A SMART Success Story . . .

LESSONS LEARNED
FROM THE AH-64
LONGBOW APACHE PMO
RISK AND COST REDUCTION SYSTEM

LTC Derek J. Paquette

Background

Virtually every trade publication DOD-wide has dedicated substantial space to Simulation and Modeling for Acquisition Requirements and Training (SMART) and Simulation Based Acquisition (SBA) activities since DOD mandated their use in every major acquisition program in June 2001. This article reports a real-world success story that has produced quantifiable benefits to an ongoing acquisition program in the system development and demonstration phase of the acquisition cycle on a legacy aircraft platform. The Apache Program Management Office (PMO’s) success highlights the benefits that SMART and SBA are capable of delivering!

Introduction

Within aviation, there has been a significant and renewed interest in the SMART processes and SBA activities. This interest is due largely, and correctly so, to perceptions that the appropriate modeling and simulation of a particular system or subsystem early in the acquisition cycle can lead to significantly reduced life-cycle and total-ownership costs (TOC), cost avoidance benefits, reduced acquisition cycle times, and design risk reduction.

Long before June 2001, the AH-64 Apache PMO implemented a vision with the Program Executive Office for Aviation's first real SBA asset known as the Risk and Cost Reduction System (RACRS). RACRS is used to support the development and procurement of the Modernized Target Acquisition and Designation Sight/Pilot's Night Vision Sensor (M-TADS/PNVS). These improved sighting and pilotage sensors will significantly increase the safety of night flying operations with the introduction of advanced forward looking infrared technology into the Apache, as well as greatly enhancing embedded targeting and electronics capabilities.

Challenges

The challenge of implementing SMART/SBA processes into a program centers on identifying the key performance areas and key performance parameters that are the anticipated cost drivers. Once they are identified, the challenge is to determine which areas and/or parameters can benefit most from modeling and simulation analyses. For Apache, this process was further complicated because the M-TADS/PNVS is an enhancement to a legacy system on a legacy aircraft platform. Very little attention has been given to SMART implementations into the “legacy-platform-upgrade-world” that dominates much of aviation acquisition.

The Camber Corp.'s Information Technology Division was tasked by the Project Manager, Apache (PM, Apache) to develop a program in concert with the original equipment manufacturer and current prime contractor for the M-TADS/PNVS Lockheed Martin Missiles and Fire Control (LMMFC) to mature image processing algorithms prior to production. The task also called for help in developing the multtarget tracker capability in the M-TADS/PNVS and assisting in the integration of the other subsensors that make up the M-TADS/PNVS, which represented the highest risk areas to the program. Camber did this by integrating the LMMFC-developed M-TADS/PNVS software into the Longbow Apache.
RACRS, which resides within the Camber Modeling and Simulation Laboratory in Huntsville, AL.

The RACRS consists of a high-fidelity cockpit simulation of the Longbow Apache pilot and co-pilot gunner stations, and a high-resolution out-the-window visual system running on an SGI 3500 Image Generator with multiple, changeable, high-resolution, Camber-developed, geospecific databases on which to fly. Provisions also exist for the integration of various hardware components of the Longbow Apache as well as open functionality within the software architecture, allowing for future upgrades and follow-on modifications to the Longbow to be tested and evaluated in a “try-it-before-you-fly-it” environment. This capability alone has made PM, Apache a much more informed buyer of modernizations and improvements.

**Teamwork**

Much of the SBA work on the M-TADS/PNVS is a virtual modeling and simulation effort with intense collaboration between the Apache PMO, the LMMFC development team, and Camber’s modeling and simulation staff. Many of the benefits of the Camber efforts are difficult to quantify, a situation similar to that of many of the SBA programs within the Army today. Though difficult to quantify, the benefits are obvious to all who are working on the program, both government personnel and contractors. The driving force behind these program benefits is the collaborative and cooperative environment that has emerged between the four parties involved: PM, Apache; Boeing-Mesa (Apache’s manufacturer); LMMFC; and Camber. This team environment facilitated the free-flowing exchange of ideas and information critical to achieving the goal of providing the soldier with a far superior sensor array.

A significant amount of the collaborative work centered on the image processing algorithms, the multitarget tracker functionality, and M-TADS/PNVS system initialization. Much of the effort has been...
Because of the complexities and diversity of new system development, collaboration is critical to the future success of developmental programs.

PM, Apache is increasing its commitment to modeling and simulation efforts as a result of the myriad of successes achieved to date and the ever-increasing complexities of the modernization path ahead. Helmet displays, situational awareness enhancements, fire control radar modifications, emerging missile technologies, unmanned aerial vehicle interoperability studies, and other efforts that represent much of the approved elements of the Longbow Apache Product Improvement Program and other Army transformation efforts will go through similar SMART processes.

LTC DEREK J. PAQUETTE has served more than 2 years as Product Manager for Apache Modernization and the Modernized TADS/PNVS for the Apache Attack Helicopter Program at Redstone Arsenal, Huntsville, AL. He is an Aviation Officer and Senior Aviator with more than 20 years of service. He has a bachelor's degree in engineering from the U.S. Military Academy, West Point, NY, and master's of science degrees from the University of Texas, Austin in aerospace engineering and the University of Southern California in systems management.

Summary

The bottom line on the success of the Apache SMART story is that there have been multiple millions of dollars in cost avoidance and risk mitigation realized as a result of these cooperative SBA efforts. The long-term benefit of TOC reduction is still being assessed because the developmental process is not complete. Historical data show that software-intensive programs typically experience growth of at least 40 percent over their life cycle in excess of planned and estimated costs. Camber's efforts have curbed that TOC growth by at least 20 percent. Internal rates of return on PM, Apache's investment are estimated at 10-to-1. This real-world, real-time acquisition program's successes highlight the viability and visibility of the benefits of SMART. This will, hopefully, provide a modernization road map for many other legacy or current force platforms during the Army transformation process.

How does this SMART/SBA asset help Army pilots? The AH-64 PMO SMART/SBA RACRS allows pilots and acquisition officials to try it before they fly it on the real aircraft. This tool not only saves valuable aircraft time and resources, but also reduces risks and enhances pilot familiarization with the new systems, e.g., M-TADS/ PNVS. As a mission test rehearsal tool, the RACRS allows pilots to fly on geospecific 1-meter resolution, physics-mapped databases under varying environmental and expected threat conditions. On the M-TADS/ PNVS Program, the pilots will fly the exact test profiles required at Yuma Proving Ground for an actual flight test, thus saving range time while providing an upfront training benefit.

Total cost avoidance to date has been estimated at $70 million. Many of the areas of focus outlined above are still impacting system design and operations. TOC benefits will continue to be developed as the program continues to mature. Part and parcel to TOC is the cost associated with software development, maintenance, and upgrades of systems over their useful life cycle. These areas are continuing to be evaluated now and throughout FY03.

Because of the complexities and diversity of new system development, collaboration is critical to the future success of developmental programs.

The bottom line on the success of the Apache SMART story is that there have been multiple millions of dollars in cost avoidance and risk mitigation realized as a result of these cooperative SBA efforts. An overview of some of the collaborative efforts is provided in the table on Page 21.

Because of the complexities and diversity of new system development, collaboration is critical to the future success of developmental programs. LMMFC has some of the world's finest algorithm architects, while Fort Rucker and Boeing-Mesa have the most experienced and gifted Apache Longbow test pilots. We are learning through solving problems together that the only way for these organizations to truly communicate and articulate real-world concerns, issues, and solutions is through the collaborative environment a SMART program affords. Camber's role as the "honest broker" has allowed these generally mutually exclusive worlds to come together in a cooperative and nonthreatening environment to the betterment and benefit of the soldier.

Total cost avoidance to date has been estimated at $70 million. Many of the areas of focus outlined above are still impacting system design and operations. TOC benefits will continue to be developed as the program continues to mature. Part and parcel to TOC is the cost associated with software development, maintenance, and upgrades of systems over their useful life cycle. These areas are continuing to be evaluated now and throughout FY03.

Summary

The bottom line on the success of the Apache SMART story is that there have been multiple millions of dollars in cost avoidance and risk mitigation realized as a result of these cooperative SBA efforts. The long-term benefit of TOC reduction is still being assessed because the developmental process is not complete. Historical data show that software-intensive programs typically experience growth of at least 40 percent over their life cycle in excess of planned and estimated costs. Camber's efforts have curbed that TOC growth by at least 20 percent. Internal rates of return on PM, Apache's investment are estimated at 10-to-1. This real-world, real-time acquisition program's successes highlight the viability and visibility of the benefits of SMART. This will, hopefully, provide a modernization road map for many other legacy or current force platforms during the Army transformation process.

How does this SMART/SBA asset help Army pilots? The AH-64 PMO SMART/SBA RACRS allows pilots and acquisition officials to try it before they fly it on the real aircraft. This tool not only saves valuable aircraft time and resources, but also reduces risks and enhances pilot familiarization with the new systems, e.g., M-TADS/ PNVS. As a mission test rehearsal tool, the RACRS allows pilots to fly on geospecific 1-meter resolution, physics-mapped databases under varying environmental and expected threat conditions. On the M-TADS/ PNVS Program, the pilots will fly the exact test profiles required at Yuma Proving Ground for an actual flight test, thus saving range time while providing an upfront training benefit.

Because of the complexities and diversity of new system development, collaboration is critical to the future success of developmental programs.

The bottom line on the success of the Apache SMART story is that there have been multiple millions of dollars in cost avoidance and risk mitigation realized as a result of these cooperative SBA efforts. An overview of some of the collaborative efforts is provided in the table on Page 21.

Because of the complexities and diversity of new system development, collaboration is critical to the future success of developmental programs. LMMFC has some of the world's finest algorithm architects, while Fort Rucker and Boeing-Mesa have the most experienced and gifted Apache Longbow test pilots. We are learning through solving problems together that the only way for these organizations to truly communicate and articulate real-world concerns, issues, and solutions is through the collaborative environment a SMART program affords. Camber's role as the "honest broker" has allowed these generally mutually exclusive worlds to come together in a cooperative and nonthreatening environment to the betterment and benefit of the soldier.

Total cost avoidance to date has been estimated at $70 million. Many of the areas of focus outlined above are still impacting system design and operations. TOC benefits will continue to be developed as the program continues to mature. Part and parcel to TOC is the cost associated with software development, maintenance, and upgrades of systems over their useful life cycle. These areas are continuing to be evaluated now and throughout FY03.

Summary

The bottom line on the success of the Apache SMART story is that there have been multiple millions of dollars in cost avoidance and risk mitigation realized as a result of these cooperative SBA efforts. The long-term benefit of TOC reduction is still being assessed because the developmental process is not complete. Historical data show that software-intensive programs typically experience growth of at least 40 percent over their life cycle in excess of planned and estimated costs. Camber's efforts have curbed that TOC growth by at least 20 percent. Internal rates of return on PM, Apache's investment are estimated at 10-to-1. This real-world, real-time acquisition program's successes highlight the viability and visibility of the benefits of SMART. This will, hopefully, provide a modernization road map for many other legacy or current force platforms during the Army transformation process.

How does this SMART/SBA asset help Army pilots? The AH-64 PMO SMART/SBA RACRS allows pilots and acquisition officials to try it before they fly it on the real aircraft. This tool not only saves valuable aircraft time and resources, but also reduces risks and enhances pilot familiarization with the new systems, e.g., M-TADS/ PNVS. As a mission test rehearsal tool, the RACRS allows pilots to fly on geospecific 1-meter resolution, physics-mapped databases under varying environmental and expected threat conditions. On the M-TADS/ PNVS Program, the pilots will fly the exact test profiles required at Yuma Proving Ground for an actual flight test, thus saving range time while providing an upfront training benefit.

Because of the complexities and diversity of new system development, collaboration is critical to the future success of developmental programs.

The bottom line on the success of the Apache SMART story is that there have been multiple millions of dollars in cost avoidance and risk mitigation realized as a result of these cooperative SBA efforts. An overview of some of the collaborative efforts is provided in the table on Page 21.

Because of the complexities and diversity of new system development, collaboration is critical to the future success of developmental programs. LMMFC has some of the world's finest algorithm architects, while Fort Rucker and Boeing-Mesa have the most experienced and gifted Apache Longbow test pilots. We are learning through solving problems together that the only way for these organizations to truly communicate and articulate real-world concerns, issues, and solutions is through the collaborative environment a SMART program affords. Camber's role as the "honest broker" has allowed these generally mutually exclusive worlds to come together in a cooperative and nonthreatening environment to the betterment and benefit of the soldier.

Total cost avoidance to date has been estimated at $70 million. Many of the areas of focus outlined above are still impacting system design and operations. TOC benefits will continue to be developed as the program continues to mature. Part and parcel to TOC is the cost associated with software development, maintenance, and upgrades of systems over their useful life cycle. These areas are continuing to be evaluated now and throughout FY03.

Summary

The bottom line on the success of the Apache SMART story is that there have been multiple millions of dollars in cost avoidance and risk mitigation realized as a result of these cooperative SBA efforts. The long-term benefit of TOC reduction is still being assessed because the developmental process is not complete. Historical data show that software-intensive programs typically experience growth of at least 40 percent over their life cycle in excess of planned and estimated costs. Camber's efforts have curbed that TOC growth by at least 20 percent. Internal rates of return on PM, Apache's investment are estimated at 10-to-1. This real-world, real-time acquisition program's successes highlight the viability and visibility of the benefits of SMART. This will, hopefully, provide a modernization road map for many other legacy or current force platforms during the Army transformation process.

How does this SMART/SBA asset help Army pilots? The AH-64 PMO SMART/SBA RACRS allows pilots and acquisition officials to try it before they fly it on the real aircraft. This tool not only saves valuable aircraft time and resources, but also reduces risks and enhances pilot familiarization with the new systems, e.g., M-TADS/ PNVS. As a mission test rehearsal tool, the RACRS allows pilots to fly on geospecific 1-meter resolution, physics-mapped databases under varying environmental and expected threat conditions. On the M-TADS/ PNVS Program, the pilots will fly the exact test profiles required at Yuma Proving Ground for an actual flight test, thus saving range time while providing an upfront training benefit.