A RISK-BASED APPROACH TO TEST AND EVALUATION

SSCF RESEARCH REPORT

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Senior Service College Fellowship

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ABSTRACT

Our current fiscal environment requires serious consideration of new test and evaluation strategies that provide an accurate assessment of program risks. With this is in mind, is it truly possible to transition from the conventional test and evaluation process to a risk-based model?

Risk, by definition, is a measure of future uncertainties in achieving program performance goals and objectives within defined cost, schedule, and performance constraints. Risk can be associated with all aspects of a program, such as technology maturity, supplier capability, design maturation, and demonstrated performance against planned performance. Traditionally, this assessment of risk and the development of mitigation strategies have most often resided exclusively within the program manager's domain.

The purpose of this Strategic Research Paper is to determine the viability of a risk-based approach to test and evaluation. Research is based on a limited population of the total materiel acquisition community and represents an Alpha test of the stated issue. If proved viable with follow-on research, the risk-based approach would provide senior decision-makers within the Department of the Army with an independent perspective of risks based on test data, synthetic modeling data, and other relevant analysis. The target population for this research effort will be the Army Test and Evaluation Command and Program Executive Office Intelligence, Electronic Warfare and Sensors, both located at Aberdeen Proving Ground, MD. The methods that will be used to support this research effort will be a quantitative analysis based on a 20-question survey.

CHAPTER 1
INTRODUCTION

Background and Introduction

The Army acquisition community is in the midst of a transformation that demands the very best materiel solutions for the least cost. This transformation is principally driven by changes in our geopolitical and economic environments. While all serious discussions regarding the future of programs acknowledge existing capability gaps, senior leaders within the U.S. Army acquisition community are under constant pressure to accurately characterize risks and make tough decisions regarding the future course of their acquisition programs.

In his statement to the House Armed Services Committee on January 26, 2011, Defense Secretary Robert Gates outlined four initiatives that the Department of Defense (DoD) would take to reduce spending. He offered that the Services would achieve $100 billion in efficiencies over fiscal year (FY) 2012 through FY 2016, of which $29 billion would come from the Army. The Services would also develop additional efficiencies to accommodate a $78 billion reduction in the top line to support the administration's reduction efforts. Finally, he identified significant personnel reduction as a means to achieve additional efficiencies that included reductions in the contractor workforce, a civilian hiring freeze, reduced civilian workforce levels to the FY 2010 level, and a reduction of General Officer (GO) and Senior Executive Service (SES) billets over the next 2 years.

There is no doubt that our current fiscal environment demands serious consideration of all viable test and evaluation (T&E) approaches that result in substantive cost savings and an accurate assessment of program risks. With this in mind, is it possible to transition from a conventionally based construct for conducting T&E to a risk-based approach? The viability of such a transition as it relates to fielding complex systems in times of constrained resources is examined in this research. Also examined are the viability and implications of moving to a risk-based approach to T&E. Finally, this approach may provide senior decision-makers with an independent perspective of risks based on test data, synthetic modeling environments, and relevant analysis.

Risk, by definition, is a measure of future uncertainties in achieving program performance goals and objectives within defined cost, schedule, and performance constraints (*Risk Management Guide for DoD Acquisitions*, Sixth Edition, p. 1). Risk can be associated with

all aspects of a program such as technology maturity, supplier capability, design maturation, and demonstrated performance against planned performance. Traditionally, this assessment of risk and the development of associated mitigation strategies have most often resided exclusively within the program manager's (PM's) domain.

To assist in managing the risks involved in developing, producing, operating, and sustaining systems and capabilities, the acquisition and testing communities perform T&E. The PM, in concert with the user and testers, coordinates developmental, operational, live-fire, system-of-systems, interoperability, information assurance, and modeling and simulation activities into myriad activities commonly referred to as the T&E strategy. This strategy's principal objectives are to provide knowledge that will assist senior leaders in managing the technical risks, to measure progress in both system and capability development, to provide knowledge of system capabilities and limitations to the acquisition community for use in improving system performance, and to provide knowledge to the user community for optimizing system use in operational employment.

The U.S. Army Test and Evaluation Command (ATEC) is the premier organization chartered with the responsibility to conduct unbiased T&E for the U.S. Army. In addition to planning, executing, and reporting test and evaluation events, it also serves as the Independent Senior Adviser to the Secretary of the Army and the Chief of Staff of the Army on all T&E matters.

ATEC recently has been reorganized to optimize efficiencies, increase effectiveness, and provide senior leaders with the absolute best information and recommendations available to support senior leader decisions. Under the new reorganization, the command consists of nine Developmental Test Centers (DTCs), Operational Test Command (OTC), and Army Evaluation Center (OTC).

DTCs represent the largest, most diverse array of testing capabilities within the DoD. DTCs test military hardware of every description under precise conditions across the full spectrum of arctic, tropic, desert, and other natural or controlled environments on highly instrumented ranges and test courses. These centers offer a full range of test services, including providing unbiased test data on the technical feasibility of early concepts, determining system performance and safety, assessing technical risks during system development, confirming designs, and validating manufacturers' facilities and processes at both system and component

levels. Their testing services are extended to all DoD, other federal agencies, state and local governments, foreign and allied governments, and private industry. ATEC accomplishes its developmental test mission at eight test centers, including White Sands Test Center at White Sand Missile Range, NM; West Desert Test Center at Dugway Proving Ground, UT; Redstone Test Center at Redstone Arsenal, AL; Yuma Test Center at Yuma Proving Ground, AZ; Aberdeen Test Center at Aberdeen Proving Ground (APG), MD; Cold Regions Test Center at Fort Greely, AK; and the Electronic Proving Ground at Fort Huachuca, AZ.

As the U.S. Army transitions to the new geopolitical and economic environments, so does the Army's only independent operational test organization, the U.S. Army OTC at Fort Hood, TX. OTC has the mission to conduct realistic operational testing in the critical areas of equipment, doctrine, force design, and training. Operational tests conducted by this command are required by public law and provide significant data to Army decision-makers on key systems and concepts. The command also has five operational test directorates at critical locations throughout the United States. OTC uses highly sophisticated and state-of-the-art technology, both instrumentation along with modeling and simulation, to collect test data that will document performance levels and operational suitability. Perhaps the most striking initiative by the Army is leveraging the capabilities of OTC in providing an operational systems of systems environment to test new systems for operational utility. This network-centric test mission is conducted at White Sands Missile Range, NM, and represents the epicenter of T&E for the Army.

This network-centric test event, known as Agile Provider, represents the largest operational test in Army history. It is a cooperative effort between ATEC, Program Executive Office- Integration (PEO-I), and the Brigade Modernization Command (BMC) to test the Army's network. It also represents a new paradigm for operational testing that includes a dedicated test unit, realistic scenarios, bundled systems testing instead of a one-system test, and a series of network integration events that lead to a capstone test in fourth-quarter FY 2012. This new paradigm represents significant efficiencies in testing and will save more than 130,000 man hours alone with total cost reductions of more than $5.7 million by eliminating duplication of efforts (Simmons, 2011).

The Army Evaluation Center (AEC) is the organization that prepares the final evaluation report used by decision-makers to determine whether a new or enhanced system will become part of the Army's arsenal. In this role, AEC gets involved early in the acquisition process to ensure

that T&E programs, strategies, and objectives are consistent throughout the acquisition program. Since T&E results often impact decisions reached at design and milestone reviews, early involvement in the acquisition process adds value to the final product of any acquisition program. AEC evaluates and reports on each system's effectiveness, suitability, and survivability to the Army's senior leadership and, when requested, to Congress. AEC organizes and employs ATEC Systems Teams (AST) for each system under evaluation and coordinates input into the Test and Evaluation Working Integrated Product Teams (T&E WIPTs). The AST Chair serves as the lead voice and ensures that the T&E strategy is designed effectively to characterize the performance, suitability, and survivability of the system.

A New Model for Risk-Based Test and Evaluation

U.S. Army Materiel Systems Analysis Activity (AMSAA) is an analysis organization of the Army with an overall goal to provide soldiers with the best materiel solutions possible. AMSAA supports the Army by conducting systems and engineering analyses to support decisions on technology, materiel acquisitions, and the designing, developing, and sustaining of Army weapon systems. In its presentation to the 2011 Army Operational Research Symposium, AMSAA identified a technical risk methodology that included a 13-step process for reducing technical risks across the materiel development community. The desired end-state of the proposed process is an assessment of whether the proposed technology could be delivered within the required timeframes and cost targets. This assessment risk includes the development effort, the integration effort, and the manufacturing effort (Appendix C). The central premise of this research paper is that ATEC is well positioned to marshal its resources and partner with AMSAA in this innovative approach to risk-based program evaluations.

The process would begin early in the development cycle by identifying critical technologies and other technologies of interest. Each technology would be assessed at a particular technology readiness level (TRL). Manufacturing readiness and integration readiness also would be assessed for each segment of technology. Potential risks would be identified and probability distribution would be prepared for each technology. These distributions would be prepared for each major milestone decision within the life cycle of the program. The TRL, manufacturing readiness levels (MRL), and integration readiness levels (IRL) would be assessed for each milestone event with the objective readiness as follows: TRL 7, MRL 8, and IRL 8 by

Milestone C. This new risk-based approach to T&E would arm senior leaders with innovative cost-sensitive perspectives as they conduct key milestone decision reviews.

Overview of Methodology

This research project utilized a quantitative research methodology involving numerical representation of responses received from the target population described below. Data were collected to test the hypothesis and investigate the perceptions of the T&E community and the program management community with regard to ATEC's active role in risk management. The target population is both supervisory and nonsupervisory personnel from AEC and the Program Executive Office for Intelligence, Electronic Warfare, and Sensors (PEO IEW&S). PEO IEW&S is located at APG, MD, and is responsible for a combination of more than 110 programs of record and quick reaction capabilities.

Research Questions

This strategic research paper will assess the potential for a shift in focus for the ATEC in the characterization of risks for the program management community. In addition, this research paper adds to the volume of knowledge on potential efficiencies and effectiveness related to the formal risk management processes now almost exclusively within the PM's domain. This research tests the hypothesis that the Army would benefit from a shift in ATEC's mission where the principal product is based on a comprehensive assessment of risk. The key research question supporting this hypothesis is: Should the methodology for evaluating materiel acquisition systems within the U.S. Army transition from the delivery of traditional T&E to a risk-based assessment model? Other supporting research questions that will be answered as a result of this research include: Would a risk-based assessment prove more useful to PMs and Milestone Decision Authorities (MDAs) than the current method of T&E? Should a risk-based assessment apply to all categories of materiel acquisition programs? Would an independent assessment of the cost, schedule, and performance risks contribute to program success?

Research Hypothesis

AEC leadership supports the adaptation of evaluation methodologies that accurately and efficiently characterize risk for the acquisition community. Likewise, the acquisition community would benefit from T&E products that independently characterize program risks and provide associated mitigation strategies for those risk areas. This leads to the following hypotheses:

1. The current evaluation methodology employed by AEC should be changed to a risk-focused construct that directly supports the PM's efforts to accurately characterize program risks.
2. The current evaluation methodology should be continued by AEC and should not be changed to a risk-focused construct that directly supports the PM's efforts to accurately characterize program risk.

Limitations of this Study

The principal limitation of this study relates to the scope and magnitude of the target population. Although the Army has numerous PEOs dispersed throughout various locations within the continental United States, it is beyond the scope of this research effort to effectively manage the survey instrument throughout the entire materiel acquisition community. Therefore, the actual target population for this research effort will include the T&E community and will be limited to one PEO and its associated program management offices (PMOs).

CHAPTER 2
LITERATURE REVIEW

Introduction to the Literary Review

In its 2003 Report 04-53 to the Senate and House Armed Services Committees on revised acquisition policy, the General Accounting Office—now the Government Accountability Office (GAO), concluded that DoD acquisition policies incorporate best practices but fail to implement sufficient controls. These controls apply to program launch, the interval between integration and demonstration, and at production commitment. This report also emphasizes the critical point that without an effective risk management program in place, aspiring PMs cannot hope to sustain the level of control required to manage a successful acquisition program.

While the main catalyst for this research is the need for the Army to effectively leverage T&E resources in the area of risk management, there is a wealth of scholarly sources available on the subject of risk. As a result, the literature search begins with an overview of DoD's and the Army's risk management policies, procedures, and objectives. Academic research from commercial sources then is reviewed to ascertain the posture of risk management practices with commercial sectors. Finally, the literary review will progress to relevant scholarly presentation recently presented to the engineering and scientific community on the state of risk management within DoD and suggested improvements.

Department of Defense Relevant Literature

The principal source for regulatory guidance within DoD relevant to risk management is Department of Defense Directive (DoDD) 5000.1, *The Defense Acquisition System*. This document provides mandatory provisions that the materiel acquisition community must follow with respect to all aspects of program management, including the role of T&E. It provides specific guidance that is relevant to our research—namely, that the PM must balance the risks of cost, schedule, and performance to keep the program on track to production and fielding. It is the responsibility of decision-making authorities to assess risk tradeoffs. As stated in DoDD 5000.1, *The Defense Acquisition System*, "Test and evaluation shall be integrated throughout the defense acquisition process. Test and evaluation shall be structured to provide essential information to decision makers, assess attainment of technical performance parameters, and determine whether systems are operationally effective, suitable, survivable, and safe for intended use. The conduct of test and evaluation, integrated with modeling and simulation, shall facilitate learning, assess

technology maturity and interoperability, facilitate integration into fielded forces, and confirm performance against documented capability needs and adversary capabilities as described in the system threat assessment." The DoD 5000 series clearly sustains the notion that T&E organizations should play an integral role in risk management for DoD materiel acquisition systems.

The overarching document within DoD that assists PMs in effectively managing risks during the entire materiel acquisition life cycle is the *Risk Management Guide for DoD Acquisition*, Sixth Edition. This commonly used source acknowledges that the purpose of risk management is to help ensure program cost, schedule, and performance objectives are achieved at every stage in the life cycle and to communicate to all stakeholders the process of managing program uncertainties. Although this guide cannot be characterized as mandatory guidance, it provides risk management elements that PMs should follow as they apply the fundamental management tools provided. One of the more notable changes to this document is the emphasis given tracking the status of risk mitigation implantation vs. risk tracking and focusing on event-driven technical reviews to help identify risk areas and ongoing risk mitigation efforts. These are specific areas where ATEC could potentially leverage its considerable T&E expertise in managing program risk.

The Defense Acquisition University's (DAU) *Test and Evaluation Management Guide* is another relevant product that reinforces the importance of substantive test and evaluation involvement in the risk management process. It is important to note that the T&E process is an integral part of the Systems Engineering Process (SEP), which identifies levels of performance and assists the developer in correcting deficiencies. It is a significant element in the decision-making process, providing data that support tradeoff analysis, risk reduction, and requirements refinement. Program decisions on system performance maturity and readiness to advance to the next phase of development take into consideration demonstrated performance. Finally, the T&E process provides data that advise senior leaders within the Army how well the system is performing during development and if it is ready for fielding.

Academic Research from Commercial Sources

Commercial sources and academia have provided a wealth of information related to risk management. While the literary search revealed much of this research was related to specific niche areas within the commercial sector, the following sources were particularly relevant. In

their paper, A new approach to risk: The implications of E3, Robert Bea and other members of the Civil and Environmental Engineering Department at the University of California at Berkeley offered some particularly useful insights into the effective characterization of risk. The thesis of this paper is that no matter how much physical science and technology are involved in complex systems, no system is ever purely or solely physical or technical. Certainly, no system of which we are aware is purely scientific or technical in its operation or management. Furthermore, while research on and the modeling of complex systems usually rely heavily on the consideration of technological variables and processes, they typically fail to consider the contributions of individual psychological, organizational, and contextual factors. This paper argues that we need more effective models that avoid committing errors of the third kind, solving the wrong problem. The paper concludes that risk assessment shapes design, construction and management of infrastructure systems solutions, so great attention is needed on how it is done. The paper is extremely relevant to this study and significantly adds to the body of research on risk management.

Probabilistic risk assessment concepts provide a measure of statistical rigor when evaluating program risks. Curtis Smith from the Idaho National Engineering and Environmental Laboratory offers useful insights into this area of study. He concludes that probabilistic risk assessment methodology is an analysis that systematically answers the questions: What can go wrong, how likely is it to occur (probability, frequency), and what will be the outcome (consequences)? The SAPHIRE software tool also is introduced as a way to develop those risk concepts dealing with event trees, fault trees, and desired end states. SAPHIRE is a probabilistic risk, and reliability assessment software tool. SAPHIRE stands for Systems Analysis Programs for Hands-on Integrated Reliability Evaluations and was developed for the U.S. Nuclear Regulatory Commission (NRC) by the Idaho National Laboratory. Throughout the presentation, Curtis Smith emphasizes the importance of high-fidelity data analysis that quantifies likelihood of component failure and ranks individual basic events relative to other basic events. Finally, he discusses how “importance measures” are used to rank events and are vital for determining uncertainty. These “importance measures” are comparable to the “measures of effectiveness” employed by system evaluators as they assess the effectiveness, suitability, and survivability of new programs for the Army. This literary source also adds to the body of research related to risk

management and provides a useful construct to characterize risk in objective terms that provide a measure of statistical rigor.

Relevant Risk Management Scholarly Presentations

The Army Materiel Analysis has contributed much to this specific research topic. Three of their presentations at the 2011 Army Operational Research Symposium addressed the topic of schedule, cost, and performance risk methodologies. These presentations provided a direct correlation between effective program management and an innovative approach to risk management.

The effective measurement of technology risk with each materiel solution is paramount to program success. High technology risks mean technology will not be delivered within the required timeframe and cost target. A proposed methodology for characterizing technology risk level considers the likelihood that a specific technology will not be fully developed, integrated, and manufactured within the given costs and schedule constraints.

In considering likelihood, the model presents three variables for consideration. The development effort itself is defined as the level of effort required to reach TRL 7 by Milestone C. This is determined by considering the vendor's current TRL as compared to the probability of reaching TRL 7 by Milestone C and is based on subject matter expertise and/or historical data. The next variable in the "Likelihood" equation was the integration effort. This variable considers the current level of integration readiness and inversely proportional to the probability to reach IRL 7 by Milestone C. The final variable in the "Likelihood" equation is the manufacturing effort. In this venue, manufacturing readiness consist of an assessment of manufacturing readiness and the probability to reach MRL 8 given TRL 7 by Milestone C. This factor also is based on subject matter expertise and/or historical data. Finally, a Monte Carlo simulation on probability distributions is done to determine expected probability and is defined as the likelihood level for achieving a desired technology risk level. Data for these variables were obtained through a 12-step process known as technical risk assessment approach. The process began with a gathering of system information and concludes with the performance of a sensitivity analysis using the distribution for "Likelihood."

Effective measurement of schedule risk also is an issue of significance to the program management community. A schedule risk assessment methodology should be consistent, quantifiable, and repeatable. While the immediate schedule risk assessment methodology should

include the phase-driven approach, the desired end-state for this methodology is clearly to evolve to a primarily event-driven approach. The proposed methodology would include hierarchical levels that include schedules from the management level (Level I), the summary schedule (Level II), the control schedule (Level III), the medium-term schedule (Level IV), and the implementation schedule (Level V). Both the Management Schedule and the Control Schedule are required for the Phased-Driven approach described above. This approach to managing schedule risk consists of 10 steps that begin with a thorough review of the proposed schedule and culminates with the generation of the final schedule risk analysis, recommendations to mitigate schedule drivers, and a review of historical lessons learned. Data sources for this methodology include the PM's Integrated Master Schedule (IMS), any relevant GAO reports, subject matter expert interviews, relevant historical data, as well as other sources of scheduling data that may be available to the risk management team. This structured approach to risk management is expected to deliver consistent, quantifiable, and repeatable assessments of schedule risk.

The final and perhaps the most important sources in the literature review were related to the assessment of cost risk. Few would argue that cost risk demands effective management and the complete attention of the PM. This is especially true given the existing budget constraints associated with the current fiscal environment. While this element of risk is beyond the bounds of traditional T&E, a brief overview of the independent risk assessment process is useful. The Office of the Deputy Assistant Secretary of the Army for Cost and Economics (ODASA-CE) regularly provides overviews of cost risk and uncertainty analysis. Without an effective risk analysis, a cost estimate usually will be a point estimate, which may not account for all of the uncertainties inherent in the program effort. Not accounting for potential uncertainties may lead to underfunding, cost overruns, and the potential for a program reduction in scope. The analysis methodology begins with the identification of areas of uncertainty. The uncertainty then is addressed within the current program cost estimate, after which the risk is quantified within the cost estimate, and the results are presented to relevant stakeholders. At the conclusion of the risk management process and in preparation for the MDA briefing, the technical, schedule, and cost risk assessments will be summarized to identify key risk drivers, to show any interactions and interdependencies between risk categories, and the presentation of risk mitigation strategies and/or potential tradeoff for each alternatives.

Summary

Developing effective risk management methodologies provides challenges for the entire acquisition workforce as it performs critical functions with constrained resources. Whether the risk is technology based, schedule based, or cost based, it is imperative that we provide develop accurate and repeatable assessment to senior leaders. Given the limited resources available to the PM, we cannot afford to rely on marginal assessments that support critical acquisition decisions.

This literature review provides a glimpse of the voluminous studies, reviews, and articles pertaining to risk management. It also illustrates the currently constrained environment that acquisition professionals operate in as they deliver quality materiel solutions to the Army.

CHAPTER 3
RESEARCH METHODOLOGY

Introduction

The applied research methodology supporting this strategic research paper conformed to the descriptive category. Research was used to describe facts and characteristics of a given population systematically, factually, and accurately.

Data were collected in order to test the hypothesis using quantitative methods: The risk-based test and evaluation concept, originally developed by AMSAA and further developed in this paper, provides a useful construct in assessing program risk. Data were collected through the use of a survey instrument administered to and completed by members of the T&E community as well as the program management community. The subsequent analysis from the survey instrument relies on quantitative analysis to accurately characterize inputs from various members of the materiel acquisition community.

Research Perspective

The research perspective for this study is derived from that of the Army T&E community as well as a representative sample of the program management community and their viewpoint on the risk-based approach to T&E. This target population consists of 40 senior leaders from the Intelligence, Electronic Warfare, and Sensors program management community at APG, MD. This research seeks to assess the benefit and usefulness of a transition from traditional T&E to a risk-based approach. Surveys were administered anonymously through Army Knowledge Online (AKO) using SurveyMonkey (surveymonkey.com) as the principal data interface mechanism. Tier I, Tier II, and other senior technical acquisition personnel completed the survey. While the scope of this study is purposely narrow, the views and experiences of this segment of the total population can be reasonably expected to be similar to that of other commodity areas that were not part of this study.

Research Design

The principal method chosen for this project included use of a survey instrument. The use of this quantitative method addressed the basic research question: Should the methodology for evaluation materiel acquisition systems within the U.S. Army transition from traditional T&E to a risk-based assessment model? The survey data were received and managed by a commercial, online product that provided cross tabulation capabilities. The sampling approach applied for this

research consisted of representative program management organizations within a single specific commodity area.

Research Instruments

The following survey instrument was utilized to collect quantitative inputs for this research paper. The survey consisted of 20 questions that included both demographical as well as substantive questions related to risk management. Additionally, questions were targeted to assess respective levels of usefulness, overall satisfaction with current T&E products, and characterization of existing risk processes.

Participants, Population, and Sample

The survey's target population was senior leaders from the PEO IEW&S acquisition workforce. Participants included senior military officers, nonsupervisory (GS-13 to GS-14), supervisory (GS-14 to GS-15) and SES individuals. These employees are in the T&E Career field and the Program Management Career field at APG, MD. Although PEO IEW&S has a workforce of approximately 600, the actual population of PMs, deputy PMs, product managers, deputy product managers, and senior T&E personnel is approximately 40. These personnel represent the target population for this survey.

Methodology Summary

This research was designed to determine if a migration to a risk-based approach to T&E would be of interest to selected members of the acquisition community on APG, MD. As a first step, this research has produced data that afford the reader an opportunity to better understand the complexities associated with effective risk management as well as the potential usefulness of a new risk construct. As with all survey instruments, there is a known bias in the collection of opinion data, and there are questions regarding the complete accuracy and validity of the employee population data. Nonetheless, the methodology is believed sufficient to allow representative acquisition workforce members to make an assessment regarding the extent and potential usefulness of the risk-based approach to T&E.

CHAPTER 4
DATA ANALYSIS AND RESULTS

Methodology Summary

This chapter presents the results of the research. The first section describes the target population and provides relevant demographics such as number of years of experience, current grade, program management experience, and current level of responsibility. The second section provides response data based on the use of this survey instrument. The actual survey instrument is provided as an attachment to this research paper at Appendix A.

Population, Sample, and Participants

PEO IEW&S is made up of a team of seven project managers/directors dedicated to delivering designing, delivering, and sustaining advanced technologies. By providing systems that cover the full spectrum of warfighters' needs, the PEO impacts virtually every mission from providing a persistent view of the battlefield to protecting aircrews from enemy threats. PEO IEW&S develops and integrates sensors and sensor data across multiple technologies, ensuring warfighters have a complete understanding of the battlefield. This is achieved through the assimilation of sensor information into relevant, timely products that can be used for targeting, situational awareness, force protection, and Reconnaissance, Surveillance, and Target Acquisition (RSTA). PEO IEW&S has lead roles in most critical current operations efforts to include Counter Improvised Explosive Devices (IEDs), sensors for Counter Rocket and Mortar, the ISR Surge, and the Integrated Intelligence Architecture (I2A). The PEO also is responsible for a combination of more than 110 programs of record and quick reaction capabilities. Fielded systems are utilized for a large array of missions from countering IEDs, to aircraft survivability. By providing a bevy of sensors, radars, intelligence collection and dissemination equipment, our most important soldiers are given a complete picture of the battle space.

The target population for this survey consisted of Tier I and Tier II level personnel within PEO IEW&S along with associated PMOs. Of the 40 personnel affiliated with this population, 24 responses were received, resulting in a 60 percent response rate.

While all participants were members of the Army Acquisition Corps, they were asked to identify their assigned acquisition specialty which role they fulfill within the acquisition community. Results are shown in Figure 1.

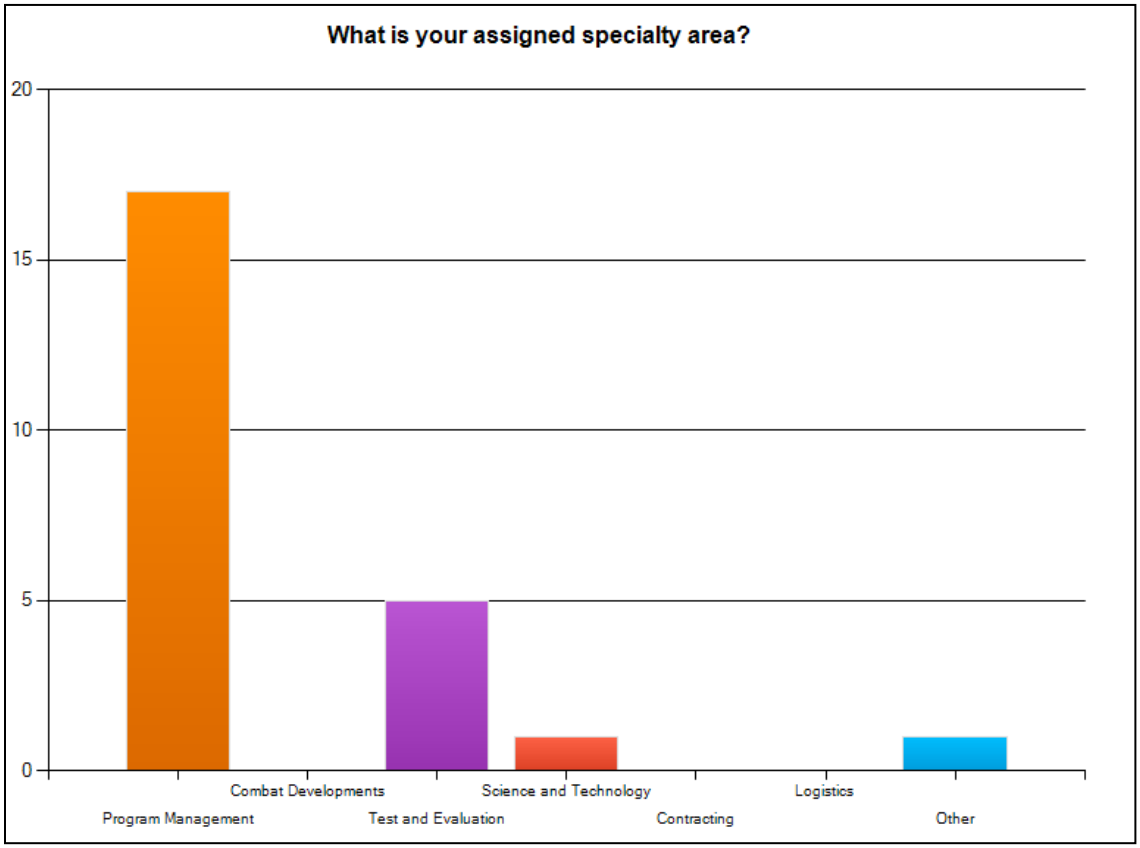

Figure 1. Assigned Specialty Areas

There were four specialty areas identified by this target population. More than 71 percent of the total respondents indicated they were assigned in the program management specialty, with the remaining personnel reporting T&E and science and technology specialties. These demographics substantiate the intent of shaping a target population consisting of senior program management personnel. Respondents also were asked to identify their levels of experience. Fifty-five percent of respondents were experienced professionals with more than 20 years of experience in acquisition-related positions. Forty-six percent of respondents reported varying levels of acquisition experience ranging from 6 to 20 years. This demographic confirms the earlier statement that the target population consists of senior professionals with substantive experience in materiel acquisition.

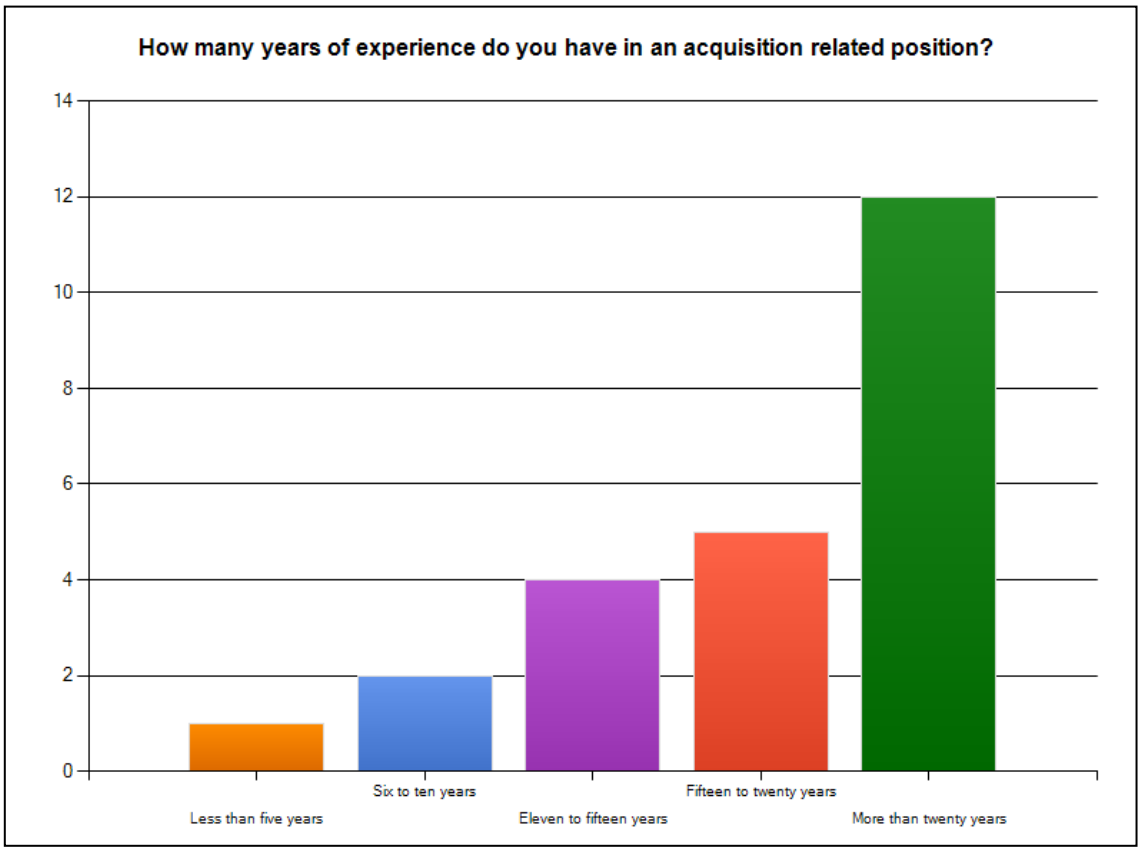

Figure 2. Years of Experience

The survey instrument also asked respondents to identify their employment status as indicated in Figure 3. The reported demographic indicated more than 70 percent Department of the Army (DA) civilians and 21 percent military. The remaining 8 percent were contractors who provided direct support to senior acquisition officials.

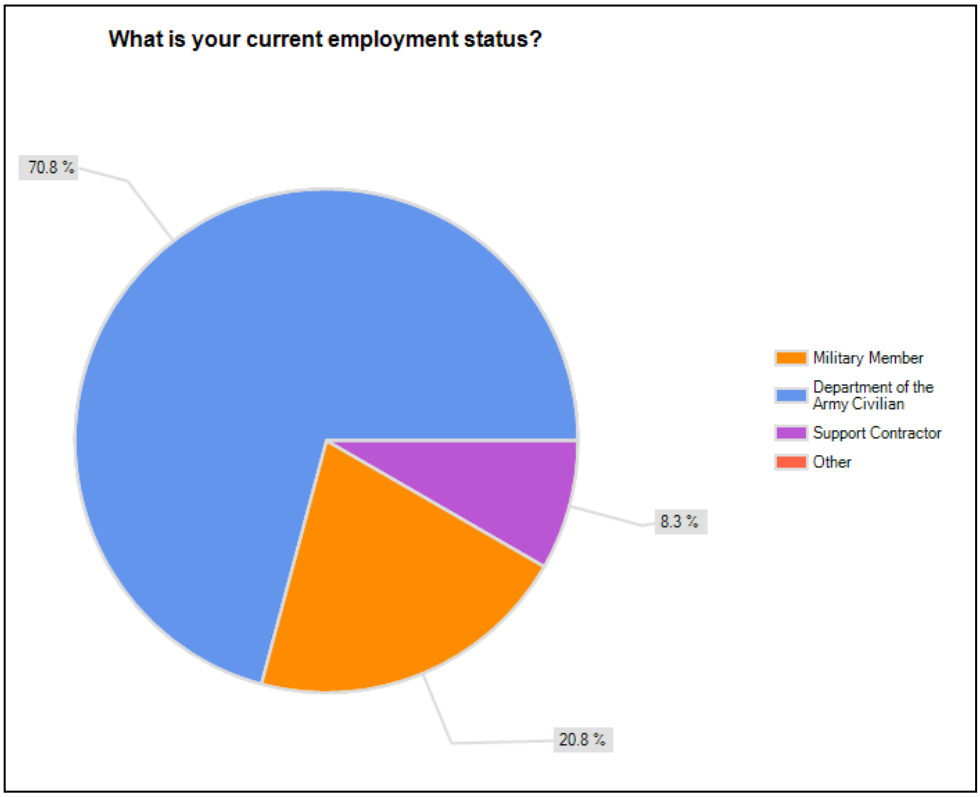

Figure 3. Employment Status

By far, the largest demographic in the population were DA Civilians at the grades of GS-14 and GS-15, with more than 62 percent. Military officers represented the next largest demographic, with 17 percent. The survey respondents also included one GO and one member of the SES.

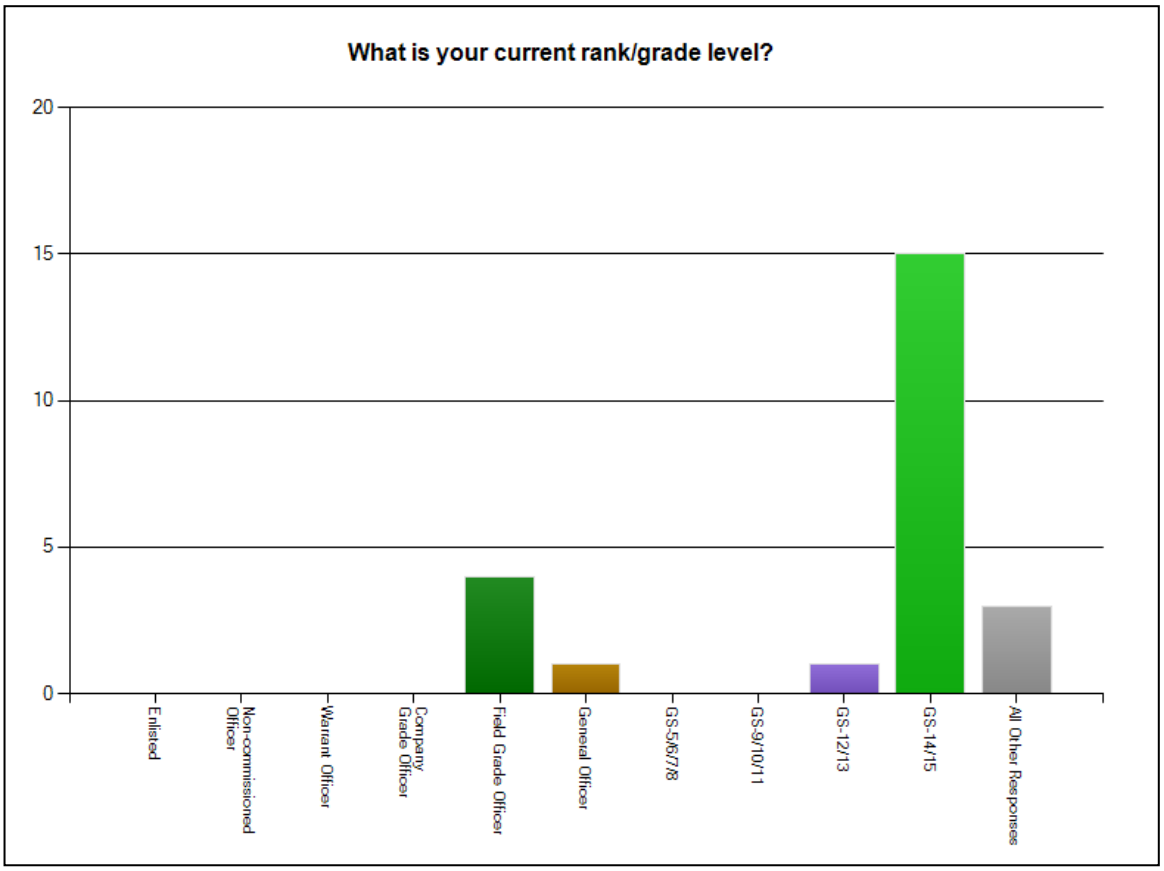

Figure 4. Current Grade

Seventy-five percent of respondents indicated they had experience working large complex acquisition programs designated as acquisition category (ACAT) I. The remaining respondents reported experience ACAT II and III as their largest programs.

Survey Results

Respondents also were asked to assess the usefulness of ATEC products at varying stages of the materiel acquisition life cycle. The largest segment of the population that reported the highest levels of usefulness for ATEC products were those respondents preparing for a Milestone C or Full Rate Production decision. The largest segments of the population reporting a minimal value of satisfaction were those preparing for Program Initiation or a Milestone B decision.

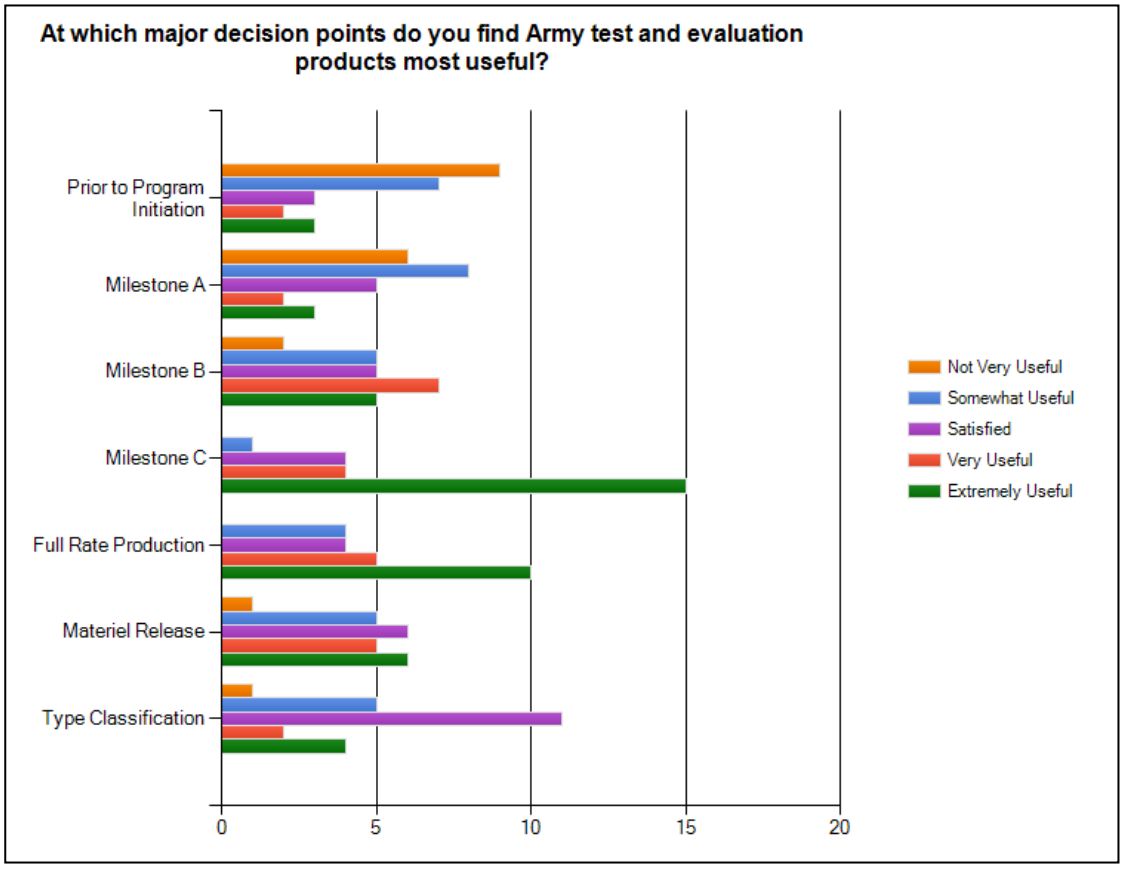

Figure 5. Usefulness of ATEC Products

A cross-tabulation of this question also was done to compare levels of satisfaction between senior and more junior personnel. While all grades reported varying levels of satisfaction with T&E products, clearly the GS-14/15 segment reported the highest levels of satisfaction.

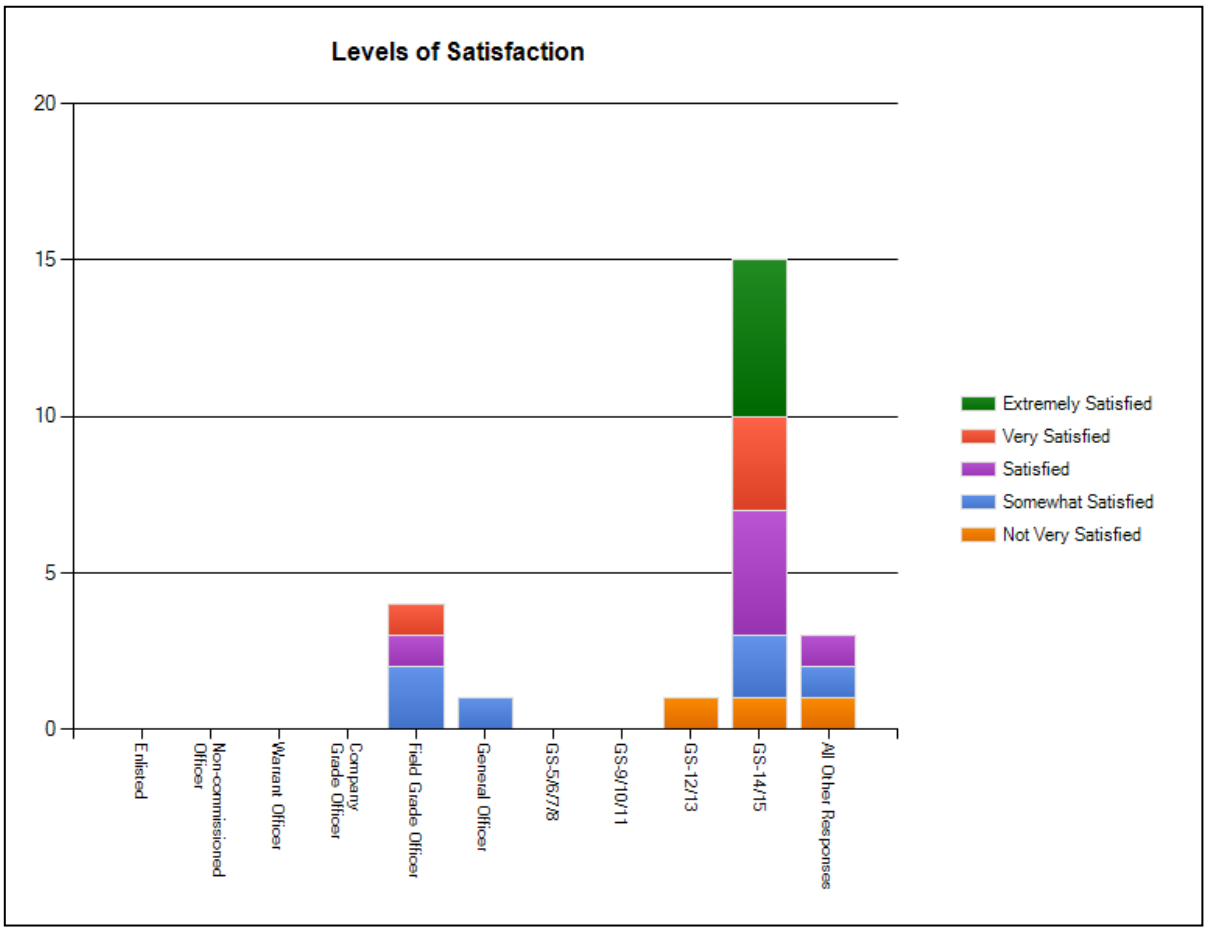

Figure 6. Levels of Satisfaction

A cross-tabulation of this question also was done to compare levels of satisfaction between personnel who identified themselves as Producers and Recipients of T&E products. While both segments reported varying levels of satisfaction with T&E products, clearly the producers reported highest levels of satisfaction.

Respondents were asked to identify the highest level of program they had been affiliated with. Given the complex nature of major programs and increasing oversight from the Office of the Secretary of Defense (OSD), external audit agencies and GAO, responses to this item provided a contextual framework on whether a T&E based risk management approach would be useful. Of the total responses, 75 percent reported ACAT 1 programs as their highest level, with the remaining 25 percent reporting ACAT II/III. These data may also be characteristic of the specific functional areas associated with the target organization.

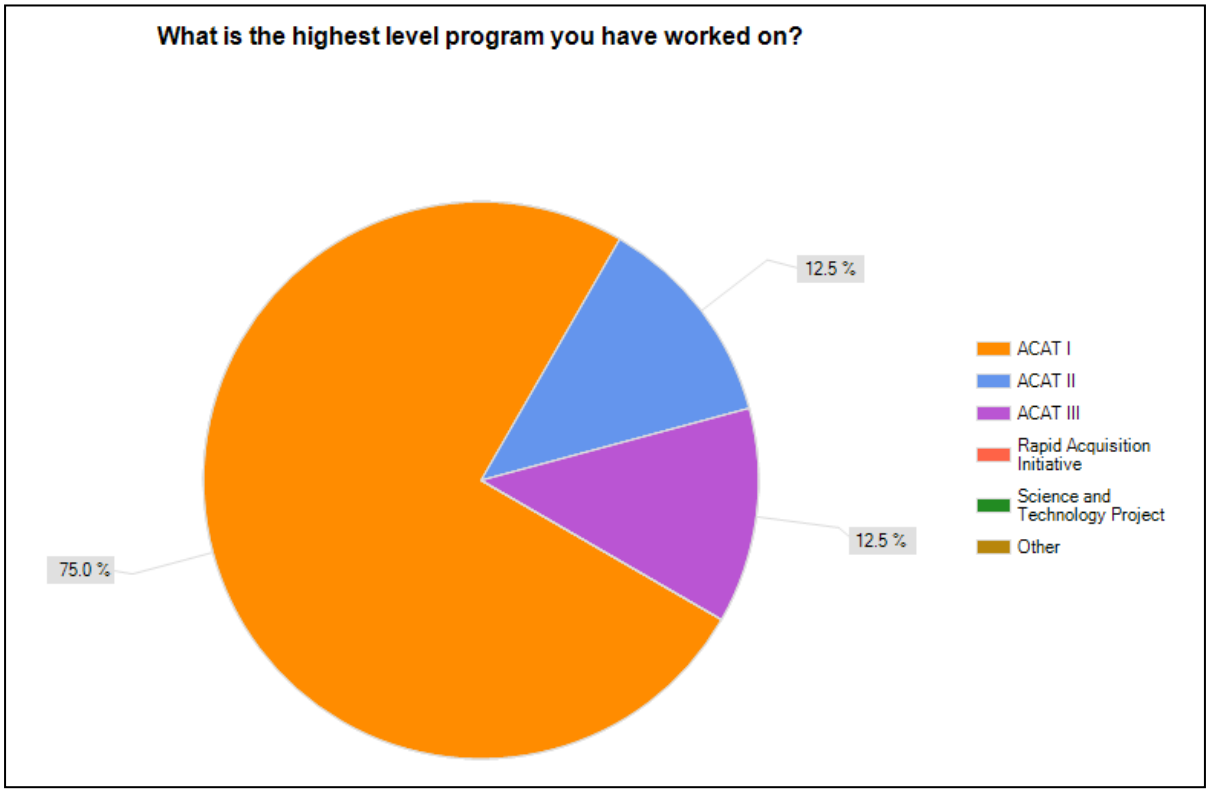

Figure 7. ACAT Levels

Respondents were asked to assess the overall usefulness of government T&E products compared to commercial products. A significant majority, 61 percent, of respondents believed that data from multiple commercial and government sources were more useful than a single-source approach to evaluation. Thirty-five percent felt that government T&E reports were most useful, while 4 percent believed contractor reports were sufficient to assess the effectiveness, suitability, and survivability of major system acquisitions.

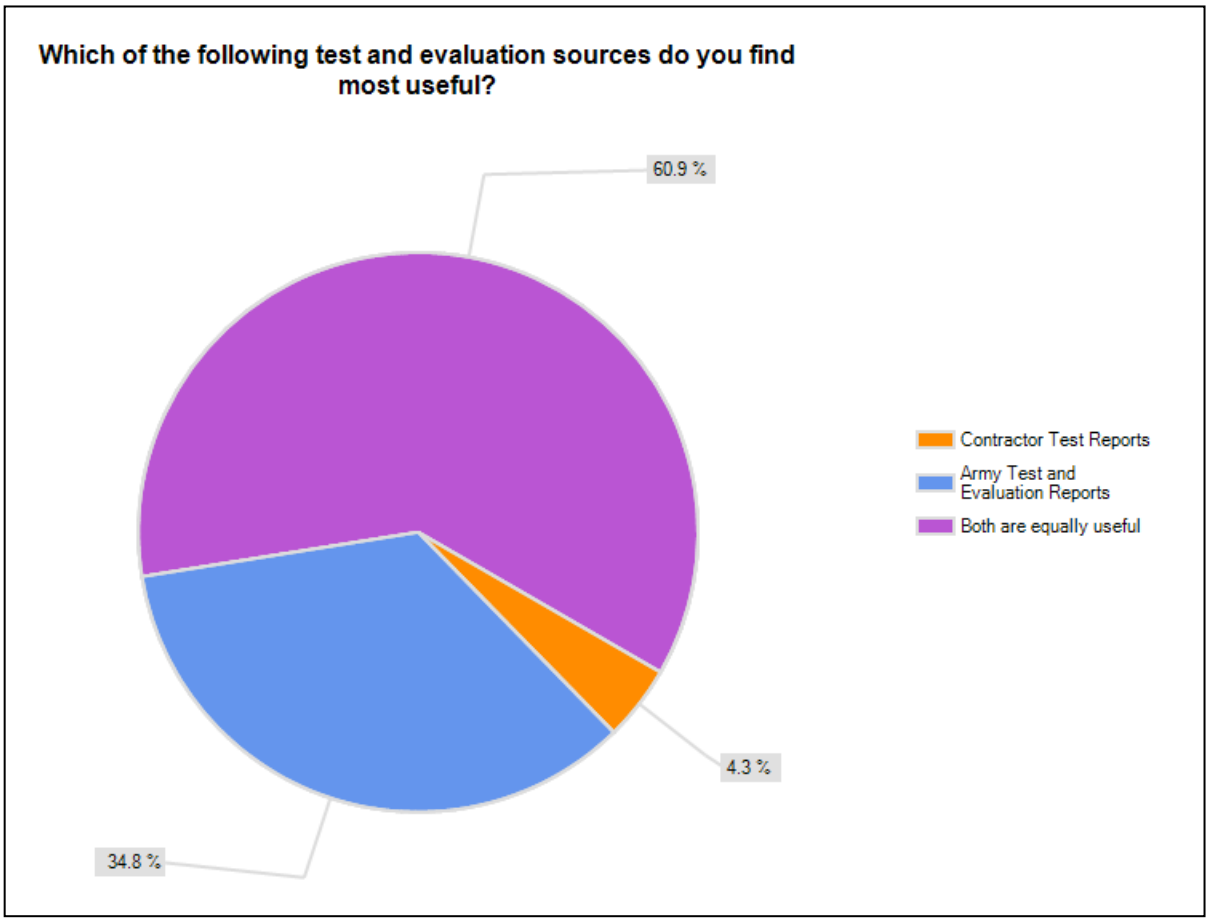

Figure 8. Usefulness of Government vs. Commercial T&E Products

Respondents were asked to assess the overall quality of government T&E products derived from various sources. Possible responses ranged from "Not Very Satisfied" to "Extremely Satisfied." Possible products included developmental test reports, operational test reports, formal system evaluation reports, abbreviated capabilities and limitation reports, and finally, forward areas assessment reports. Of the total respondents who indicated an extremely satisfied level of satisfaction, developmental tests reports received the highest level of satisfaction with 32 percent, followed by operational test reports with 21 percent. The formal evaluation reports received extreme satisfaction levels of 17 percent, while the Capabilities and Limitation Reports and the Forward Area Assessment Reports both received extreme satisfaction levels of 15 percent each. Those respondents unsatisfied with the overall quality of T&E products were the smallest group of respondents.

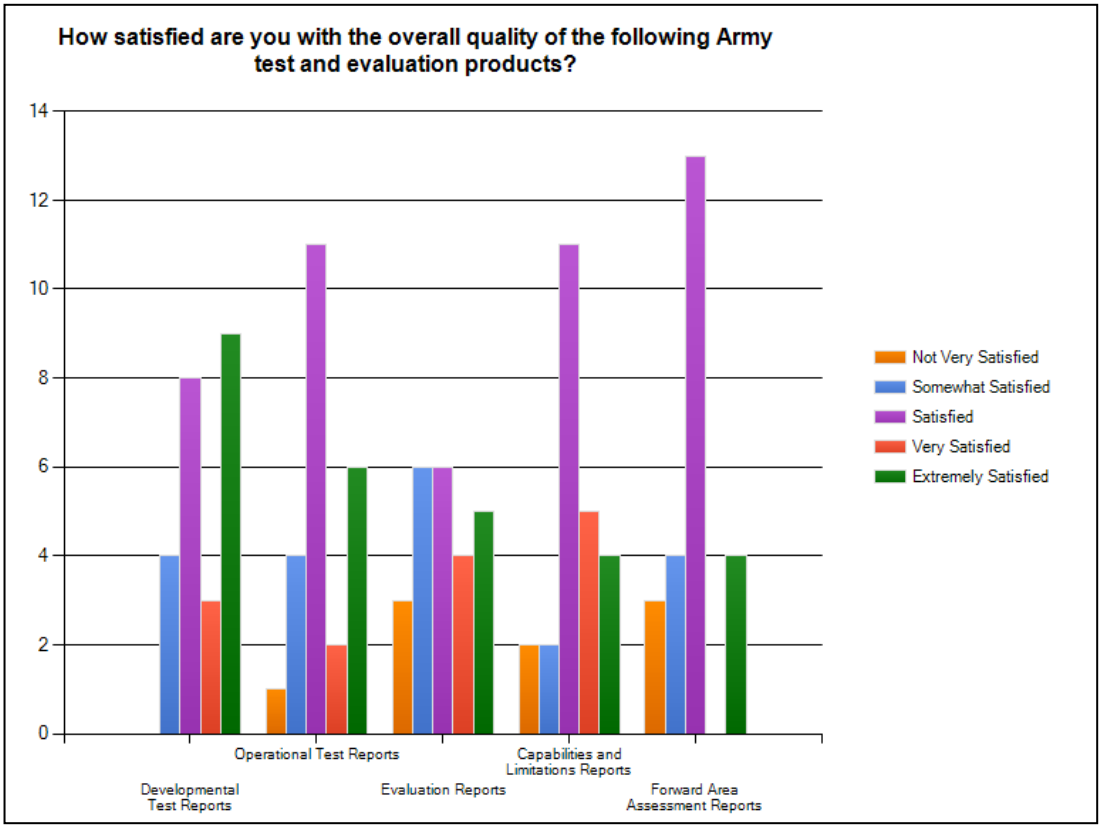

Figure 9. Levels of Satisfaction with T&E Products

Respondents were asked to assess the overall timeliness of government T&E products derived from various sources. As with the previous question, possible responses ranged from "Not Very Satisfied" to "Extremely Satisfied." Possible products included developmental test reports, operational test reports, formal system evaluation reports, abbreviated capabilities and limitation reports, and finally, forward areas assessment reports. Of the total respondents indicating they were extremely satisfied about timeliness, developmental test reports received the highest level of satisfaction with 28 percent. Twenty-eight percent of respondents believed there were timeliness issues with formal evaluation reports.

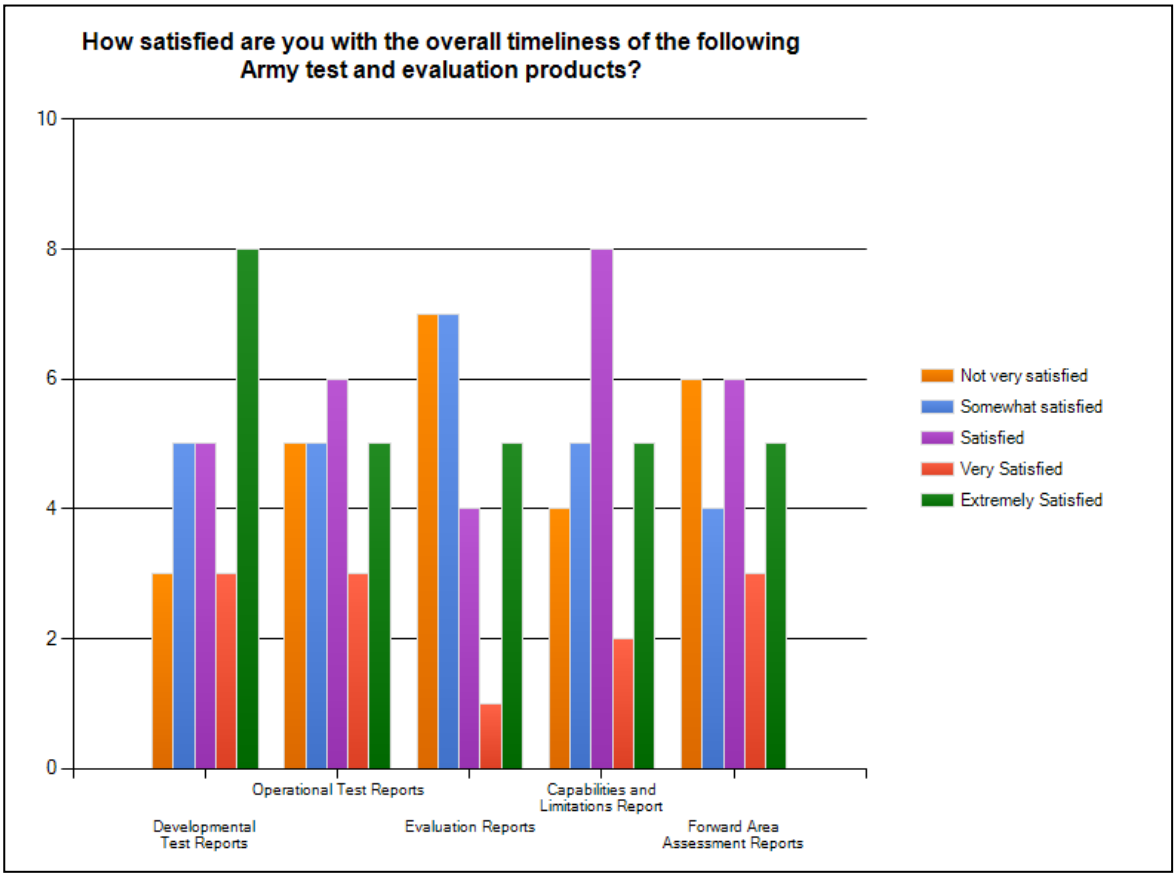

Figure 10. Timeliness of T&E Products

Respondents were asked how often they conducted Risk Review Boards within their respective PMOs. The survey data revealed that risk management provided significant program metrics and commanded significant meeting time. Thirty-eight percent reported having monthly review boards and 33 percent reported risk review boards prior to major milestone decisions.

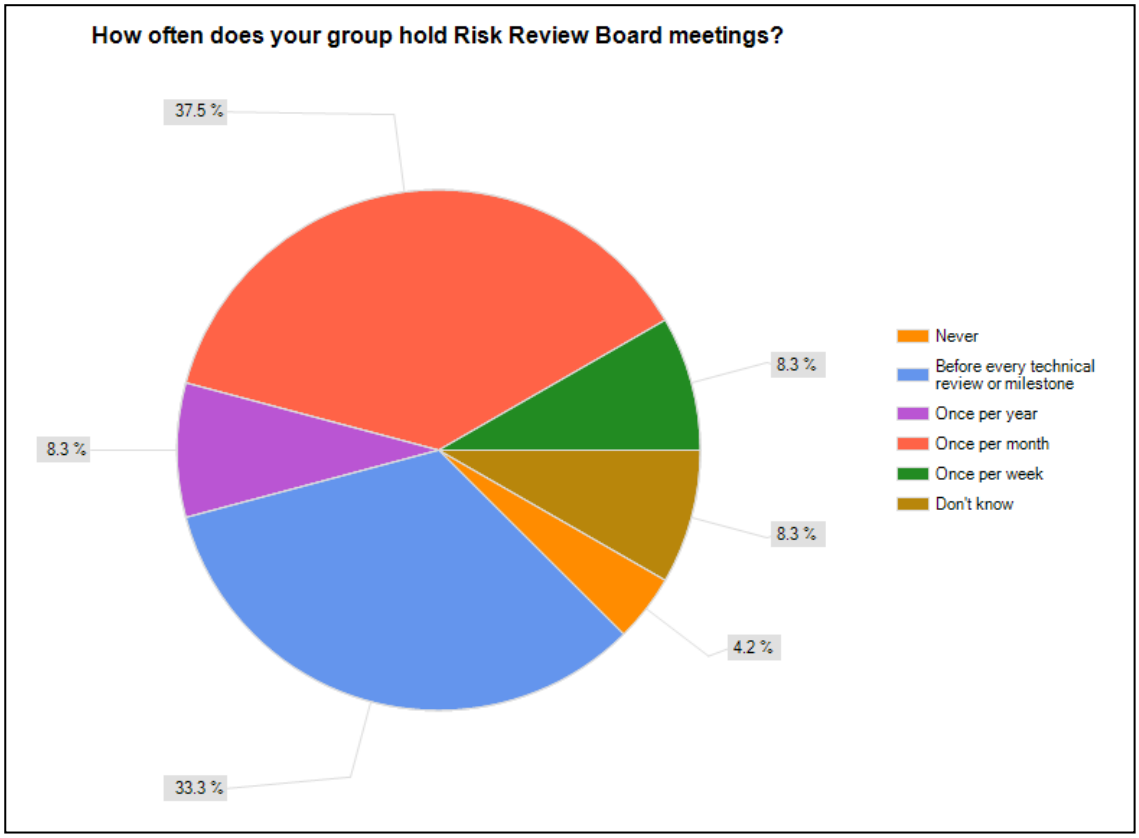

Figure 11. Risk Review Boards

Respondents were asked whether their PMOs maintained Risk Management Plans as a formal mechanism to manage risks. A full 83 percent reported having a written risk management plan, with only 9 percent reporting not having a risk management plan. This small percentage may reflect personnel who are not assigned to specific PMOs but rather work in a staff position.

Figure 12. Risk Management Plans

Respondents were asked to identify those steps of the risk management process that would benefit from a risk-based approach to T&E. The vast majority of respondents perceived that there would be some benefit, some moderate benefit, or substantial benefit to the various steps of their risk management program through the use of risk-based T&E products. As shown in Figure 14, only a small percentage believed that risk-based T&E products would not have provided added value to the risk management process.

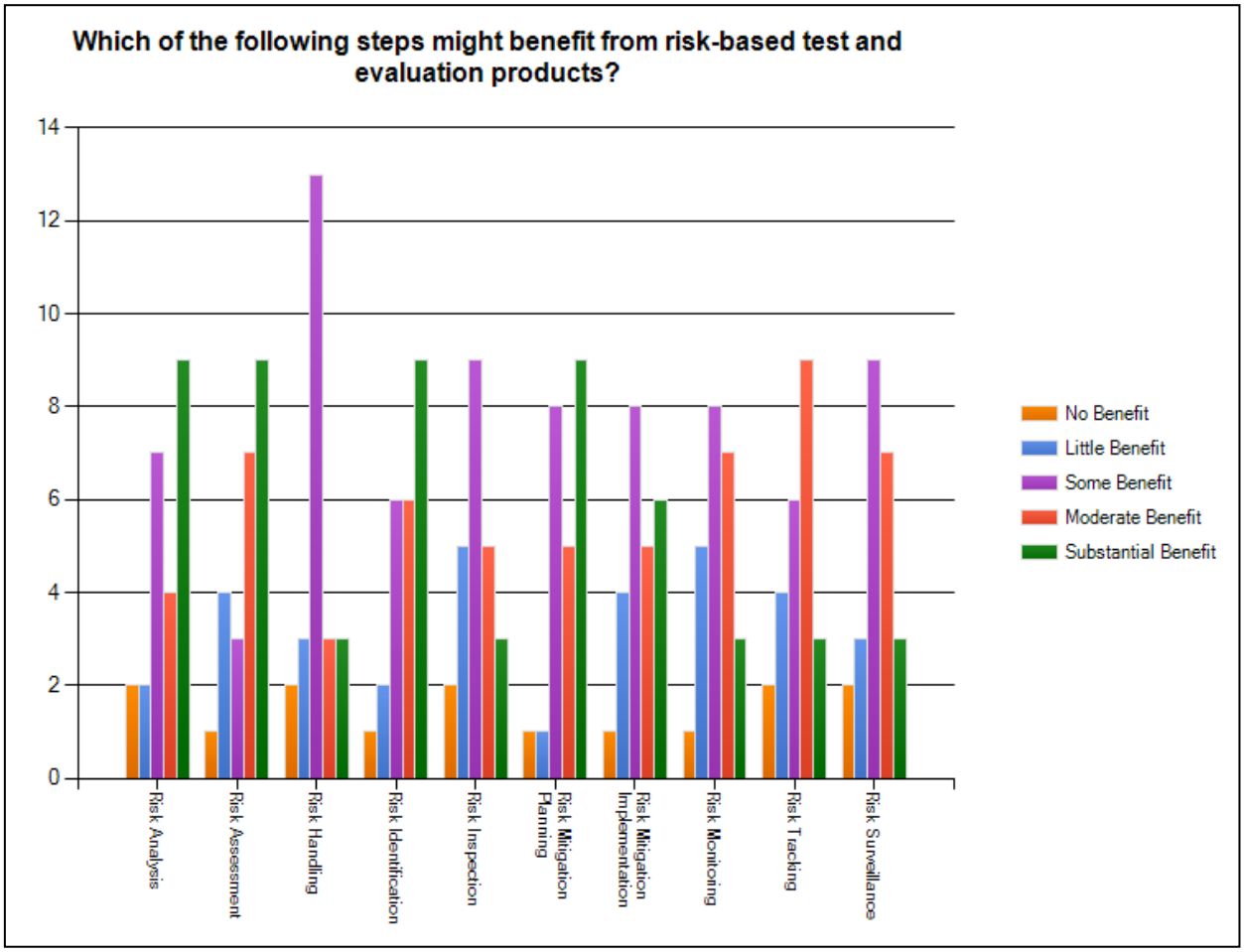

Figure 13. Risk Management Steps

Members of the target population were asked if they believed ATEC should expand the focus of its analysis to include an assessment of cost risk. In particular, the question focused the respondent on the difference between "should costs" and "will costs" and included cost risks associated with the overall program as well as costs associated with the program's T&E events. Thirty-nine percent of respondents perceived there to be no value in ATEC's involvement in program cost analysis, however, 61 percent of respondents perceived there to be varying levels of value from ATEC's involvement in analysis. Levels of value ranged from "somewhat useful" to "very useful" to "extremely useful." A significant majority of respondents believed ATEC should be involved in analysis of costs associated with the planning, execution, and reporting of test events.

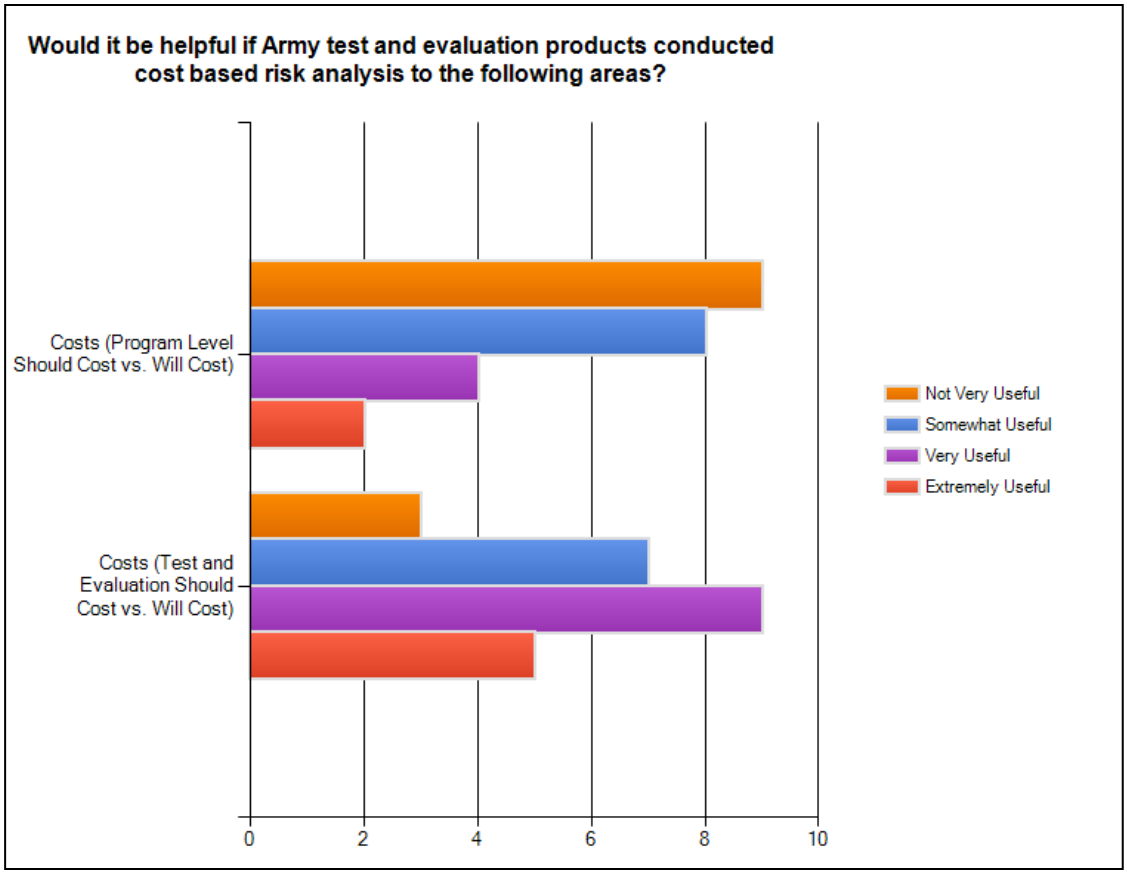

Figure 14. Cost-Based Risk Assessment

Members of the target population were asked if they believed ATEC should expand the focus of its analysis to include an assessment of schedule risk. This question was framed to include risk associated with the program's IMS and the specific schedule associated with T&E events. Sixty-five percent of respondents perceived there would be varying degrees of value associated with an external assessment of schedule risk from the T&E community, while only 35 percent rendered a perception of minimal value. With regard to those risks associated with the T&E schedule, 83 percent perceived varying degrees of usefulness with an external assessment of schedule risks.

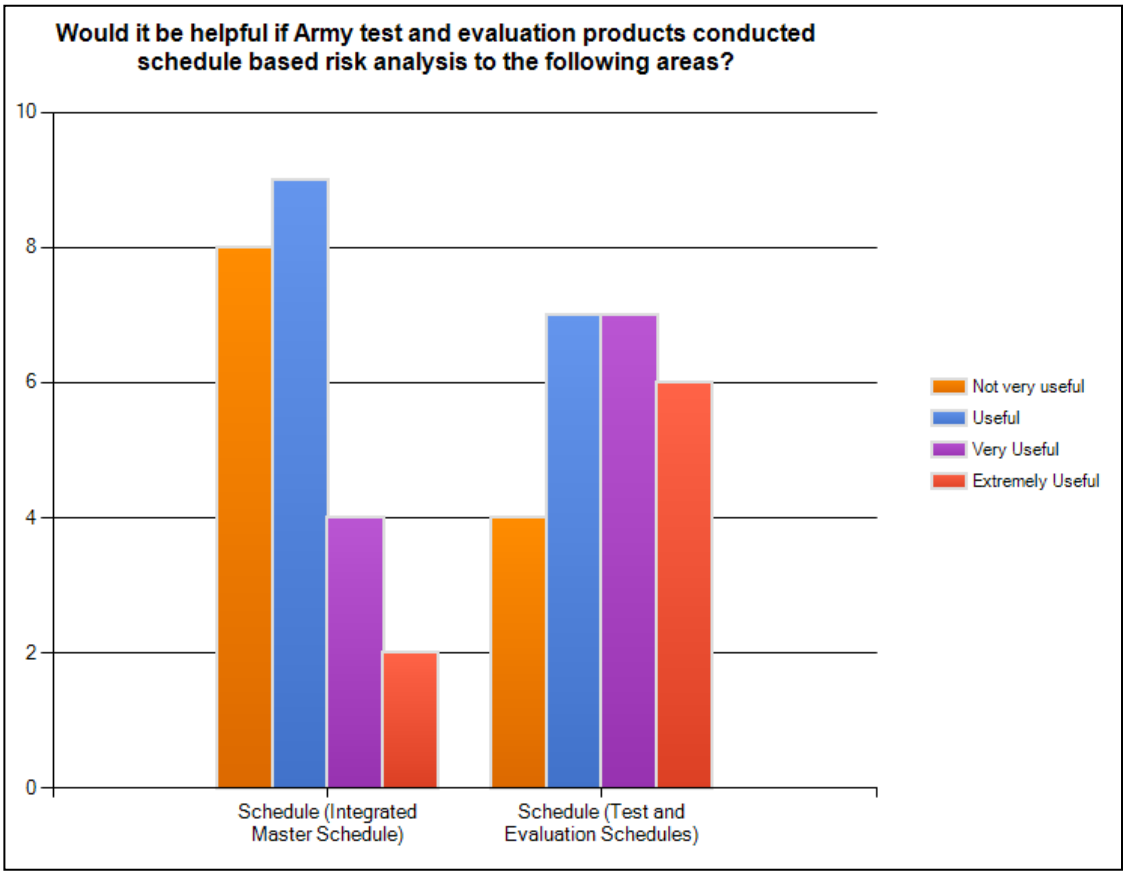

Figure 15. Schedule Risk Assessment

Respondents were asked if it would be helpful if Army T&E products conducted performance-based risk analysis in the areas of effectiveness, suitability, and survivability. Eighty-four percent believed it would help in assessing effectiveness risks, 83 percent believed it would help in assessing suitability risks, and 83 percent believed that a risk-based approach to T&E would help in assessing survivability risks.

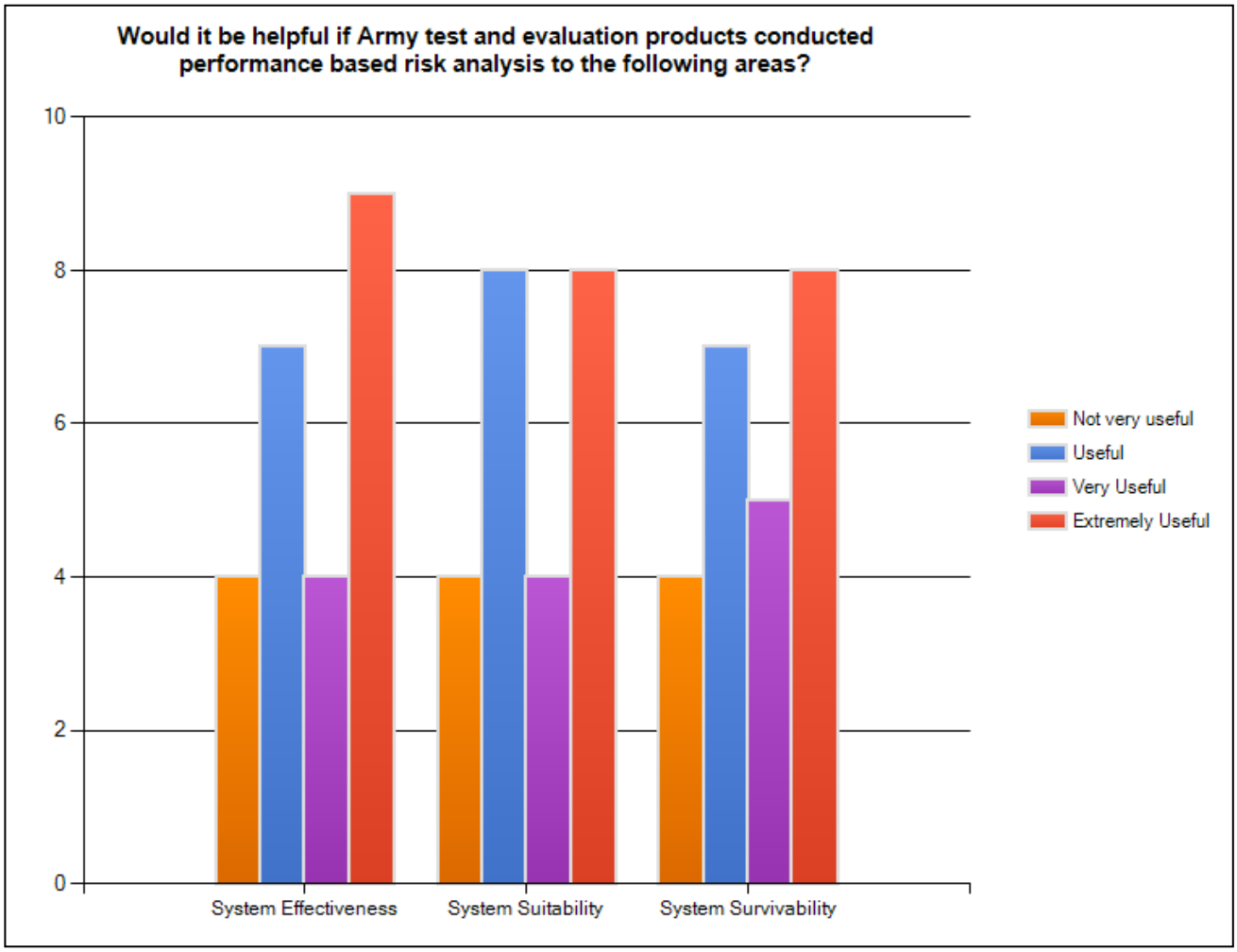

Figure 16. Performance Risks

Respondents were asked "Who should be the principle recipient of risk-based T&E products?" Forty-two percent of respondents believed the PM should be the principle recipient of T&E products. Forty-two percent also believed it was important for all stakeholders to be principal recipients of T&E products. Only 4 percent, 8 percent, and 4 percent believed the Combat Developer, PEO, or the MDA should be the principal recipient of risk-based T&E products.

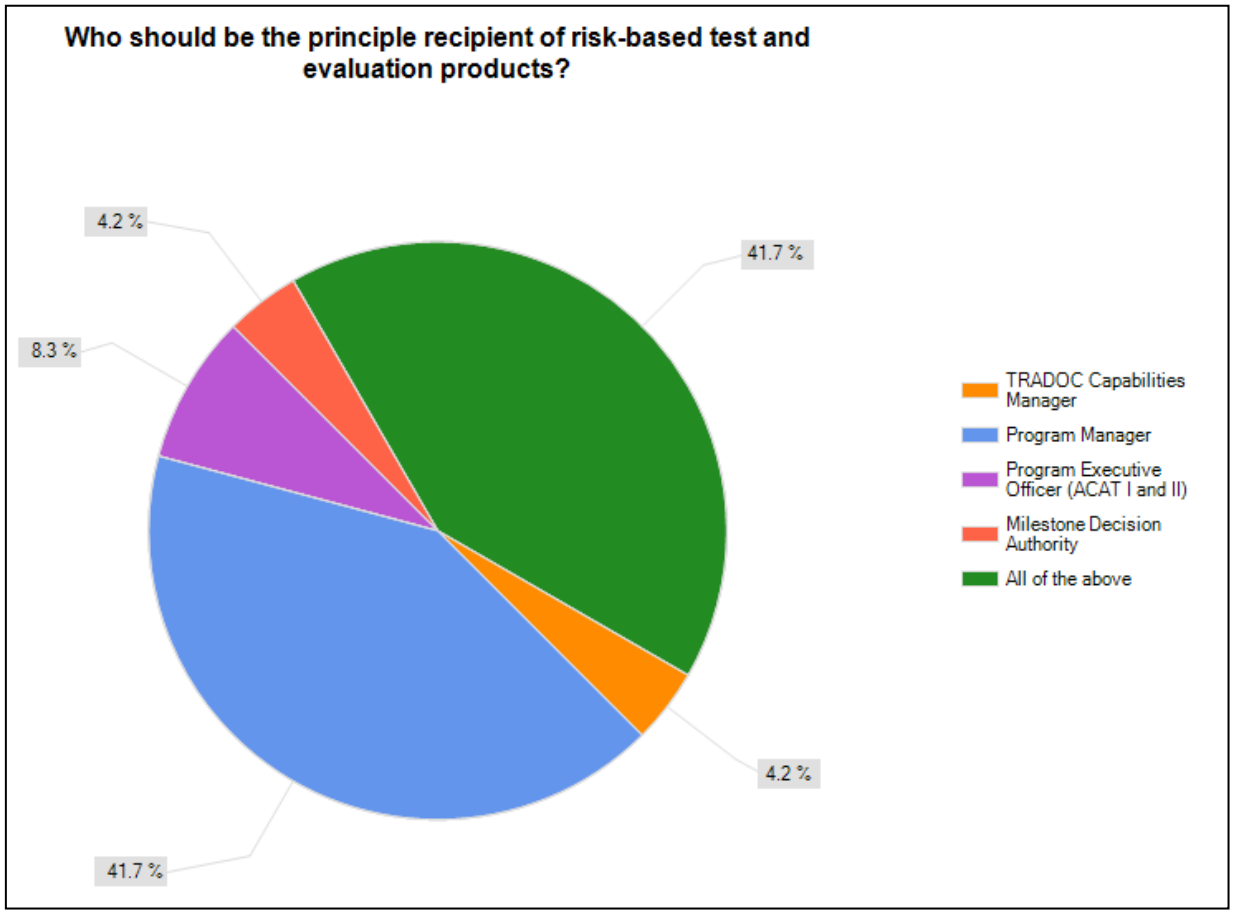

Figure 17. Recipients of Risk-Based T&E Products

Participant Comments

Participants were given the opportunity to provide comments on a Risk-Based T&E approach. Comments varied. However, 60 percent of the comments indicated a preference for a shift to risk-based T&E, 15 percent of the comments reflected a resistance to shifting to a risk-based approach to T&E, and 25 percent contained other nonrelated comments. A complete listing of all comments is found at Appendix B.

Summary of Results

The target population for this research consisted of selected senior leaders directly engaged in materiel acquisition activity and responsible for evaluating programmatic risks. To create proper boundaries for this research effort, the target population was limited to one PEO and its respective PMs and leaders associated with Intelligence, Electronic Warfare, and Sensors systems. Of the 40 affiliated workforce members, 24 responses were received, resulting in a 60 percent response rate.

The survey was designed to collect information regarding the respondents' personal characteristics, their professional experience, and their perspectives on the value of a risk-based approach to T&E. Survey results indicated that the vast majority of respondents had substantive acquisition experience with major programs of record that required effective employment of a risk management program. Response data were then analyzed to determine if the members perceived the positive benefits of a risk-based approach to T&E. While responses varied with respect to the evaluation of schedule and cost risks, the vast majority of respondents believed that a risk-based approach to T&E would add value to the risk management process, especially in evaluating those risks associated with the effectiveness, suitability, and survivability of major programs of record.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The intent of this strategic research paper was to determine the viability of a risk-based approach to T&E for the materiel acquisition community at large. In doing so, the research effort considered the perceptions of senior leadership from representative program management organizations regarding the value of T&E products within the construct of risk management. This chapter of the strategic research paper provides an overview of the research results, identifies the limitations of this research, draws conclusions, and provides recommendations regarding the implications for further research.

Risk is a measure of future uncertainties in achieving program performance goals and objectives within defined cost, schedule, and performance constraints. While this measurement has traditionally resided exclusively within the PM's domain, this research has shown it would add value to have additional risk management input from external sources. Though there is some evidence PMs also would benefit from external schedule and cost risk analysis, this research substantiates the value of the T&E community in assessing system performance. This research has clearly shown that the program management community values the early involvement of the test community as it relates to effectiveness, suitability, and survivability of system performance.

This research has also shown that senior leaders perceive the value of a shift in paradigms from the existing construct presently used by testers to a risk-based model. They believe this model should be applied throughout the life cycle of the program to achieve maximum benefit. Respondents indicated the process should begin early in the development cycle by identifying critical technologies and other technologies of interest. Each technology should be assessed at a particular technology readiness level. Furthermore, manufacturing readiness and integration readiness also should be assessed for each segment of technology. Potential cost, schedule, and performance risks should be identified, and probability distribution would be prepared for each technology. These distributions should be prepared for each major milestone decision event within the life cycle of the program. This new risk-based approach to T&E would sufficiently arm senior leaders with innovative cost-sensitive perspectives as they conduct key milestone decision reviews.

Given the complex nature of major programs and increasing oversight from OSD, external audit agencies and GAO, this risk-based approach would benefit PMs as they manage key stakeholders and risks associated with their programs. This research also indicated a significant majority of senior leaders believed that the PM should be the principal recipient of risk-based T&E products. Although other key stakeholders also should be integrated into the overall risk coordination community, the PM is ultimately responsible for the identification, characterization, and mitigation of program risks.

Another significant finding associated with this research is the value that PMs place on multiple sources of risk management information. Senior leaders consistently reported the use of a formal risk management plan and systemic risk review panels to synchronize program risks. Data from multiple government and commercial sources must be verified, validated, and synchronized into the overall risk management package. While "more" is not necessarily better, the test community is well equipped to assist in this regard.

Finally, this research proved that members of the program management community are indeed satisfied with the overall quality of government T&E products derived from various sources. These sources include developmental test reports, operational test reports, formal system evaluation reports, abbreviated capabilities and limitation reports, and forward area assessment reports. Sustaining this exceptional level of credibility will remain of utmost importance as the test community migrates to a new risk-based model for test and evaluation.

Strengths and Limitations of this Study

A key limitation of this research is that it purposely focused on a very limited number of organizations and senior leaders at APG. The target population consisted of 40 senior leaders from one PEO and its associated PMs. While this research provided adequate coverage for this segment of the acquisition community, it should be expanded to include a broader segment of the materiel acquisition community.

Another key limitation is the low overall response rate to the survey. Of the 40 possible respondents, only 24 actually completed and returned the survey instrument as requested, resulting in a 60 percent response rate. Even though the response rate was relatively low, the data provide good insight into senior leader views on the potential migration of the current T&E model to a risk-based model.

Recommendations for Future Research

Actions that should be taken are relatively straightforward. These actions consist of additional research as well as the initiation of a pilot program to fully validate the concepts described in this strategic research paper.

As referenced throughout this paper, the scope of additional research should be expanded to include a larger segment of the program management community. The next phase of research should include a more robust target population consisting of materiel developers, combat developers, and independent evaluators. Additionally, senior representatives from OSD and the Army should also be identified as important stakeholders in the migration to risk-based evaluations. A coordination forum should also be convened to discuss major research findings, develop specific processes, and implementation execution mechanisms.

Finally, a pilot effort should be planned to adequately characterize and correct any inconsistencies found in the newly developed processes. The pilot effort should include small sample hypothesis tests performed on very specific hypothesis to formally test the null hypothesis. The pilot program should consist of three programs at varying stages of development. A major program of record should be included to accurately assess implementation risks and complexities for a program approaching a production decision. A smaller, less complex program approaching a Milestone B decision should be included in the pilot to assess whether the proposed risk management mechanisms provide increased value. A rapid acquisition program should be included to characterize the variances associated with streamlined acquisition.

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GLOSSARY OF ACRONYMS AND TERMS

ACWA	Assembled Chemical Weapons Alternatives
AEC	Army Evaluation Center
AKO	Army Knowledge Online
AEP	Army Enterprise Position
AMSAA	Army Materiel Systems Analysis Activity
APG	Aberdeen Proving Ground
ASA(AL&T)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
AST	ATEC Systems Team
ATC	Aberdeen Test Center
ATEC	Army Test and Evaluation Command
BMC	Bridge Modernization Command
CAWG	Cost Analysis Working Group
CTMO	Army Civilian Talent Management Office
CTMP	Army Civilian Talent Management Program
DA	Department of the Army
DA PAM	Department of the Army Pamphlet
DAU	Defense Acquisition University
DoD	Department of Defense
DTC	Developmental Test Center
DUSA	Deputy Under Secretary of the Army
ECBC	Edgewood Chemical and Biological Center
FY	Fiscal Year
GAO	General Accounting Office (now Government Accountability Office)
GO	General Officer
I2A	Integrated Intelligence Architecture
IED	Improvised Explosive Devices
IMS	Integrated Master Schedule
IRL	Integration Readiness Level
JCIDS	Joint Capabilities Integration and Development System
JPEO-CBD	Joint Program Executive Office for Chemical and Biological Defense

MDA	Milestone Decision Authority
MRL	Manufacturing Readiness Level
NRC	Nuclear Regulatory Commission
ODASA-CE	Office of the Deputy Assistant Secretary of the Army for Cost and Economics
OTC	Operational Test Command
PEO	Program Executive Office(r)
PEO-I	Program Executive Office-Integration
PEO IEW&S	Program Executive Office for Intelligence, Electronic Warfare, and Sensors
PM	Program Manager
PMO	Program Management Office
RDECOM	Research, Development and Engineering Command
RSTA	Reconnaissance, Surveillance, and Target Acquisition
SAPHIRE	Systems Analysis Programs for Hands-on Integrated Reliability Evaluations
SEP	Systems Engineering Process
SES	Senior Executive Service
SSCF	Senior Service College Fellowship program
T&E	Test and Evaluation
TRADOC	Training and Doctrine Command (U.S. Army)
TRL	Technology Readiness Level
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology and Logistics
WIPT	Working Integrated Product Team

APPENDIX A
SURVEY INSTRUMENT

Hines Risk Based T&E

1. This survey instrument is taken to satisfy the Strategic Research Paper requirements of the DAU Senior Service College Fellowship. My participation in this research is completely voluntary. Do we have your consent to participate in this survey?

- ◯ Yes
- ◯ No

2. What is your assigned specialty area?

- ◯ Program Management
- ◯ Combat Developments
- ◯ Test and Evaluation
- ◯ Science and Technology
- ◯ Contracting
- ◯ Logistics
- ◯ Other

3. How many years of experience do you have in an acquisition related position?

- ◯ Less than five years
- ◯ Six to ten years
- ◯ Eleven to fifteen years
- ◯ Fifteen to twenty years
- ◯ More than twenty years

4. What is your current employment status?

- ◯ Military Member
- ◯ Department of the Army Civilian
- ◯ Support Contractor
- ◯ Other

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Hines Risk Based T&E

5. What is your current rank/grade level?

- ◯ Enlisted
- ◯ Non-commissioned Officer
- ◯ Warrant Officer
- ◯ Company Grade Officer
- ◯ Field Grade Officer
- ◯ General Officer
- ◯ GS-5/6/7/8
- ◯ GS-9/10/11
- ◯ GS-12/13
- ◯ GS-14/15
- ◯ Senior Executive Service
- ◯ Support Contractor

6. Would you consider yourself a producer or recipient of Army Test and Evaluation products?

- ◯ I am a producer of Test and Evaluation products.
- ◯ I am a recipient of Test and Evaluation products.
- ◯ I am neither a producer or recipient of Test and Evaluation products.

7. At which major decision points do you find Army test and evaluation products most useful?

	Not Very Useful	Somewhat Useful	Satisfied	Very Useful	Extremely Useful
Prior to Program Initiation	◯	◯	◯	◯	◯
Milestone A	◯	◯	◯	◯	◯
Milestone B	◯	◯	◯	◯	◯
Milestone C	◯	◯	◯	◯	◯
Full Rate Production	◯	◯	◯	◯	◯
Materiel Release	◯	◯	◯	◯	◯
Type Classification	◯	◯	◯	◯	◯

Hines Risk Based T&E

8. What is the highest level program you have worked on?

- ACAT I
- ACAT II
- ACAT III
- Rapid Acquisition Initiative
- Science and Technology Project
- Other

9. Which of the following test and evaluation sources do you find most useful?

- Contractor Test Reports
- Army Test and Evaluation Reports
- Both are equally useful

Other (please specify)

10. How satisfied are you with the overall quality of the following Army test and evaluation products?

	Not Very Satisfied	Somewhat Satisfied	Satisfied	Very Satisfied	Extremely Satisfied
Developmental Test Reports	○	○	○	○	○
Operational Test Reports	○	○	○	○	○
Evaluation Reports	○	○	○	○	○
Capabilities and Limitations Reports	○	○	○	○	○
Forward Area Assessment Reports	○	○	○	○	○

11. How satisfied are you with the overall timeliness of the following Army test and evaluation products?

	Not very satisfied	Somewhat satisfied	Satisfied	Very Satisfied	Extremely Satisfied
Developmental Test Reports	○	○	○	○	○
Operational Test Reports	○	○	○	○	○
Evaluation Reports	○	○	○	○	○
Capabilities and Limitations Report	○	○	○	○	○
Forward Area Assessment Reports	○	○	○	○	○

Hines Risk Based T&E

12. Based on your experience, which risk components do you find most important?

- ☐ Consequence & Probability
- ☐ Likelihood & Probability
- ☐ Consequence, Future Root Cause, Likelihood
- ☐ Probably and Event
- ☐ Failure mode and Root Cause

13. How often does your group hold Risk Review Board meetings?

- ◯ Never
- ◯ Before every technical review or milestone
- ◯ Once per year
- ◯ Once per month
- ◯ Once per week
- ◯ Don't know

14. Does your organization have a written Risk Management Plan?

- ◯ Yes
- ◯ No
- ◯ Don't Know

15. How useful do you find existing Army Test and Evaluation products when conducting risk management related actions?

	Not Very Useful	Somewhat Useful	Very Useful	Extremely Useful
Developmental Test Reports	◯	◯	◯	◯
Operational Test Reports	◯	◯	◯	◯
Evaluation Reports	◯	◯	◯	◯
Capabilities and Limitations Reports	◯	◯	◯	◯

16. Would it be helpful if Army test and evaluation products conducted cost based risk analysis to the following areas?

	Not Very Useful	Somewhat Useful	Very Useful	Extremely Useful
Costs (Program Level Should Cost vs. Will Cost)	◯	◯	◯	◯
Costs (Test and Evaluation Should Cost vs. Will Cost)	◯	◯	◯	◯

Hines Risk Based T&E

17. Which of the following steps might benefit from risk-based test and evaluation products?

	No Benefit	Little Benefit	Some Benefit	Moderate Benefit	Substantial Benefit
Risk Analysis	○	○	○	○	○
Risk Assessment	○	○	○	○	○
Risk Handling	○	○	○	○	○
Risk Identification	○	○	○	○	○
Risk Inspection	○	○	○	○	○
Risk Mitigation Planning	○	○	○	○	○
Risk Mitigation Implementation	○	○	○	○	○
Risk Monitoring	○	○	○	○	○
Risk Tracking	○	○	○	○	○
Risk Surveillance	○	○	○	○	○

18. Would it be helpful if Army test and evaluation products conducted schedule based risk analysis to the following areas?

	Not very useful	Useful	Very Useful	Extremely Useful
Schedule (Integrated Master Schedule)	○	○	○	○
Schedule (Test and Evaluation Schedules)	○	○	○	○

19. Would it be helpful if Army test and evaluation products conducted performance based risk analysis to the following areas?

	Not very useful	Useful	Very Useful	Extremely Useful
System Effectiveness	○	○	○	○
System Suitability	○	○	○	○
System Survivability	○	○	○	○

20. Who should be the principle recipient of risk-based test and evaluation products?

- ○ TRADOC Capabilities Manager
- ○ Program Manager
- ○ Program Executive Officer (ACAT I and II)
- ○ Milestone Decision Authority
- ○ All of the above

Other (please specify)

Hines Risk Based T&E

*21. What suggestions or comments do you have regarding a risk based approach to Army test and evaluation?

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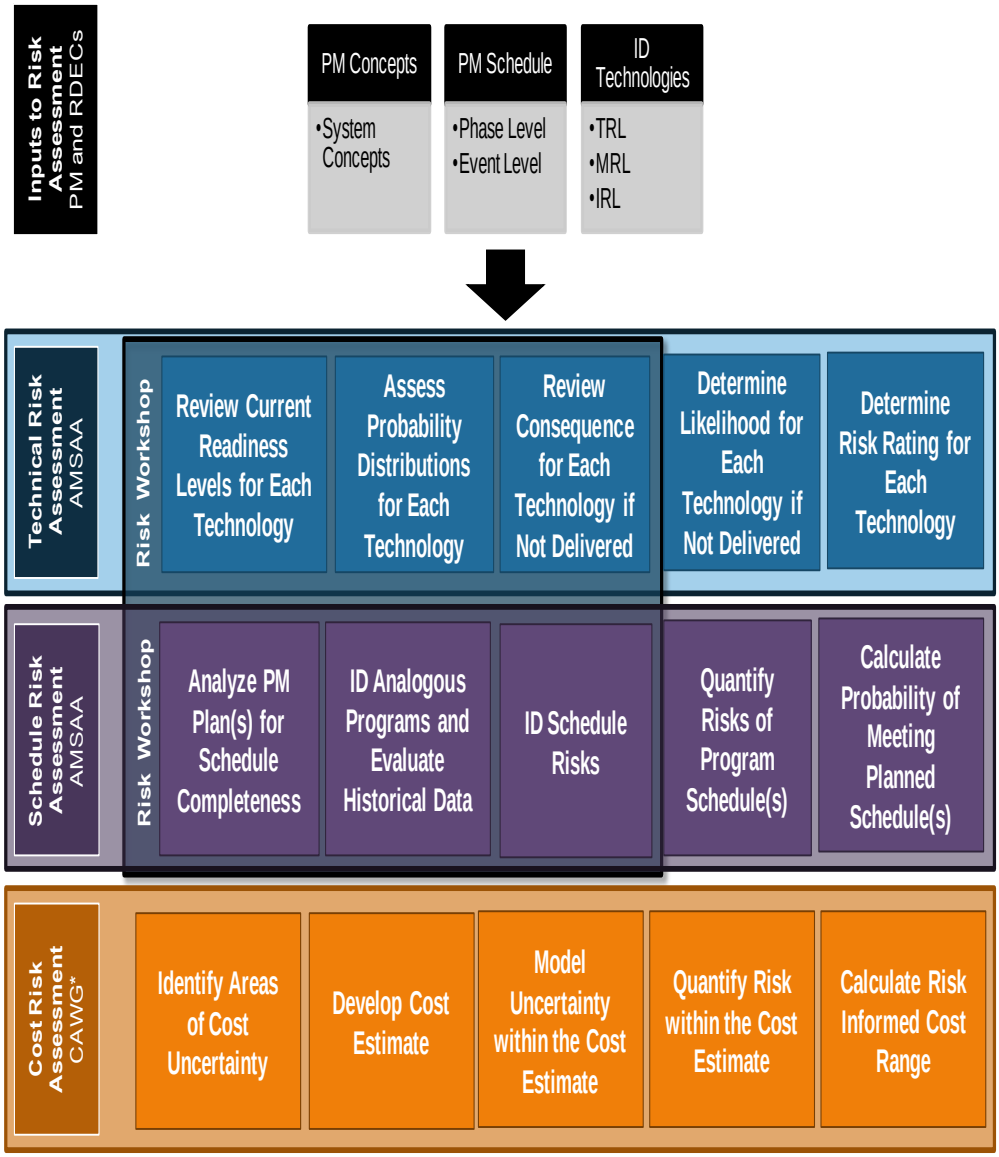
APPENDIX B
NARRATIVE RESPONSES
(QUESTION 21)

What suggestions or comments do you have regarding a risk-based approach to Army test and evaluation?

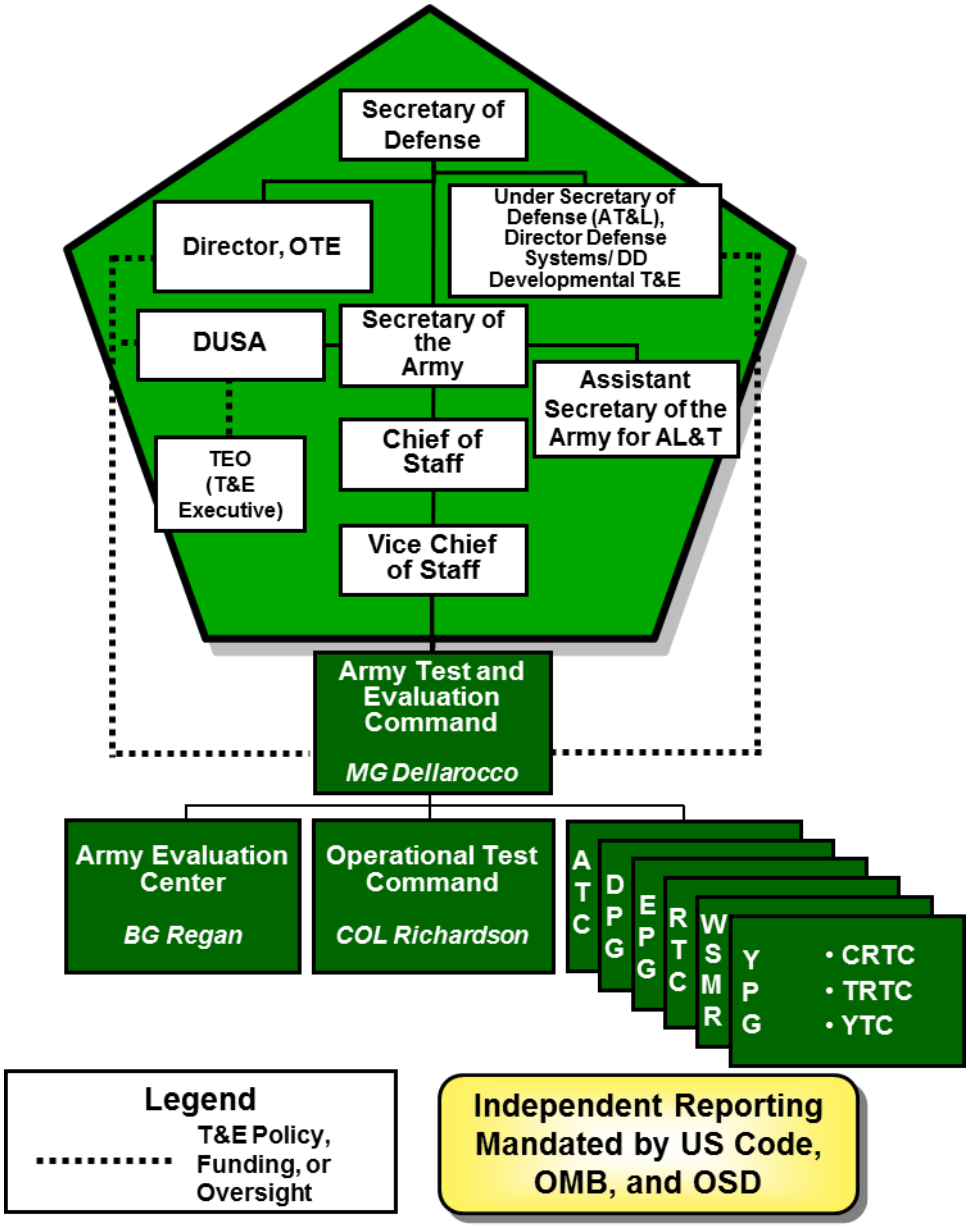
1. ATEC should move to a risk-based approach to T&E.
2. ATEC should be an active participant of the risk management process throughout the entire life cycle.
3. ATEC should be an active participant in the PM's risk management effort.
4. A risk-based approach would be useful in characterizing performance. Unsure of the usefulness in characterizing schedule and cost risks.
5. Risk-based testing would move us from the binary, on-off, black-white evaluation to a more nuanced and useful construct.
6. If Testers want to be PMs, they should compete for the job.
7. PM's are typically responsible to manage risk, not sure what value T&E based risk adds to PM.
8. ATEC should assign risk to their own products and amount of time to get their products out for usefulness.
9. Need to know operational context better. Need to keep pace with changing missions and goals. Asymmetrical warfare and system production to meet mission challenges change requirements, acceptable risk, and material solution dynamics faster than T&E community can keep pace.
10. T&E needs to customize its risk-based approaches to support source selection, post-award testing, and act as an independent PARTNER to the PM.
11. Risk-based approach helps to focus T&E and should be employed more often. DOT&E is recommending it.
12. Needs to be integrated earlier in the Acquisition process to have any value added. As it stands now, ATEC enters the process too late to effectively impact design or actual build of the product. Operational testing is good to see how it works, but it's expensive and hard to coordinate with technically immature systems.

13. It would have been helpful if there was more context in understanding risk-based approach to Army test and evaluation. I could have answered these questions differently based upon situation.
14. Risk analysis should be incorporated into every phase of acquisition. Each component should ultimately support the PMs overarching risk assessment and plan. I believe a much more focused training effort from DAU and ASA(ALT) on risk would pay massive dividends.
15. Be punctual. Late reports and late information mean the response is a scramble to understand.
16. Done early when changes are cost-effective.
17. More information on what risk-based T&E is and how it works should be made available to the acquisition community.
18. Early in the JCIDS process, the T&E community needs to be pulled into the overall, to include risk planning, IMS.
19. Risk-based would be better than pass/fail.
20. The risk-based approach to T&E would be more useful than the current capabilities & limitations report.

APPENDIX C
INDEPENDENT RISK ASSESSMENT MODEL



APPENDIX D
ARMY TEST AND EVALUATION ORGANIZATION



APPENDIX E
ARMY TEST AND EVALUATION MISSION STATEMENT

ATEC plans, integrates, and conducts experiments, developmental testing, independent operational testing, and independent evaluations and assessments to provide essential information to acquisition decision makers and commanders.

General Orders No. 13
Signed CSA 16 Oct 06