possible [Ref. 36] [Ref. 37].

3. Source Selection Process & Pricing Analysis

The source selection process for the BSFV-E utilized four areas for evaluation:

- Technical
- Price
- Past Performance (not addressed in this thesis)
- Management (not addressed in this thesis).

The technical element was further broken down into: performance/concept, integrated logistics support, product assurance, configuration management, and test. The technical element was weighted most heavily, followed by price, and then past performance and management (which were equivalent in weight). Qualitative ratings, founded upon an adjectival basis, were applied to the different areas of evaluation to take into account apparent differences. Offerors were not told the exact weighting of each evaluation criterion; however, they were informed as to the relative weighting of the different factors. This source selection process is depicted in Figure 3-3. [Ref. 37]

United Defense's loss of this contract, and the fact that it had purportedly sunk a substantial sum into the development of what had been the only existing prototype of the BSFV-E during the Air Defense Lab's experimentation [Ref. 30], reflects an area of concern for industry and Government alike: how does one (either contractor or

Government agency) strike an equitable bargain through which both sides are protected? Is it unreasonable for UDLP to expect something in return for its investment in the hardware prototype development? This issue will be discussed at greater length in the following chapter of this thesis.

Because this contract's source selection was based upon a competitive, best value evaluation, using a firm fixed-price (FFP) structure, there was no need for a detailed audit. There was also no requirement for certified cost and pricing data to be submitted by the

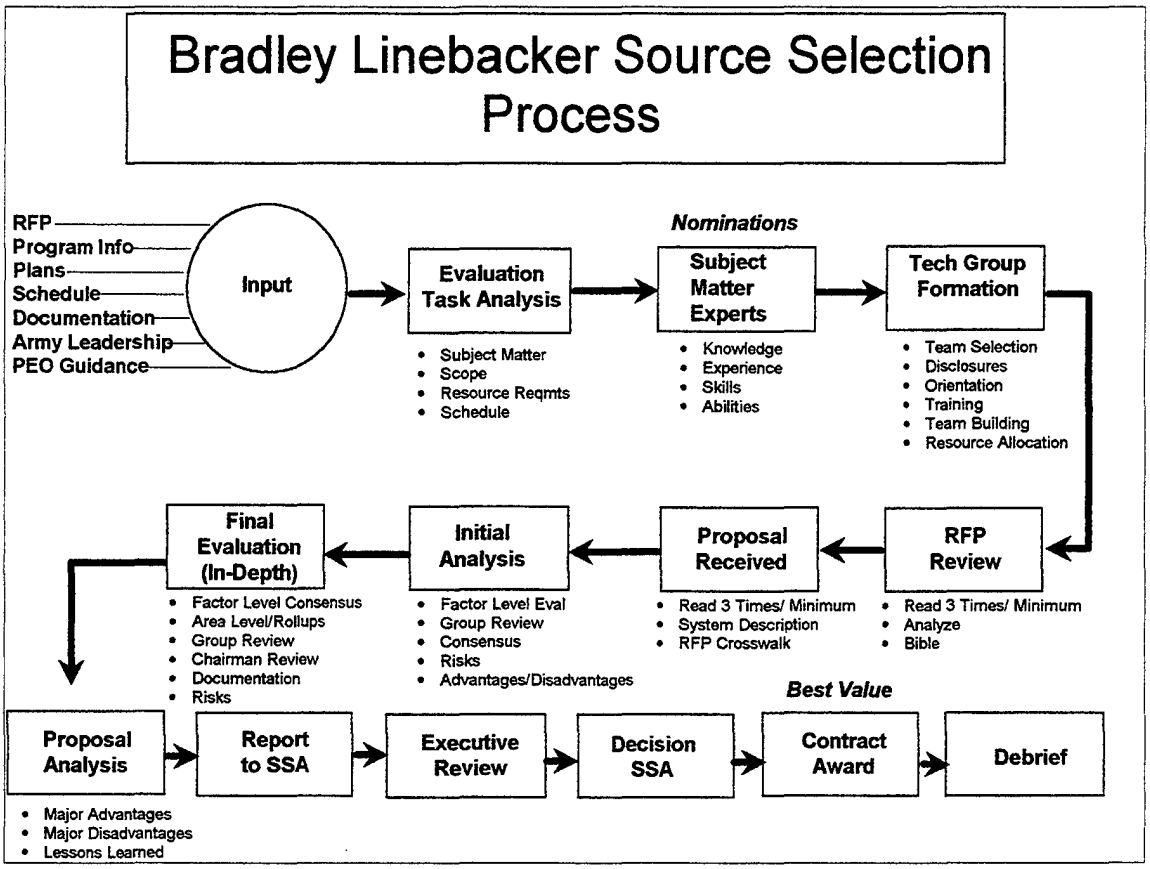

Figure 3-3. Source Selection Process After Ref. [37]

contractors. The decision to proceed without negotiations also meant that there was no need for a pre-negotiation business clearance memorandum. In addition, a detailed pricing analysis was not performed. However, a price analysis comparison by contract line item

number (CLINs) and amount for each CLIN was conducted to establish relative differences between the two different proposals. This price analysis did indicate that Boeing's prices as proposed were fair and reasonable. [Ref. 40]

In the supporting documentation, a memorandum for record substituted for what would have been a post negotiation memorandum had the competition involved negotiations. This record documented that [Ref. 39]:

- Reviews of the proposals received from solicitation of the BSFV-E RFP from both UDLP and Boeing were in accordance with the FAR
- The RFP stated that the award would be made to the offeror judged to present the best value to the Government in accordance with the evaluation criteria
- It was unnecessary to require certified cost and pricing data because this award was based upon competition
- The RFP had allowed for award without discussions, but reserved the right to negotiate or not, as necessary
- The method used to establish and conduct the evaluation considered extensive technical, price, management and past performance of both offerors and made a recommendation to the source selection authority (SSA)
- The contracting officer, serving as the SSA, awarded the BSFV-E contract to Boeing Defense and Space Group based upon the evaluation factors and after determining that the recipient of the contract award was both responsive and responsible within the meaning of the FAR.

4. Effects of Acquisition Reform

The willingness of the contractor to support the program has also been instrumental in the BSFV-E's success: Boeing's integrated product team (IPT) leader [Ref. 42] for this program very emphatically states that the integrated process team approach and the rapid acquisition process showcased in the program have been "an excellent way to do business

-- and was much more than mere lip service or use of current buzz words." The Boeing program manager [Ref. 43] supported this by citing three specific reasons why Boeing's use of IPTs was successful:

- Customer (Army project office) was an active member of the IPT
- All IPT members were empowered to make decisions
- Boeing's IPT leadership and the customer shared common objectives and a common vision from the onset of the program.

Besides referring to IPTs as an example of acquisition reform encompassed in the this program, the Boeing program manager [Ref. 43] cited the advantages of ISO 9000 practices incorporated within the project. He stated that the use of commercial specifications and standards in lieu of MILSPECs [military specifications] reflects an important example of how the BSFV-E exemplifies acquisition reform. Instead of some forty or fifty military specifications, the development of BSFV-E relied upon only three MILSPECs to deliver the first production unit in less than twelve months from contract award.

E. SUMMARY

The BSFV-E (Boeing proposal) was selected and the program was considered a suitable candidate for the Army's Warfighting Rapid Acquisition Program (WRAP) for several reasons. First, the mission need statement for the Forward Area Air Defense system had gained wide acceptance since its approval in January 1986. The BSFV-E did not require development of new technology, only integration of existing components and these components' planned upgrades. Also, under the guidelines of the DoD 5000 series publications, tailored acquisition strategies which take advantage of opportunities to compress the traditional acquisition phases were encouraged. The big ticket items like the Bradley Fighting Vehicle and the Stinger missiles were already assigned to the receiving air defense units. Because of the extensive use of the existing components, much of the lengthy and costly testing for safety, environmental, survivability had already been documented. Extensive retesting of these components for the minor changes was not

necessary and would be redundant. Finally, the BSFV-E was deemed suitable based upon its success during prior experimentation. BSFV-E acquisition strategy called for its entry into low rate initial production with eight systems available for the critical Advanced Warfighter Experiment, Task Force XXI, which is being planned for March 1997 [Ref. 29]. [Ref. 24]

The BSFV-E program has demonstrated that the Government can meet the challenge of expedited acquisition methods to improve upon the old ways of doing business. But without the necessary funding, these advancements would have amounted to little more than good theory.

The PM-FAAD office feels that the Bradley Stinger Fighting Vehicle - Enhanced program has been a role model for the rest of the Army acquisition process to take note of. The BSFV-E product manager's assessment is that effective use of acquisition streamlining initiatives pushed this program to the forefront of the Army's new way of doing things better, faster, and cheaper.

Technical concerns were addressed up front during the discussion phase until all offerors were comfortable and then the competition commenced. Since the contractors knew that they had only one chance to shine, they were incentivized to do so. The elimination of extraneous requirements by the program's Technical Evaluation Committee created a lean and effective framework for contractor selection. Ultimately, these factors came together and provided for a lower price along with higher performance than what the Government's product manager [Ref. 29] had expected. However, the methods used by the BSFV-E program are not boiler plate solutions to be applied generically to all other programs; these methods proved effective because of many influencing factors:

- Army's adoption of the BSFV-E program as a designated fast track acquisition model to prove WRAP process
- Relatively small size of the program
- Limited scope of the problem and use of NDI
- Criticality of Task Force XXI AWE

- Synergy resulting from the program's emphasis upon teaming and partnership between the Government and contractor program offices
- Fervent support by the parent PEO organization.

TRADOC has recognized that its Battle Labs can contribute to acquisition reform by leveraging both new and mature technologies and facilitating an accelerated acquisition process. The BSFV-E is the first weapon system to highlight how Battle Labs and the WRAP process can do more than just launch good ideas into the materiel development arena. According to General James J. Cravens, Jr. (current Deputy Chief of Staff for Combat Developments, Headquarters, TRADOC), BSFV-E is an excellent model for Army acquisition reform [Ref. 26]. Hopefully, the Battle Labs and WRAP will be able to capitalize on the lessons learned from the BSFV-E experience and continue to contribute similar successes.

IV. CASE ANALYSIS OF THE BSFV-E PROGRAM

A. INTRODUCTION

The analysis of the BSFV-E program reveals many lessons learned about the relationship of the Army's Warfighting Rapid Acquisition Program (WRAP) process to the acquisition streamlining initiatives implemented in this program. BSFV-E is the Army's first WRAP venture which has progressed significantly beyond gaining WRAP Council approval for accelerated acquisition. This thesis is based upon a case study which relies on the BSFV-E program as the single point of data used to infer lessons learned about the WRAP process. These lessons are qualitative in nature and are founded upon factors critical in affecting the BSFV-E program. Additionally, these lessons learned are not designed to make any conclusions about the competency of the program management of the BSFV-E or the execution of the Battle Labs in their mission. Instead, they may provide insights to other acquisition managers and their staffs laboring to effectively manage acquisition programs which involve WRAP. In addition, these lessons may be of interest to students of acquisition management.

B. LESSONS LEARNED

The major lessons learned about the Battle Labs' AWE/WRAP process when applied to the BSFV-E program are:

> **The experiences of the BSFV-E program reflect that although the Warfighting Rapid Acquisition Process (WRAP) proved conceptually valid, it suffered from a flaw in its lack of funding for approved rapid acquisition programs.**

The BSFV-E program illustrated an apparent disconnect in the Army's current WRAP policy. Though WRAP permits validated good ideas to be transitioned from the Battle Labs into WRAP Council-approved programs, the existing process ignores funding for these approved programs. Once the WRAP Council approves a TRADOC rapid acquisition priority, a "glitch" occurs. The BSFV-E received WRAP status and was one of

only two approved TRADOC rapid acquisition programs for 1995, but there was no money tied to the decision.

Even though the current WRAP implementation policy states that WRAP approved programs will receive funding as prototypes for two years following their approval, it also states that these candidates are not guaranteed immediate funding even if submitted in time to place funding in budget and programming documents. The BSFV-E program indicates that WRAP falls short of its original intent. The situation today is that the Army possesses a workable means to streamline the acquisition of a great idea but this process comes with no money attached and is further hampered by the current absence of a clearly defined process by which that great idea is linked to the Planning, Programming, Budgeting System (PPBS). It is important to note that without money, the process the Army possesses in WRAP is not acquisition reform, but idea reform [Ref. 17]. [Ref. 16]

> If the Army is truly going to pursue acquisition reform and expects Battle Labs to be involved in that reform, which they should be, and if the Army has chosen WRAP to be that mechanism for determining if a concept merits use by the operational Army, then the Army must have a means to fund that reform instead of relying upon someone like Mr. Williams to be a nice guy. [Ref. 17]

This lesson learned is perhaps the most significant conclusion of this thesis. The Army must build a process which links funding to programs which successfully negotiate the validation phase of WRAP. The lack of funding can quickly transform a rapid acquisition program like BSFV-E into a conventional business-as-usual program by unnecessarily stretching out the program's life cycle and subsequently driving costs up. If WRAP is a "must do" process for the Army as advocated by General Hartzog, the current TRADOC Commander [Ref. 9], then it should be prioritized as such and subsequently reflected in the Army's budget. Fortunately for the BSFV-E program, the intervention of Mr. Williams provided the necessary dollars for producing the initial eight systems to be used in the AWE set for Spring 1997. In addition, recent funding decisions on other programs have freed some funding to go to BSFV-E. Although BSFV-E is partially

funded for production of Force Package I, this did not occur as a direct result of the WRAP process.

The WRAP policy [Ref. 25] states that after receiving two years of funding for operational prototypes, subsequent resourcing will be based on Department of the Army, Deputy Chief of Staff for Operations (DA DCSOPS) prioritization of TRADOC-approved warfighting requirements. The experience of the BSFV-E program does not clarify how this will work in the future. This one data point indicates that this rough spot in WRAP funding may need more work. TRADOC's senior-most leadership is addressing the issue of funding for WRAP as this thesis is being written. [Ref. 9] [Ref. 26]

The BSFV-E experience illustrates that the speed of acquiring WRAP approved programs can outstrip the timing of the existing POM funding cycle.

It might be said that funding is a problem for all programs. The difference here is that for WRAP to be effective, it must launch new systems inside a PPBS cycle. Otherwise the launch's time line is just like a normal program's time line. The BSFV-E case also exemplifies how the current two year Program Objectives Memorandum (POM) funding process does not accommodate Warfighting Rapid Acquisition Programs which may progress from concept to initial operational capability in less than twelve months. This does not imply that the rapid acquisition under WRAP is too fast -- that is one of WRAP's chief objectives. What it does highlight is that if WRAP operates as intended, then the PPBS cycle is structurally unable to react within the right time frame to fund WRAP programs. WRAP can provide the Army with a proven means to accelerate acquisition; however, as mentioned previously, this accelerated process becomes hamstrung and can potentially result in little more than rhetoric if funding is not secured. Perhaps by relating the initiation point of WRAP approved programs to the POM, the Army might be able to synchronize better with the PPBS cycle.

The success that the BSFV-E program has enjoyed to date results from the influence of many factors beyond the WRAP process and TRADOC's Battle Labs.

The initial efforts of the Air Defense Lab proved that the underlying concept of integrating a Stinger launcher with a Bradley Infantry Fighting Vehicle carrier was feasible and achievable. TRADOC Battle Lab involvement and the BSFV-E's status as a WRAP Council-approved rapid acquisition program do not appear to be the only significant factors in this program's success. While the Product Manager [Ref. 29], Program Executive Officer [Ref. 36], and TRADOC System Manager (TSM) [Ref. 17] all agree that the early experiments conducted by the Fort Bliss Battle Lab Support Element (the Air Defense Lab) were essential to demonstrate the potential of the BSFV-E program, they unanimously agree that many more intertwining factors also contributed to the program.

BSFV-E benefited from the strong support of a "champion" from the Air Defense community. The Commanding General of the US Army Air Defense Center pushed the BSFV-E concept very hard and devoted Air Defense Artillery resources to the BSFV-E initiative developed by the Air Defense Lab. Had he not done so, the BSFV-E weapon system probably never would not have become a WRAP candidate. [Ref. 20] [Ref. 26]

At the time of its participation in the BSFV-E program, the Air Defense Lab was an "unofficial" organization. The Air Defense Artillery community took personnel "out of hide" to create its own "unofficial" Battle Lab (which eventually became sanctioned as a TRADOC Battle Lab Support Element). This "unofficial" Battle Lab organization was essential to the launch of the BSFV-E program. Without the air defense community's support of the infant Air Defense Lab, it is questionable whether the BSFV-E would have been as successful as it has today. [Ref. 20]

Secondly, the overarching Battle Lab methodology and some of its processes provided much needed stepping stones for the BSFV-E. According to founding personnel within the Air Defense Lab, the Air Defense Lab consciously capitalized upon the initial confusion regarding the nature of Battle Labs. They took advantage of an Army -- and Industry-wide -- perception of General Franks' total, unwavering support of the infant

Battle Labs and the announced move of the Army towards General Sullivan's vision of Force XXI. The Air Defense Lab acted as an official Battle Lab even though it lacked any legitimate "clout." The Air Defense Lab used its perceived legitimacy to conduct its experimentation with the BSFV-E. Because no one had defined what Battle Labs were, the Air Defense Lab was given free reign to "tinker." This permitted the Air Defense Lab to validate the concept by which the BSFV-E evolved. [Ref. 27]

The time frame of the BSFV-E program's Milestone II decision and the convening of the first WRAP Council also contributed the success of the BSFV-E. When the first WRAP Council was convened, it needed several acquisition system(s) which would serve as test cases for its streamlined acquisition process. The Tiger Team, discussed in Chapter II, was given the mission to find candidate systems to be evaluated under WRAP which possessed a high probability of being transitioned from Battle Lab successes into rapid acquisition successes. Although much effort had been invested by the Air Defense Lab to further this program, it was almost a coincidence that the BSFV-E was selected from a list of nominated programs. Because someone familiar with the BSFV-E prototype was present at the briefing where formation of the Tiger Team was announced, BSFV-E was nominated for consideration by the first WRAP Council [Ref. 27]. This illustrates that BSFV-E may have been a case of "being at the right place at the right time."

Another successful aspect of the BSFV-E program has been the conviction and involvement of the high caliber personnel responsible for managing the BSFV-E program. Perhaps most importantly, in addition to being at the right place at the right time, it is clear that this program was fortunate to have the right people involved in key positions. During one interview, when the TSM [Ref. 17] was asked to provide an assessment of how well the product manager had managed the BSFV-E program, the emphatic response was, "On a scale of one to ten, if ten is the top score then I'd give the program office a 15!" This positive sentiment was not limited to just the BSFV-E program office but the PEO as well. In nearly every thesis interview, Mr. George Williams, the Program Executive Officer for Tactical Missiles, was cited for his staunch support of this program. There was absolute consensus that if Mr. Williams had not been involved in supporting the program, BSFV-E

would have met an early demise. When questioned about why he backed the BSFV-E, Mr. Williams' personal belief in the program became apparent:

> I came to this man's Army in 1963 from the Air Force and at that time we had something called Redeye and something called Duster.... As I am leaving this job, we have a missile (Stinger) and we don't have a gun... now if that's progress?... We haven't extended the battle space, we haven't extended lethality, and we're just now getting around to integrating the sensors to where we can use the data they provide.... By the way, if you don't have this system (BSFV-E), why do you need all the sensor (systems) up front in the division area anyway?...I am absolutely scared to death that someday, five or ten years from now, the division will be at serious risk because we'll be fighting a battle that is not convenient for the Air Force to help us out in or we'll be in a place like the Falklands where we cannot bring to bear the things we've done in the past.... I'm afraid in some future battle of getting ourselves waxed by some good group of helicopter flyers who can do what we do today with Apache Longbow, and that is eat an armored battalion's lunch and never even be seen. [Ref. 36]

Mr. Williams provided more than just political and moral support for the BSFV-E; since the program failed to receive money from the overall Army budget, he found the money to launch the program within his own organization. Due to the success of production on the Javelin and Longbow missile programs (two other acquisition programs within the purview of PEO Tactical Missiles), funding was able to be reprogrammed below threshold from those programs to the Stinger and BSFV-E line. This covered the cost of operational testing and provided initial funding for the prototype BSFV-Es which were scheduled to participate in the Task Force XXI. [Ref. 36]

BSFV-E and TRADOC's WRAP process were a fortunate "marriage." BSFV-E helped demonstrate the potential of WRAP. Also, the WRAP process moved the BSFV-E program along expeditiously. Each helped the other. When asked, the current TRADOC CG generally agreed with this mutually beneficial characterization of the WRAP and BSFV-E relationship [Ref. 9].

Analysis of the BSFV-E program reveals that Battle Labs help provide what has been a missing link between technical feasibility and user needs that was lacking in the previous system of warfighting requirements development.

The experimentation role of the Army Battle Labs within the overall framework of Force XXI was discussed in Chapter II. Battle Labs serve as a bridge between the user community and materiel developers during the requirements generation process. In the past, the concept based requirement system (CBRS) suffered due to a gap between these two groups.

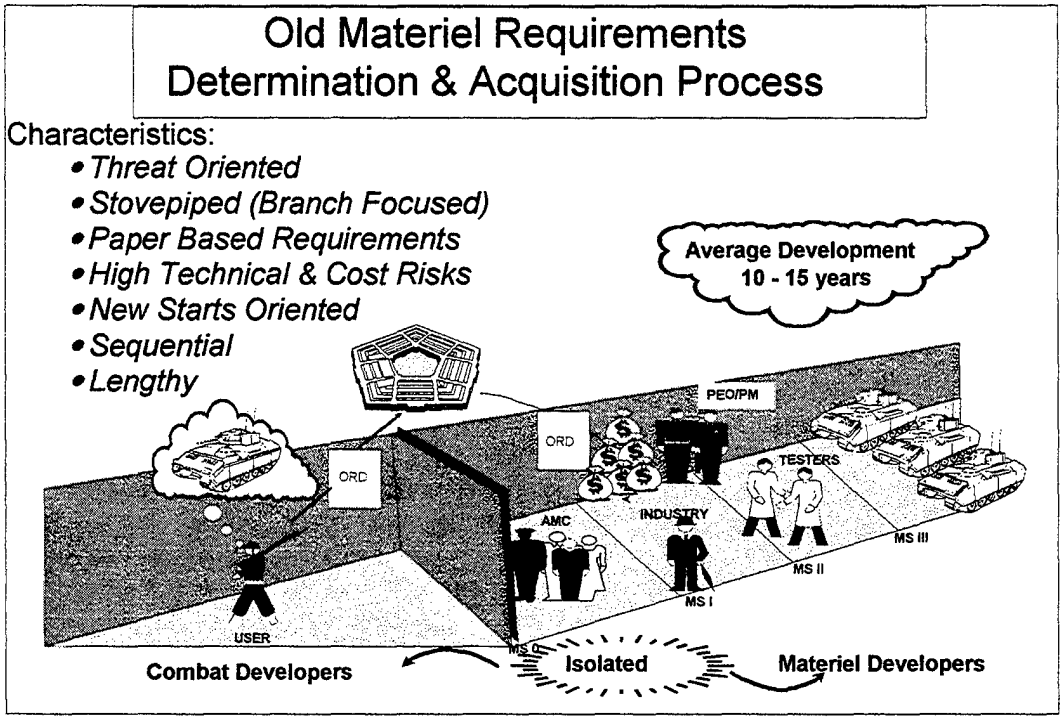

Figure 4-1. Old Materiel Requirements Determination After Ref. [12]

The old relationship, portrayed in Figure 4-1, can best be illustrated by an analogy in which users were on one side of a proverbial fence and the materiel developers were on the other. When the warfighters realized they had a need, they turned to Directorate of Combat Development (DCD) personnel who then generated their best impression of that requirement. In the old system, this requirement was then "thrown over the fence" to the

materiel developers. The problem was that the users possessed tactical competence to develop the requirement but did not know if what they were asking for was technically feasible. Since this was not their concern, it went over the fence to a materiel developer who would try to design a solution. If it went well, the design would mesh with the requirement. More often, this did not occur; instead the materiel developer would develop a design based on technical feasibility and then attempt to sell it back to the originator of the warfighting requirement. Ultimately, under this CBRS, the technical solution did not necessarily meet the tactical need. [Ref. 44]

The Army's experiences with the BSFV-E weapon system shows how Battle Lab organizations such as the Air Defense Lab have improved the previous system. Battle Labs serve as a bridge which links the user and combat development communities with the materiel development community. This facilitates the effective use of the integrated concept team approach discussed in Chapter II and results in a shortening of the "old" requirements determination process. This requirements streamlining, complemented by the WRAP process used in the BSFV-E program, resulted in the noteworthy speed with which

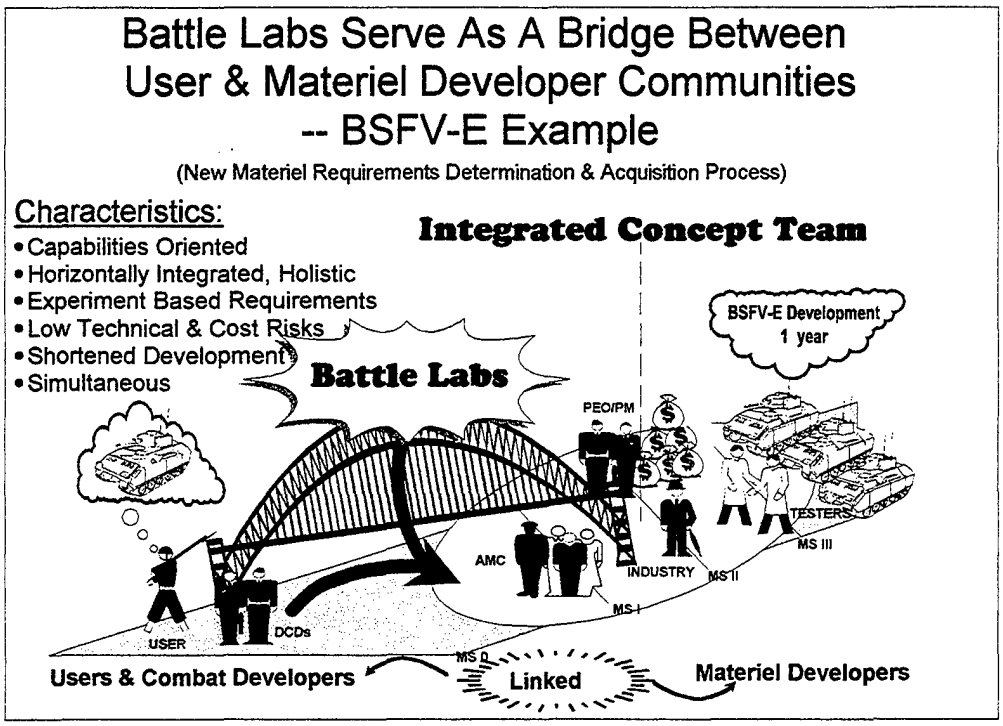

Figure 4-2. New Materiel Requirements Determination After Ref. [12]

that system has been developed. Capitalizing on this streamlining enables BSFV-E to be less expensive, a critical point in today's downsizing environment. Figure 4-2 illustrates how Battle Labs contribute to requirements streamlining.

According to Mr. Rick Cosby [Ref.44] of TECOM's Analysis and Experimentation Planning Group, the process which Battle Labs provide to requirements generation is "at least an order of magnitude improvement in our ability to apply technical competence to a tactical need." Staffed by officers who are selected for their technical and tactical competence, Battle Labs have demonstrated the ability to articulate many more of the technical complexities of warfighting requirements. The Labs have also developed an alignment with the RDEC community which has promoted a better understanding between user and materiel developer. The resulting product should be an improved melding of technical and tactical factors. [Ref. 44]

Although it may be unfair and inaccurate to draw a tight comparison between the Sergeant York air defense gun system and the BSFV-E because the Sergeant York suffered from changing requirements and was limited by technology, the Battle Lab process did help BSFV-E avoid some of the pitfalls of Sergeant York. The early and extensive use of simulations, virtual prototyping and AWE results from the Battle Labs allowed the BSFV-E product manager to properly tailor testing by removing unnecessary test requirements without compromising certification of the system. In addition, the accelerated developmental milestones facilitated by the WRAP process also contributed to the BSFV-E program by shortening the acquisition cycle. In contrast, Sergeant York's testing stretched out so long that the threat it was designed to defeat changed before the testing concluded. [Ref. 46:p. 27] [Ref 48]

Use of simulations by the BSFV-E program illustrates how the Battle Lab emphasis upon virtual prototyping can successfully accelerate programs.

The prime contractor's use of a virtual prototype simulator (VPS) performed up to expectations and facilitated significant cost and schedule savings experienced in this program. According to the Boeing program manager [Ref. 43] for BSFV-E, VPS

contributed to the phenomenally short time (less than twelve months) that it took the contractor to move from contract award to completed production of the initial eight BSFV-Es. In addition to the successful use of prototyping in the Congressionally mandated ADA turret study mentioned previously in Chapter III, the BSFV-E also benefited from the application of analytical testing of its critical components such as the Bradley chassis and the SVML. This testing, which had already been accepted by the Army, significantly reduced the time the Army needed to test the integration of these components in the BSFV-E. VPS will also be used to train for the Task Force XXI exercise.

The BSFV-E program provides a clear example that contractors do not receive a guaranteed advantage by entering into cooperative relationships with Battle Labs.

The program examined in this study is one example of how working with the Army's Battle Labs does not offer a panacea to industry. In concept, Battle Labs were initially created to provide an interface between the Army user communities and industry. The Battle Labs were designed to offer a unique vantage point over technology that industry could provide to answer warfighter requirements [Ref. 49]. The DoD has clearly stated its goal of adopting more commercial practices into its procurement policies; this DoD attempt to implement meaningful acquisition reform is evidenced by discontinued emphasis on military specifications and increased reliance on outsourcing [Ref. 50, May-June 96, p.4].

Working together with the Battle Labs, industry would receive use of Army evaluation resources such as test ranges and share data collected, for no fee. In addition, participating contractors could also expect to receive an indication of what battlefield deficiencies the Army was looking at. The idea was that contractors would receive feedback from the Battle Labs outlining both the good and bad points of a contractor-provided concept. If a warfighting requirement subsequently surfaced which might be answered by the contractor's concept, then the feedback furnished by the Battle Labs

could be used to "fine tune" the concept and to enhance a participating contractor's competitiveness in a future source selection process. [Ref. 36]

At least two problems arose from this relationship with contractors. First, although there were no guarantees by the Government, participating contractors perceived that they would reap some benefits. In the case of the BSFV-E prototype developed by UDLP, the contractor acknowledged that it knew there were no guarantees that it would receive any special consideration. However, the Battle Labs process encouraged contractors to spend their own research and development dollars on projects and concepts. Industry is understandably cautious of arrangements where the risk of no return on investment is high. The eventual award of the BSFV-E contract to a contractor who did not participate in the early Air Defense Lab experiment of Stinger missile, Avenger launcher, and Bradley IFV chassis, illustrates that risk. Such occurrences may discourage industry from continuing to remain interested and participatory in Battle Lab experiments. [Ref. 30] [Ref. 36]

Secondly, industry must exercise caution in all cooperative efforts with Battle Labs because, as Mr. Williams [Ref. 36] said, "There are a lot of users out there!" In other words, in entering a cooperative effort with the Battle Labs, industry assumes the risk that Battle Labs might not be speaking for the institutional user. Battle Labs should not be mistaken as the sole voice of the user community. In their early years, this misconception may have resulted in unintentionally misleading industry representatives as to what the Army was really interested in. As the Labs have matured, so has the understanding by industry concerning the nature of their role. Army Battle Labs rightly are participants along with other TRADOC elements in forums to foster interchange between the contractors and the Army, such as the Advanced Planning Boards for Industry (APBI) arranged by the American Defense Preparedness Association. The APBI is designed to furnish industry with a view of the military's long range research and development, acquisition, and sustainment needs and initiatives.

The results from the Task Force XXI AWE may not be a fair report card for determining the effectiveness of the BSFV-E program or other programs participating in that Battle Lab experiment. BSFV-E's report card (and other Task Force XXI programs) must be written in developmental and operational testing.

Although the BSFV-E product manager never intended to directly tie the program to the Task Force XXI AWE, he admits that without doing so the BSFV-E program might not have survived [Ref. 29]. In the midst of today's dwindling budgets, the BSFV-E project office found solid backing in the Army's strong support of initiatives to be incorporated into the Task Force XXI effort scheduled for early 1997. Recognizing that BSFV-E could benefit from Force XXI impetus, the project office did attempt to align itself with the preparation for the Task Force XXI AWE in areas where it made sense. However, the BSFV-E's future success does not rest on the success of TF XXI. Nor is BSFV-E funding tied to TF XXI success. What the Task Force XXI AWE did provide was a means to justify going forward with the BSFV-E program quickly. [Ref. 36]

When one considers that the underlying intent of AWEs is not to prove out a system, then it becomes easier to understand that the Task Force XXI is not an indicator of a given program's success or failure. AWEs were meant to experiment with some organizational and doctrinal concepts and hardware in order to gain insights into the Army's Force XXI vision; they were not conceived as a tool to prove a piece of equipment. This is not to say that if a given piece of equipment performs well in AWE its associated project office will not publicize that fact. However, if a specific piece of equipment does not perform up to expectations during the AWE, the Battle Labs will not necessarily be able to identify the true reasons behind the problem. Since the AWE performs experiments in warfighting capabilities, the Battle Labs' AWE will not prove out a system in the way that operational and developmental testing would.

Even so, Task Force XXI will serve as a report card for the BSFV-E and other Task Force XXI programs, which may not be fair. In today's environment of downsizing, particularly in the RDT&E business, there is a perception that Task Force XXI is the only game in town. Right or wrong, programs sense that if they not participating in Task Force

XXI, they are not part of the game. Further, if they are not perceived as part of the game, then they will also risk being left out during the PPBS cycles. This perception has encouraged a mentality which unwittingly pits the various initiatives sponsored by Task Force XXI against one another. [Ref. 44]

Much of the expected success or failure in Task Force XXI will hinge upon the soldier, training, or doctrinal employment aspects of the Task Force XXI AWE. The transition of the Army into Force XXI is especially complex since it calls for more than just a change in the type of technology used; it demands that the Army undergo a cultural change. People, and the organizations they comprise, have an inherently difficult time accepting this transformation. The change called for in Force XXI is monumental. In fact, Mr. Walter Hollis, the Army's Deputy Under Secretary for Operations Research, noted that Force XXI may be too ambitious [Ref. 44]. Although there is little doubt that today's Army possesses some of the best soldiers it has ever seen, it is important to recognize that these soldiers are still people with human failings. It is going to take some time for the soldiers of today to assimilate the many complexities of Force XXI and to put those complexities to their best advantage. If Task Force XXI is executed in the Spring of 1997, it may be that soldiers operating the equipment may not have had sufficient time to familiarize themselves with it. [Ref. 44]

The current growth path for the BSFV-E lacks connectivity with other systems using the same chassis. If BSFV-E is not on a vehicle chassis common to other applications, some of the benefits of HTI might be at risk; logistics support will be at risk as well.

As the Army transitions to the M2A3 Bradley IFV at the turn of the century and as a digitized Force XXI takes on a more concrete form, it would be natural for the BSFV-E air defense system (which is based upon the M2A2 Bradley IFV chassis) to upgrade as well. However, according to the growth path for the BSFV-E, this contingency has not been appropriately planned for. Early research conducted with the BSFV-E project office identified this as an issue before the BSFV-E contract was even competed. However,

questioning of current BSFV-E program personnel does not show any clearly defined plan in place now to accomplish the transition to the A3 version of the chassis. [Ref. 17]

What this highlights may be a shortfall in RDT&E and procurement funds which may prove significant for the BSFV-E program in the near future. Based on the progress of the BSFV-E to date, it is probable that this system will be fielded to at least Force Package I level. Assuming that occurs, divisional air defenders will experience gains in survivability and lethality well beyond the capabilities currently fielded in the "non-enhanced" Bradley Stinger Fighting Vehicle. However, just after the BSFV-E improvements are realized by combat soldiers in the field, the Army as a whole may adopt the M2A3 Bradley IFV. The integration of mounting an SVML and the associated fire control components to a M2A3 Bradley is not the same as performing the modification to a M2A2 chassis. While similar in physical appearance, the complex software associated with the enhanced digital capability of the M2A3 makes this carrier a completely different vehicle than its predecessor [Ref. 51]. The bottom line is that after upgrading from the BSFV-MUA version of the M2A2 configuration to the M2A2-based BSFV-E, air defenders will be presented with the challenge of balancing the up-front research and development cost of adapting the BSFV-E to the M2A3 versus the logistics burden of maintaining a fleet of M2A2-based BSFV-Es. No substantial work to integrate the BSFV-E enhancements to the A3 have occurred to date. However, it is important to note that the Army's use of the M2A2-based BSFV-E will still significantly enhance its current air defense capabilities. This issue has been identified and is being currently addressed by the FAAD TRADOC System Manager and the BSFV-E project office.

The BSFV-E program does serve as one excellent example of acquisition reform.

Although there are unresolved design and funding issues and the BSFV-E has yet to be fielded to Force Package I units, the BSFV-E is an excellent example of acquisition reform. This view is supported by both the current TRADOC Commander [Ref. 9], who considers the BSFV-E effort to be an "extremely great example of how the Army can get a

capability into the hands of soldiers ... faster and cheaper than ever done before," and the Army Acquisition Executive, who states that BSFV-E is "an excellent example of acquisition reform. [Ref. 48]"

When one examines the timetables which have been achieved in this program, it becomes apparent that BSFV-E embodies numerous major tenets of rapid acquisition. In terms of delivering to the soldier a combat capability which works well and provides that capability in a quick and cost effective manner, BSFV-E serves as a positive example. This program portrays how an urgently needed warfighting requirement can be met through an accelerated acquisition process comprised of TRADOC Battle Lab experimentation followed by the Warfighting Rapid Acquisition Program's process. Figure 4-3 depicts the relative timetable differences between WRAP and the traditional acquisition strategy. The BSFV-E illustrates how the acquisition process was tailored into an effective NDI acquisition strategy:

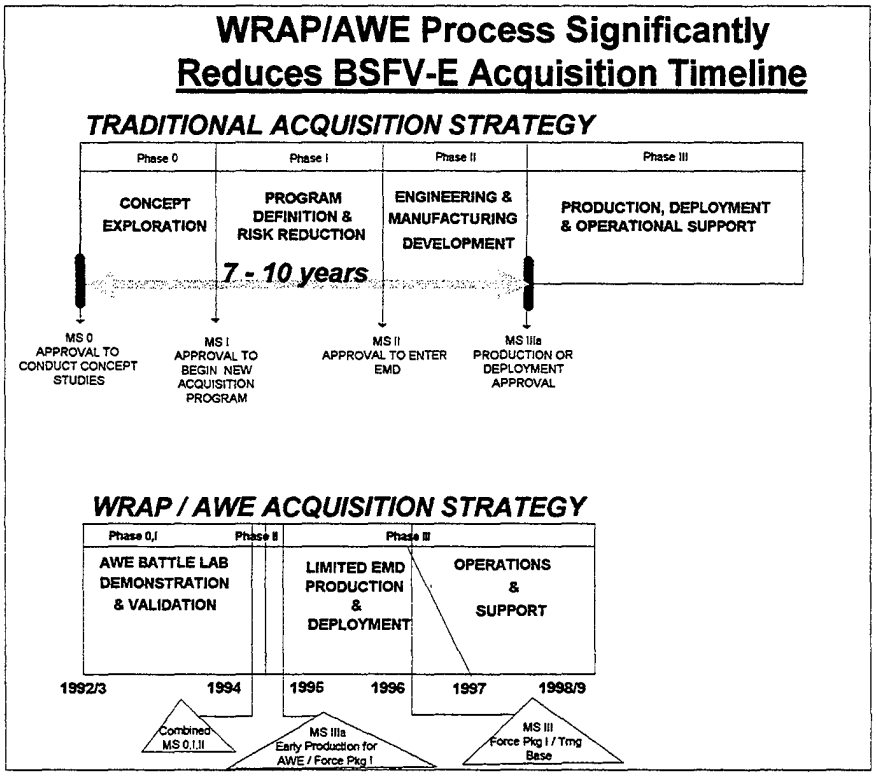

Figure 4-3. AWE/WRAP Reduces Acquisition Time of BSFV-E [Developed by Researcher]

- As one of the Army's first WRAP programs, BSFV-E's precedent-setting, streamlined acquisition process permitted a reduction in the administrative and procedural requirements which typically burden most weapon systems development.
- The selection of the appropriate use of NDI components lent themselves to a relatively low technical risk acquisition program requiring minimal integration
- A low risk technical approach supported the use of a Firm-Fixed-Price (FFP) contract for the BSFV-E, which proved to be another successful factor for this program
- The decision to compete the award of this program on the basis of a best value, FFP contract award, without any BAFOs, significantly enhanced this program's chance of success by accelerating the contracting phase of this program
- This program's use of the Battle Lab experimentation methodology and simulations eliminated much of the developmental efforts of other traditional acquisition programs
- The tailored test and evaluation (T&E) plan permitted the Army to modify this acquisition based upon its NDI classification. This allowed the required test and evaluation to be decreased by relying upon previously conducted component level testing
- The use of IPTs and commercial specifications and standards in the acquisition of the BSFV-E serve as further examples of effective acquisition streamlining.

Examination of the BSFV-E program indicates that WRAP is not a one-size-fits-all solution to acquisition streamlining; the WRAP process is most effectively applied to certain acquisition program types, like the BSFV-E.

The accelerated development of the BSFV-E program illustrates that the Warfighting Rapid Acquisition Program process can be very effective at streamlining one type of system acquisition. However, WRAP is not a one-size-fits-all acquisition streamlining tool; there are specific programmatic characteristics which lend themselves to a more effective application of the WRAP process. These characteristics of appropriateness, gleaned from the BSFV-E experience, indicate that WRAP is best suited for acquisition programs which:

- Have demonstrated an executable solution to a relevant, urgent Army warfighting need
- Utilize mature technology posing low technical risk; NDI might often present such an opportunity
- Do not require a new developmental effort ("new start") to occur
- Capitalize upon a HTI modification
- Are small in size -- WRAP is not appropriate for major ACAT I type programs
- Are supported by a strong "champion" from the user community
- Are supported by a committed materiel developer "champion"
- Utilize a fixed-price type contract vehicle; this is consistent with low technical risk
- Are low production quantity or include the use of exercisable contract options so as to be able to build upon success
- Use contract incentives associated with key program or milestone events to spur contractors forward

- Require a level of funding which is below the established reprogramming thresholds for acquisition programs ($3.999 million RDT&E and $9.999 million in procurement).

C. SUMMARY

Using the BSFV-E program as an example, this chapter has examined some of the acquisition streamlining measures found in the linkage between the Warfighting Rapid Acquisition Program and TRADOC Battle Lab experimentation. The lessons learned which are discussed in this chapter interpret the impact of WRAP based on the progress of the BSFV-E program alone. The Army's WRAP process has been influential in bringing about some of reform measures in this particular air defense weapon system. It may also be inferred from the BSFV-E program that it is not appropriate to indiscriminately apply the WRAP process to just any acquisition program in the hopes of achieving acquisition streamlining; this tool is most effective when used in unique circumstances addressed above.

V. CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL CONCLUSIONS

It is apparent that as the Defense budget diminishes, the emphasis upon acquisition streamlining will continue to increase. Program managers will require a clearer understanding of how to implement acquisition reform in order to remain competitive in this challenging environment as the Army evolves into Force XXI. In an effort to assist acquisition managers accomplish this task, this thesis examined some of the TRADOC organizations and initiatives which contributed to acquisition streamlining in the BSFV-E weapon system. The Warfighting Rapid Acquisition Program (WRAP) policy and TRADOC's Battle Labs were examined for their influence on the progress of the BSFV-E program. It appears that the BSFV-E presents a good example of acquisition reform and exemplifies how TRADOC is involved in accelerating the Army's acquisition process. There are many factors which have contributed to the BSFV-E's success to date and this thesis offers some of the lessons learned.

The fielding of the BSFV-E, along with the FAAD C2I/Ground Base Sensor (GBS), will complete the horizontal digitization of divisional air defense. Mobility, lethality, survivability and situational awareness will all be significantly improved. The WRAP-approved Bradley Stinger Fighting Vehicle - Enhanced is definitely not a "business-as-usual" program. Here is one example of how the Army is moving towards attainment of its Force XXI goals, this program reflects the challenges and rewards posed by implementing acquisition reform. When successful, the beneficiary is the soldier.

B. SUMMARY OF LESSONS LEARNED

A summary of the lessons learned from the study of the Army's Warfighting Rapid Acquisition Program and its impact upon acquisition streamlining in the BSFV-E program is listed below:

- The experiences of the BSFV-E program reflect that although the Warfighting Rapid Acquisition Process (WRAP) is conceptually valid, it suffers from a flaw in its lack of funding for approved rapid acquisition programs
- The BSFV-E experience illustrates that the speed of acquiring WRAP approved programs can outstrip the timing of the existing POM funding cycle
- The success that the BSFV-E program has enjoyed to date results from the influence of many factors beyond the WRAP process and TRADOC's Battle Labs
- Analysis of the BSFV-E program reveals that Battle Labs help provide what has been a missing link between technical feasibility and user needs that was lacking in the previous system of warfighting requirements development
- Use of simulations by the BSFV-E program illustrates how the Battle Lab emphasis upon virtual prototyping can successfully accelerate programs.
- The BSFV-E program provides a clear example that contractors do not receive a guaranteed advantage by entering into cooperative relationships with Battle Labs
- The results from the Task Force XXI AWE may not be a fair report card for determining the effectiveness of the BSFV-E program or other programs participating in that Battle Lab experiment; BSFV-E's report card (and other Task Force XXI programs) must be written in developmental and operational testing
- The current growth path for the BSFV-E lacks connectivity with other systems using the same chassis; if BSFV-E is not on a vehicle chassis common to other applications, some of the benefits of HTI might be at risk; logistics support will be at risk as well
- The BSFV-E program does serve as one excellent example of acquisition reform

- Examination of the BSFV-E program indicates that WRAP is not a "one-size-fits-all" solution to acquisition streamlining; the WRAP process is most effectively applied to certain acquisition program types, like the BSFV-E.

C. RECOMMENDATIONS

From the examination of the Warfighting Rapid Acquisition Program's influence upon the BSFV-E, the following recommendations are made:

- The WRAP Council should ensure that following all AWEs, all programs considered to be successful under the Battle Lab experimentation methodology and which can fulfill an urgent warfighting need be considered for assessment by the WRAP process

- Funding for the WRAP process must be somehow built into the process; although the insertion of POM "wedges" or other designated pools of money in future Army budgets may prove impractical, measures need to be taken to eliminate the existing funding limitations now experienced by WRAP candidates and to provide a funding stream that contributes to WRAP success.

D. AREAS FOR FURTHER RESEARCH

The following areas were seen as open issues beyond the scope of this thesis and are recommended for further research:

- Analyzing how other Services accomplish rapid acquisition using processes similar to the Army's WRAP program to highlight the advantages/disadvantages of each (e.g., the USAF High Gear Program)

- Analyzing the effectiveness of organizations in other Services (such as the USMC Commandant's Warfighting Lab) which appear to have a similar role to that of the Army Battle Labs

- Comparing the results of subsequent WRAP Council boards to determine long term effectiveness of the WRAP process and to develop a template for choosing future WRAP candidates

- Examining the benefit of applying the Warfighting Rapid Acquisition Program process on a major systems acquisition

- Analyzing whether TRADOC should standardize the organization of its Battle Lab Support Elements

- Analyzing the influence of the Battle Labs and their experimental methodology upon other rapid acquisition initiatives (such as the Advanced Precision Aerial Delivery System [APADS] or Avenger slew-to-cue)

- Comprehensively evaluating the Army's Advanced Concepts and Technology II (ACT II) Program.

APPENDIX A [LIST OF ACRONYMS]

A/C	Aircraft
AAC	Army Acquisition Corps
AAD	Army Air Defense
AAE	Army Acquisition Executive
AAW	Anti-Air Warfare
ABT	Air-Breathing Target; Air Breathing Threat
ACAT	Acquisition Category
ACD	Army Combat Developer
ACM	Advanced Concepts Manager
ACR	Armored Cavalry Regiment
ACT	Advanced Concepts and Technology
ACTD	Advanced Concept Technology Demo
AD	Air Defense
ADA	Air Defense Artillery
ADA C2S	Air Defense Artillery C & C System
ADATS	Air Defense Anti-Tank System
ADCSCD	ADCS (Combat Development)
ADCSOPS	ADCS Operations
ADCST	ADCS Training
ADCSTE	ADCS Test and Evaluation
ADDCS	Air Defense C & C System
ADL	Air Defense Lab
ADM	Acquisition Decision Memorandum
ADO	Army Digitization Office
AF	Air Force
AFARS	Army Federal Acquisition Regulation Supplement
AMC	Army Materiel Command
AMSAA	Army Materiel Systems Analysis Activity
APADS	Advanced Precision Airborne Delivery System
APBI	Advanced Planning Board for Industry
ARL	Army Research Laboratory
ASARC	Army Systems Acquisition Review Council
ASARDA	ASA for Research, Development, & Acquisition
ASB	Army Science Board
ASD	Assistant Secretary of Defense
ASD(MRA&L)	Assistant Secretary of Defense for Manpower, Reserve Affairs, and Logistics
ASD(PA&E)	Assistant Secretary of Defense for Program Analysis and Evaluation
ATAM	Air to Air Missile
ATAS	Air to Air Stinger

ATD	Advanced Technology Demonstration
AWD	Advanced Warfighting Demonstration
AWE	Advanced Warfighting Experiment
BAA	Broad Agency Announcement
BAFO	Best and Final Offer
BC	Battle Command (Battle Lab)
BFV	Bradley Fighting Vehicle
BFVS	Bradley Fighting Vehicle System
BLEP	Battle Lab Experiment Plan
BLESROC	Battle Lab Experiment Senior Officer Review Committee
BLITC	Battle Lab Integration, Technology, and Concepts
BLITCD	Battle Lab Integration, Technology, and Concepts Directorate
BLSE	Battle Lab Support Element
BLUFOR	Blue Forces
BLWE	Battle Lab Warfighting Experiment
BOD	Board of Directors
BOS	Battlefield Operating System
BSFV	Bradley Stinger Fighting Vehicle
BSFV-MUA	Bradley Stinger Fighting Vehicle, MANPADS Under Armor
BSFV-E	Bradley Stinger Fighting Vehicle - Enhanced
C2	Command and Control
C2I	Command, Control, and Intelligence
C3	Command, Control, and Communications
C3I	Command, Control, Commo, & Intelligence
CAC	Combined Arms
CBD	Commerce Business Daily
CBRS	Concept-Based Requirements System
CBTDEV	Combat Development
CDRL	Contract Data Requirements List
CEA	Cost Effectiveness Analysis
CE/D	Concept Exploration & Definition
CEP	Concept Evaluation Program
CG	Commanding General
CLIN	Contract Line Item Number
CMTC	Combat Maneuver Training Center
COA	Course of Action
COEA	Cost & Operational Effectiveness Analysis
COTS	Commercial-Off-the-Shelf
CSA	Chief of Staff, Army
CSS	Combat Service Support (Battle Lab)
CTC	Combat Training Center

DAB	Defense Acquisition Board
DAE	Defense Acquisition Executive
DBS	Dismounted Battlespace (Battle Lab)
DCD	Directorate of Combat Developments
DCSCD	Deputy Chief of Staff for Combat Development
DCSCDD	Deputy Chief of Staff for Concepts, Doctrine, & Developments
DCSIM	Deputy Chief of Staff for Information Management
DCSINT	Deputy Chief of Staff for Intelligence
DCSLOG	Deputy Chief of Staff for Logistics
DCSOPS	Deputy Chief of Staff for Operations
DCSPER	Deputy Chief of Staff for Personnel
DCSRDA	Deputy Chief of Staff for Research, Development, and Acquisition
DCSRM	Deputy Chief of Staff for Resource Mgmt
DCST	Deputy Chief of Staff for Training
DCSTE	Deputy Chief of Staff for Test and Evaluation
DDBL	Dismounted Battlespace Battle Lab
DDT&E	Deputy Director for Test and Evaluation
DEM/VAL	Demonstration & Validation
DIBBL	Dismounted Infantry Battle Space Battle Lab
DIS	Distributed Interactive Simulation
DISC4	Director(ate) for Info Systems for Cmd, Cntrl, Commo, & Computers
DIVAD	Divisional Air Defense
DOD	Department of Defense
DOTE	Director, Operational Test and Evaluation
DPAE	Director for Program Analysis and Evaluation
DPG	Defense Planning Guidance
DPM	Deputy Project Manager
DSA	Depth & Simultaneous Attack (Battle Lab)
DTLOMS	Doctrine, Training, Leader Development, Organizations, Materiel, and Soldiers
DUSA	Deputy Under Secretary of the Army
DUSA(OR)	Deputy Under Secretary of the Army, Operations Research
DUSA(FM&C)	Deputy Under Secretary of the Army, Financial Management & Comptroller
EELS	Early Entry, Lethality, and Survivability (Battle Lab)
EFOG-M	Enhanced Fiber Optic Guided - Missile
EMD	Engineering & Manufacturing Development
EPLRS	Enhanced Position Location Reporting System
EXFOR	Experimental Forces
FAA	Functional Area
FAAD	Forward Area Air Defense

FAADC2	FAAD Command & Control
FAADC2I	FAAD Command, Control, and Intelligence
FAADC3I	FAAD Command , Control, Communications, and Intelligence
FAADS	Forward Area Air Defense System
FADC2I	Forward Air Defense Command, Control, and Intelligence
FAR	Federal Acquisition Regulation
FFP	Firm Fixed Price
FLIR	Forward Looking Infrared
FLOT	Forward Line of Troops
FOG-M	Fiber Optic Guided Missile
FOT&E	Follow-on Operational Test and Evaluation
FP I	Force Package I
FU	Fire Unit
FUE	First Unit Equipped
FXXI	Force Twenty-One
FY	Fiscal Year
GBS	Ground-Based Sensor
GFE	Government Furnished Equipment
GPS	Global Positioning System
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HTI	Horizontal Technology Insertion
ICT	Integrated Concept Team
IFV	Infantry Fighting Vehicle
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
IPPD	Integrated Product and Process Development
IPT	Integrated Product Team
IR	Infrared
IR&D	Independent Research and Development
ISU	Integrated Sight Unit
J&A	Justification and Approval
JV	Joint Venture
LAM	Louisiana Maneuvers
LAM-TF	Louisiana Maneuvers-Task Force
LAV	Light Armored Vehicle
LOS-F(H)	Line Of Sight-Forward-Heavy
LOS-R	Line Of Sight-Rear
LRIP	Low-Rate Initial Production

MANPADS	Man-Portable Air Defense System
MANPRINT	Manpower and Personnel Integration
MILSPEC	Military Specification
MBS	Mounted Battlespace (Battle Lab)
MDR	Milestone Decision Review
MECH	Mechanized
MICOM	Missile Command
MNS	Mission Needs Statement
MOE	Measure of Effectiveness
MOP	Measure of Performance
MRDEC	MICOM Research, Development and Engineering Center
MUA	MANPADS Under Armor
NDI	Non-Developmental Item
NLOS	Non-Line of Sight
NPR	National Performance Review
NTC	National Training Center
OCR	Operational Capability Requirement
OPTECH	Operational Test & Evaluation Command
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
P/D	Production & Deployment
PEO	Program Executive Office(r)
PEO-TM	Program Executive Office(r)-Tactical Missiles
PM	Program (or Project or Product) Manager
PM-FAAD	Project Manager-Forward Area Air Defense
RATT	Rapid Acquisition Tiger Team
R&D	Research and Development
RD&A	Research, Development and Acquisition
RD&E	Research Development and Engineering
RDA	Research, Development, and Acquisition
RDEC	Research Development and Engineering Center
RDTE	Research, Development, Test, and Evaluation
REGT	Regiment
RFP	Request For Proposal
RISTA	Reconnaissance, Intelligence, Surveillance, and Target Acquisition
ROC	Required Operational Capability
RW	Rotary-Wing
S&T	Science & Technology
SHTU	Simplified Hand-held Terminal Unit

SME	Subject Matter Expert
SOF	Special Operations Forces
SSA	Source Selection Agency
SSEB	Source Selection Evaluation Board
STAR-T	SHF Tri-band Advanced Range Extension - Terminal
STC	Slew-to-Cue
SVML	Standard Vehicle Mounted Launcher
SWG	Synchronization Working Group; Simulation Working Group
T&E	Test and Evaluation
TDP	Technical Data Package
TEC	Technical Evaluation Committee
TECOM	Test & Evaluation Command
TEMP	Test and Evaluation Master Plan
TOW	Tube-launched, Optically-tracked, Wire- guided
TRADOC	Training and Doctrine Command
TSM	TRADOC Systems Manager
TTP	Tactics, Techniques and Procedures
UAAPU	Under Armor Auxillary Power Unit
UAV	Unmanned Aerial Vehicle
UDLP	United Defense Limited Partnership
USAADASCH	US Army Air Defense Artillery School
USD	Under Secretary of Defense
USD/A	Under Secretary of Defense for Acquisition
USD/P	Under Secretary of Defense for Policy
USMC	United States Marine Corps
VPS	Virtual Prototype Simulations
WRAP	Warfighting Rapid Acquisition Program; Warfighting Rapid Acquisition Process

APPENDIX B
[BSFV-E PROGRAM CHRONOLOGY]

DATE	EVENT
August 1985	SECDEF cancels Sergeant York Program
August 1985 - January 1986	FAAD Working Group convenes
January 1986	SECDEF approves FAAD system concept
November 1987	ADATS selected for LOS-F-H role out of candidate evaluation involving four systems
November 1991	HQ DA approves BSFV-MUA concept to replace Vulcan air defense gun systems until fielding of ADATS
January 1992	SECDEF cancels ADATS
April 1992	BSFV-MUA fielding begins
October 1992	USAADASCH initiates Division Air Defense Study (DADS) to revisit FAAD and determine post Cold War force projection air defense requirements
September 1992	USSAADASCH Air Defense Lab begins cooperative demonstrations with industry on BSFV enhancements
November 1992	Congress directs a BSFV turret study
December 1992	Air Defense Lab proves BSFV-E principle by engaging helicopter with an ATAS equipped Bradley IFV
October 1993	DADS completed
April 1994	BSFVs participate in NTC 94-07
May 1994	PM FAAD conducts Virtual Prototype Simulation "shoot off"to evaluate operational effectiveness of three turret proposal alternatives
June 1994	SARD Rapid Acquisition Tiger Team forms

June 1994	Air Defense Lab forwards BSFV-E concept to Tiger Team
August 1994	USAADASCH forwards BSFV-E ORD to PM FAAD
September 1994	USAADASCH forwards BSFV-E Urgency of Need Statement through TRADOC
October 1994	TRADOC Simulations Working Group approves use of analytical testing in lieu of actual requirements testing in BSFV-E program
December 1994	BSFV-E receives Milestone II approval from PEO Tactical Missiles as an ACAT IV program
December 1994	Congressionally mandated BSFV turret study completed
December 1994	BSFV-E Battle Lab Experiment Plan approved
December 1994	TRADOC approves BSFV-E ORD
January 1995	First Army WRAP Council convenes
January 1995	WRAP Council approves Milestone IIIa decision to procure eight BSFV-E prototypes for Task Force XXI AWE participation
February 1995	Project office releases BSFV-E RFP
March 1995	BSFV-E contract awarded to Boeing Missiles & Space Division
October 1995 - February 1996	Boeing conducts contractor testing
May 1996	Completes IOTE
August 1996	Task Force XXI AWE EXFOR (scheduled) to receive 8 protoype BSFV-Es
November 1996	(Scheduled) Milestone III production decision to field Force Package I units
March 1987	(Scheduled) Task Force XXI AWE NTC rotation
July 1997	(Scheduled) FUE to Force Package I unit

APPENDIX C [REPRESENTATIVE INTERVIEW QUESTIONS]

- What is your opinion of the Battle Labs' use of the BSFV-E program as a representation of its positive effects (contributions to) upon acquisition reform?
- With respect to the impact of Battle Lab's and WRAP upon this specific program, has there been any perceivable value-added to the BSFV-E's development? If so, to what extent?
- With respect to the impact of Battle Labs upon other weapon system development or procurement programs that you may be familiar with, are Battle Labs and WRAP contributing to acquisition streamlining? If so, could you cite some specific, brief examples?
- What specific measures could the Battle Labs make to improve their current utility to the acquisition process?
- In light of current budgetary environmental factors, is the BSFV-E viable?
- What is the chief limitation of the Battle Labs and WRAP? Are there any principal systemic impediments to their ability to contribute to the Army?
- Should Army Battle Labs remain external to, or should they be structured within, the DCDs?
- In terms of requirements generation, to what extent do the Battle Labs speak for the institutional user?
- What is wrong, and what is right, about the current requirements generation process as it stands today?
- Should TSMs remain external to, or should they be structured within, the Army Battle Labs?
- Should Battle Labs take over the requirements generation from the TSMs?
- Is the BSFV-E program an excellent, good, or poor example of proven acquistion reform (streamlining)?
- Is WRAP an effective form of acquisition reform?

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