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April 23, 2004

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# Financial Management

Reliability of the Automated Cost  
Estimating Integrated Tools  
Software Model  
(D-2004-074)

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Department of Defense  
Office of the Inspector General

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### **Acronyms**

ACEIT	Automated Cost Estimating Integrated Tools
ESC	Electronic Systems Center
VV&A	Verification, Validation, and Accreditation



INSPECTOR GENERAL  
DEPARTMENT OF DEFENSE  
400 ARMY NAVY DRIVE  
ARLINGTON, VIRGINIA 22202-4704

April 23, 2004

MEMORANDUM FOR ASSISTANT SECRETARY OF THE AIR FORCE  
(FINANCIAL MANAGEMENT AND COMPTROLLER)  
AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Report on Reliability of the Automated Cost Estimating Integrated Tools  
Software Model (Report No. D-2004-074)

We are providing this report for your information and use. This report addresses the reliability of the Automated Cost Estimating Integrated Tools software model that is used by DoD program managers to prepare life-cycle cost estimates for acquisition programs. We considered management comments on a draft of this report when preparing the final report.

Comments on the draft of this report conformed to the requirements of DoD Directive 7650.3 and left no unresolved issues. Therefore, no additional comments are required.

We appreciate the courtesies extended to the staff. Questions should be directed to Mr. Rodney D. Britt at (703) 604-9096 (DSN 664-9096) or Ms. Melinda Oleksa at (703) 604-9093 (DSN 664-9093). See Appendix D for the report distribution. The team members are listed inside the back cover.

By direction of the Deputy Inspector General for Auditing:

A handwritten signature in cursive script, reading "Mary L. Ugone", is positioned above the printed name.

Mary L. Ugone  
Director

Acquisition Management Directorate

## Office of the Inspector General of the Department of Defense

Report No. D-2004-074

(Project No. D2003AE-0181)

April 23, 2004

### Reliability of the Automated Cost Estimating Integrated Tools Software Model

#### Executive Summary

**Who Should Read This Report and Why?** DoD acquisition program officials and their support contractors that use the Automated Cost Estimating Integrated Tools software model in preparing life-cycle cost estimates for DoD acquisition programs will be interested in this report because it discusses the model's reliability.

**Background.** The Army and the Air Force funded the development and maintenance of the Automated Cost Estimating Integrated Tools software model (the model) to provide their cost analysts at acquisition program offices with a comprehensive and integrated software program to prepare program life-cycle cost estimates during the acquisition process. The Air Force Electronics Systems Center began developing the model in 1986 through a contract with Tecolote Research, Inc., Goleta, California. Model development included integrating individual module concepts such as database management, cost estimating, life-cycle cost modeling, cost and price analysis, economic analysis, cost benefit analysis, cost engineering, financial management reporting, statistical analysis, and risk analysis, into a single, automated cost-estimating system. In 1992, the Director, Army Cost and Economics Analysis Center (now the Office of the Deputy Assistant Secretary of the Army for Cost and Economics) recognized that the model could be used in Army acquisition program offices. Since the programs inception, the Air Force has awarded five contracts and the Army has awarded two contracts totaling \$18.8 million for the models development, enhancement, support, and training.

**Results.** The Army and Air Force authorized acquisition program managers to use the model to prepare life-cycle cost estimates for their acquisition programs before verifying, validating, and accrediting the model as required. Although we did not identify any significant reliability problems with the model, acquisition program managers who use the model cannot provide milestone decision authorities with full assurance that life-cycle cost estimates developed with the model can be fully relied on for making important program milestone decisions and for obtaining accurate information on the cost of environmental liability during the weapons acquisition process. After the required verification, validation and accreditation is performed and documented for the model, Army and Air Force acquisition program managers can provide milestone decision authorities with more reliable life-cycle cost estimates at program milestone decision points and information on the cost of environmental liability for acquisition weapons system programs for inclusion in DoD-wide financial statements. See the Finding section of the report for the detailed recommendations.

**Management Comments.** The Deputy Assistant Secretary of the Army (Cost and Economics) nonconcurred with the audit finding but concurred with the recommendation to verify, validate, and accredit the next major release of the Automated Cost Estimating Integrated Tools software. The Assistant Secretary of the Air Force (Financial Management and Comptroller) also nonconcurred with the audit finding but concurred with the recommendation and agreed to work with the Deputy Assistant Secretary of the Army (Cost and Economics) to determine the best approach to fulfill the verification, validation, and accreditation requirement for the Automated Cost Estimating Integrated Tools software. See the Finding section of the report for a discussion of management comments and the Management Comments section of the report for the complete text of the comments.

Management comments were responsive to the report recommendation. Accordingly, no further comments are required in response to the final report.

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## Background

The Army and the Air Force funded the development and maintenance of the Automated Cost Estimating Integrated Tools (ACEIT) software model to provide their cost analysts at acquisition program offices with a comprehensive and integrated software program to prepare program life-cycle cost estimates. The ACEIT software model development included integrating individual model concepts, such as database management, cost estimating, life-cycle cost modeling, cost and price analysis, economic analysis, cost benefit analysis, cost engineering, financial management reporting, statistical analysis, and risk analysis, into a single, automated cost estimating system. See Appendix B for a complete description of the component modules for the ACEIT software model.

**ACEIT Software Model History.** In 1986, the Air Force Electronics Systems Center (ESC) began developing the ACEIT software model, through a \$0.8 million contract with Tecolote Research, Inc., Goleta, California (Tecolote). As the initial developing agency, ESC awarded subsequent contracts to establish 12- to 18-month cycles for updating the software and to perform maintenance and configuration management. Since the completion of the first contract, ESC has awarded four additional contracts to Tecolote for ACEIT development, enhancement, support, and training totaling \$10.4 million: in January 1988 for \$2.6 million, September 1993 for \$4.2 million, April 1999 for \$3.0 million, and April 2002 for \$0.6 million. As of December 2003, the Air Force has spent \$11.2 million for the acquisition and maintenance of the ACEIT software model.

In 1992, the Director, Army Cost and Economics Analysis Center (now the Office of the Deputy Assistant Secretary of the Army for Cost and Economics) recognized that the ACEIT software model could be used in Army acquisition program offices. Accordingly, in 1996, the Office of the Army Cost and Economics Analysis Center encouraged Army program managers to use the ACEIT software model to estimate life-cycle costs for major Defense acquisition programs. Subsequently, the Army Director awarded delivery orders on two contracts between September 1997 and September 2002 for \$6.7 million and in February 2003 for \$0.9 million to Tecolote for the development and enhancement of Army-unique cost estimating requirements in the ACEIT software model and for user support and training.

**Use of ACEIT Software Model.** Tecolote has a registered copyright for the ACEIT software model. By contract provisions, U.S. Federal Government agencies have unlimited rights to use the ACEIT software model for preparing program life-cycle cost estimates. To use the software model, each Government agency pays an annual software maintenance fee. The software maintenance fee was established to support the ACEIT software model and can be waived by the Army or Air Force. All other non-government organizations must pay an annual license to Tecolote to use the software model. Tecolote uses these annual user fees to make further enhancements to the ACEIT software model.

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## **Objectives**

The overall audit objective was to assess the reliability of ACEIT software model that is used to prepare life-cycle cost estimates for DoD acquisition programs. Specifically, we determined whether data generated by the ACEIT software model was sufficiently reliable and accurate. See Appendix A for a discussion of the audit scope and methodology.

## **Reliability of the ACEIT**

In September 2003, the audit team and a computer engineer from the Technical Assessment Division, Office of the Deputy Inspector General for Auditing of the Department of Defense observed the beta testing (final acceptance testing) procedure together with Army and the Air Force officials, for Version 6.0 of the ACEIT software model. The test results showed that the general and application controls were generally adequate and testing did not identify any significant reliability problems with the software model. However, the computer engineer could not verify that all of the Army and Air Force software requirements had been met, and could not review the source code to a system requirements document because Tecolote had not prepared a system requirements document. See Appendix C for a complete description of the computer engineer's assessment. The finding discussion and the implementation of the recommendation that follows will enable acquisition program offices to provide milestone decision authorities more reliable life-cycle cost estimates at program milestone decision points.

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# Verification, Validation and Accreditation of the Automated Cost Estimating Integrated Tools Software Model

The Army and Air Force authorized acquisition program managers to use the ACEIT software model to prepare life-cycle cost estimates for their acquisition programs before verifying, validating, and accrediting the ACEIT software model as required. This condition occurred because the Deputy Assistant Secretary of the Army (Cost and Economics) and the Commander, Air Force ESC did not comply with DoD policy for verifying, validating, and accrediting software models. Although we did not identify any significant reliability problems with the ACEIT software model, acquisition program managers who use the ACEIT software model cannot provide milestone decision authorities with full assurance that life-cycle cost estimates developed can be fully relied on for making important program milestone decisions and for providing accurate information on the cost of environmental liability for acquisition weapons system programs in DoD-wide financial statements.

## Preparation of Life-Cycle Cost Estimates

**DoD Guidance.** DoD Directive 5000.1, “The Defense Acquisition System,” and the DoD Interim Defense Acquisition Guidebook provide guidance for preparing and reporting life-cycle cost estimates.

**DoD Directive 5000.1.** DoD Directive 5000.1 states that the project manager is accountable for accomplishing program objectives for total life-cycle system management, including sustainment, and shall consider program life-cycle costs when making program decisions. Further, the DoD Directive 5000.1 states that planning for operation and support and estimating total ownership costs will begin as early as possible in the acquisition process.

**DoD Interim Defense Acquisition Guidebook.** The DoD Interim Defense Acquisition Guidebook states that program managers should consider the estimate of total operational costs of each acquisition program. It also states that the life-cycle cost estimate should present a realistic appraisal of the level of cost most likely to be realized, be consistent with the cost estimates in the analysis of alternatives, and explain major changes that may have occurred to the program.

## Criteria for Verification, Validation, and Accreditation

**DoD Guidance.** DoD Directive 5000.59, “DoD Modeling and Simulation Management,” January 4, 1994, and DoD Instruction 5000.61, “DoD Modeling and Simulation Verification, Validation, and Accreditation (VV&A),”

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May 13, 2003, establish DoD policy and responsibilities for verifying, validating, and accrediting DoD models and simulations and their associated data. Verification determines whether a model accurately represents the developer's conceptual description and specifications. Validation determines the degree to which a model accurately represents the intended uses. Accreditation is the official certification that a model or simulation is acceptable to use for a specific purpose.

**DoD Directive 5000.59.** DoD Directive 5000.59 requires that modeling and simulation applications be assigned to a specific DoD Component for management responsibility. Directive 5000.59 further requires that DoD Components:

- establish VV&A policies and procedures for the modeling and simulation applications that they manage;
- review, coordinate, and approve DoD modeling and simulation plans, programs, policies, and procedures; and
- ensure that modeling and simulation applications, standards, and databases are both efficient and effective.

**DoD Instruction 5000.61.** DoD Instruction 5000.61 requires that the verification and validation be incorporated into the development and life-cycle management processes of all models and simulations and be performed for all DoD software models and simulations in use. Instruction 5000.61 also requires models and simulations that support major DoD decision making organizations and processes be accredited and documented.

## **Authorization for Program Managers to Use ACEIT**

The Army and Air Force authorized acquisition program managers to use the ACEIT software model to prepare life-cycle cost estimates for their acquisition programs before verifying, validating, and accrediting the ACEIT software model as required.

**Air Force Usage.** In 1989, the ESC first used the ACEIT software model to complete a life-cycle cost estimate for the Cheyenne Mountain Upgrade program. Subsequently, the Air Force Cost Analysis Agency authorized Air Force acquisition program managers to use the ACEIT software model to prepare life-cycle cost estimates for all Air Force acquisition programs.

**Army Usage.** In September 1996, the Assistant Secretary of the Army (Research, Development, and Acquisition) (currently the Assistant Secretary of the Army [Acquisition, Logistics, and Technology]) and the Assistant Secretary of the Army (Financial Management and Comptroller) endorsed the use of the ACEIT software model by Army acquisition program managers to estimate life-cycle costs for Army major Defense acquisition programs.

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**VV&A.** Although the Deputy Assistant Secretary of the Army (Cost and Economics) and the Commander, ESC had not performed and documented a VV&A for the ACEIT software model, in July 1999, the Army Modeling and Simulation Office approved the use of the ACEIT software model as an Army standard for preparing life-cycle cost estimates for Army major Defense acquisition programs. A VV&A for the ACEIT software model would have ensured that the model met all of the functional requirements and would have independently determined whether the software code contained any hidden errors.

## **Compliance with DoD Requirements for VV&A**

The Deputy Assistant Secretary of the Army (Cost and Economics), and the Commander, ESC believed that their participation in Tecolote's alpha and beta testing processes before releasing each new version of ACEIT software models met DoD requirements for documenting VV&A of the software model. However, Tecolote's alpha and beta test processes were not adequate to satisfy the VV&A requirements because Tecolote did not perform a comprehensive software requirements trace. Tecolote performed the alpha and beta testing to provide the Army and Air Force representatives with an opportunity to identify errors with revisions to the model before accepting the new version. To perform VV&A for the ACEIT software model, the Army Deputy Assistant Secretary and the Air Force Commander need to develop an ACEIT software requirements document that could be used to verify that software meets its specifications and to validate how the model should function. With the software requirements document, the Army Deputy Assistant Secretary and the ESC Commander could use a future release of the ACEIT software model to perform VV&A. Accordingly, to meet the VV&A requirements in DoD Instruction 5000.61, Army and Air Force program managers need to prepare a software requirements document and perform and document VV&A for the complete ACEIT software model.

## **Reliance on Cost Estimates**

Although we did not identify any significant reliability problems with the ACEIT software model, acquisition program managers who use the ACEIT software model cannot provide milestone decision authorities with full assurance that life-cycle cost estimates developed can be fully relied on for making important program milestone decisions. Furthermore, VV&A for the ACEIT software model is needed so that Army and Air Force acquisition program managers can

provide accurate information on the cost of environmental liabilities for Army and Air Force weapon systems acquisition programs in the DoD-wide financial statements.

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## Management Comments on the Finding and Audit Response

The Deputy Assistant Secretary of the Army (Cost and Economics) and the Assistant Secretary of the Air Force (Financial Management and Comptroller) provided comments on the draft report finding. The complete text of those comments is in the Management Comments section of the report.

**Army Comments.** The Deputy Assistant Secretary of the Army (Cost and Economics) nonconcurred with the finding stating that the Automated Cost Estimating Integrated Tools software was not a traditional model that must duplicate a real-world system, entity, or process. He further stated that the calculations were all based on well-known mathematical formulas and were not subject to the uncertainty of external factors. The Deputy Assistant Secretary also stated that DoD Instruction 5000.61 permits tailoring of the verification, validation, and accreditation process and that the Army's tailored approach to testing of deliverables ensured that the software model was reliable.

**Audit Response.** As stated in the finding, we did not identify any significant reliability problems with the Automated Cost Estimating Integrated Tools software model. However, to meet the intent of DoD Instruction 5000.61, the Army should verify that software requirements were met by tracing the source code to a software requirements document for the Automated Cost Estimating Integrated Tools software model. However, the Army did not perform this verification and is unable to do so because the software requirements document had not been prepared. Performance of the required verification, validation, and accreditation will provide acquisition decision authorities with full assurance that life-cycle cost estimates developed can be fully relied on for making important program milestone decisions and cost information for inclusion in DoD financial statements.

**Air Force Comments.** The Assistant Secretary of the Air Force (Financial Management and Comptroller) also nonconcurred with the audit finding stating that the Automated Cost Estimating Integrated Tools is not a software model but instead is a tool to build cost estimating models that represent the cost of acquisition programs. The Assistant Secretary also nonconcurred with the audit finding conclusion that the program manager could not provide full assurance that the Automated Cost Estimating Integrated Tools-developed estimates were fully reliable. In this regard, the Assistant Secretary further stated that he believed the current alpha and beta testing process for new releases of the Automated Cost Estimating Integrated Tools software model was more than adequate to ensure that the results of the software model were reliable and accurate.

**Audit Response.** Representatives from the Defense and the Army Modeling and Simulation Offices stated that the Automated Cost Estimating Integrated Tools met the definition of a software model. This software model requires verification, validation, and accreditation, as discussed in our response to the Army's comments.

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## Recommendation and Management Comments

**We recommend that the Deputy Assistant Secretary of the Army for Cost and Economics and the Commander, Air Force Electronics System Center for the Automated Cost Estimating Integrated Tools software model jointly perform and document the verification, validation, and accreditation of the Automated Cost Estimating Integrated Tools software model as required in DoD Instruction 5000.61, “DoD Modeling and Simulation Verification, Validation, and Accreditation,” May 13, 2003.**

**Army Comments.** The Deputy Assistant Secretary of the Army (Cost and Economics) concurred with the recommendation and agreed to verify, validate, and accredit the next major release of the Automated Cost Estimating Integrated Tools software.

**Air Force Comments.** The Assistant Secretary of the Air Force (Financial Management and Comptroller) concurred with the recommendation and agreed to work with the Deputy Assistant Secretary of the Army (Cost and Economics) to determine the best approach to fulfill the verification, validation, and accreditation requirement for the Automated Cost Estimating Integrated Tools software.

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## Appendix A. Scope and Methodology

To review the ACEIT software model, we evaluated the acquisition processes used by the Army and the Air Force to develop and maintain the life-cycle cost estimating model for acquisition programs. Specifically, we reviewed the past and current efforts by the Office of the Deputy Assistant Secretary of the Army for Cost and Economics and the Commander, ESC to develop and maintain the ACEIT software model. We performed this audit from August 2003 through February 2004 in accordance with generally accepted government auditing standards. Our review did not include a review of the management control program because it was not a stated audit objective.

We reviewed documentation dated from March 1989 to September 2003 that we obtained from the Office of the Deputy Assistant Secretary of the Army for Cost and Economics, the ESC, and Tecolote Research, Inc., Goleta, California.

To accomplish the audit objectives:

- We visited the ESC, Hanscom AFB, Massachusetts, to discuss the initial acquisition of the ACEIT software model. During the visit, we interviewed the prior program management staff involved with ACEIT software model development. We also reviewed information relating to five Air Force contracts awarded to Tecolote. In addition, we interviewed ESC cost analyst representatives and their support contractors about the use of the ACEIT software model for Air Force acquisition programs.
- We met with the Office of the Deputy Assistant Secretary of the Army for Cost and Economics to determine Army's involvement with the ACEIT software model and the current status of Army contracts with Tecolote.
- We visited the Defense Contract Command-Washington, District of Columbia to analyze the two Army contracts, DASW01-97-D-0059 and DASW01-03-A-0011, awarded to Tecolote for ACEIT software model, enhancements, support, and training.
- We visited Tecolote to observe the beta testing process for Version 6.0 of the ACEIT software model, reviewed contracting documents, and interviewed subject-matter experts about the ACEIT software model. Our evaluation of the ACEIT software model during the visit to Tecolote was limited because the Office of the Commander, ESC, Hanscom AFB, Massachusetts had not prepared a software requirements document.

Further, we contacted the Defense Modeling and Simulation Office, the Army Modeling and Simulation Office, the Air Force Agency for Modeling and Simulation, and the Air Force Modeling and Simulation Policy Division to determine whether those offices had verified, validated, and accredited the ACEIT software model to satisfy the requirements in DoD Directive 5000.59 and DoD Instruction 5000.61.

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**Use of Computer-Processed Data.** We did not use computer-processed data to perform this audit.

**Use of Technical Assistance.** A computer engineer in the Technical Assessment Division, Office of the Assistant Inspector General for Auditing of the Department of Defense reviewed the accuracy and reliability of the ACEIT software model. Specifically, the computer engineer observed the ACEIT software model beta testing for Version 6.0 and performed benchmark tests; assessed the reliability of the software functions; reviewed identified software defects, corrective actions, and their effects on life-cycle cost estimates for weapon systems acquisition programs; reviewed the quality of the contractor's software development and testing, configuration management, third-party commercial off-the-shelf products, and protection of data from inappropriate alteration.

**General Accounting Office High-Risk Area.** The General Accounting Office has identified several high-risk areas in DoD. This report provides coverage of the effectively managing information technology investments and improved financial performance high-risk areas.

## **Prior Coverage**

No prior coverage has been conducted on the ACEIT software model during the last 5 years.

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## Appendix B. Description of the Automated Cost Estimating Integrated Tools Software Model

The ACEIT software model provides an automated framework to build concise, structured, and robust life-cycle cost estimates for weapon system acquisition programs. The ACEIT software model consists of the following components: Automated Cost Estimator; Cost and Statistical Analysis Tool; Automated Cost Database; Program Office Support Tool; Automated Cost Estimator Information Manager; ACEIT Inflation Editor; and Knowledge Web Services

**Automated Cost Estimator.** The Automated Cost Estimator component is the estimating portion and heart of the ACEIT platform. The Automated Cost Estimator is a model-building tool that is part spreadsheet and part database, which allows for an increase in analyst productivity through built-in indenture summing, inflation, learning, time phasing, documentation, sensitivity and “what-if” error trapping, risk analysis, and other analysis capabilities.

**Cost and Statistical Analysis Tool.** The Cost and Statistical Analysis Tool is the statistics portion of the ACEIT platform. The Excel-based Cost and Statistical Analysis Tool allows analysts to conduct correlations, univariate, multivariate, linear, log-linear, non-linear, beta curve, statistical sampling, and learning curve analysis.

**Automated Cost Database.** The Automated Cost Database component of the ACEIT platform is a database-building tool that allows users to tailor a database. When an analyst populates the database, the Automated Cost Database allows the user to search and retrieve cost, schedule, and programmatic data through a user-friendly tool called the Report Wizard.

**Program Office Support Tool.** The Program Office Support Tool component provides extensive capability in the areas of “what-if” case management, estimate reporting, drill-down analysis, and automated presentation and report generation. Through the Program Office Support Tool, a cost analyst can access an Automated Cost Estimator session to develop alternative excursions, create charts or tabular reports, and export charts and reports.

**Automated Cost Estimator Information Manager.** The Automated Cost Estimator Information Manager component is a powerful tool enabling any user to build and maintain the Automated Cost Estimator’s knowledge bases that can contain estimating analogs, factors, equations, rules, or source references and will appear in a cost estimating relationship library.

**ACEIT Inflation Editor.** The ACEIT Inflation Editor component allows a cost analyst to create unique inflation indices for a program, project, or organization that can be accessed by an ACEIT software tool.

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**Knowledge Web Services.** The Knowledge Web Services component is a document management tool that allows a cost analyst to set permissions for users to read and write documents, Automated Cost Estimator sessions, and cost estimating relationship libraries to Internet sites.

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## Appendix C. Technical Assessment of the Automated Cost Estimating Integrated Tools Software Model

To determine the reliability of the ACEIT software model, the audit team consulted with a computer engineer from the Technical Assessment Division, Office of the Deputy Inspector General for Auditing of the Department of Defense. The computer engineer observed beta tests for Version 6.0; performed benchmark tests; reviewed the software development and testing documents; and, corresponded with Tecolote's subject-matter experts about the ACEIT software model. In addition, the computer engineer reviewed the contractor's reported software deficiencies and configuration management process to determine whether any conditions existed that would affect the software's reliability. The computer engineer did not identify any significant problems.

**Beta Tests.** The engineer observed the beta testing before the release of Version 6.0 of the ACEIT software model. He also tested new features and performed regression testing by editing an existing cost estimate, applying inflation features, and producing graphing results. The computer engineer identified some errors but determined that none would significantly affect the reliability of the results of the ACEIT software model.

**Benchmark Tests.** To further test the software, the computer engineer obtained a copy of the ACEIT software from Tecolote and installed it on his office personal computer. He created cost methodologies to test equations, applied learning curves and phasing methods, and performed "what-if" scenarios. The computer engineer did not find any problems that would indicate that the software processing features of the ACEIT software model would inadvertently alter or modify data without the user's knowledge.

**Software Development and Testing Documents.** The computer engineer reviewed Tecolote's software development standards and ACEIT software model alpha testing documents. He was unable to review a software requirements document because a Tecolote representative stated that such a document did not exist, and that the requirements for the ACEIT software model were included within the contract statements of work. The computer engineer stated that Tecolote's internal standards for the ACEIT software model development, programming, and testing were similar to best practices used by industry.

**Software Change Requests.** To assess the types of changes that Army and Air Force users requested for the ACEIT software model, the computer engineer reviewed change requests for Versions 5.1b and 6.0 that were stored in the Tecolote defect tracking system. The computer engineer identified that Army and Air Force users had submitted 602 change requests and that the release of Versions 5.1b and 6.0 addressed 400 of the 602 change requests as either fixed, in progress, or closed. The computer engineer also discovered that the Army and the Air Force had another 71 user change requests on their unfunded requirements

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list. The computer engineer determined that a few of the 71 open change requests would affect the reliability of the results of the ACEIT software model. Tecolote had assigned action on those open change requests.

**Configuration Management Process.** The computer engineer reviewed the configuration management process for ACEIT software model change requests. He determined that the configuration management process was adequate.

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## **Appendix D. Report Distribution**

### **Office of the Secretary of Defense**

Under Secretary of Defense (Comptroller)/Chief Financial Officer  
Deputy Chief Financial Officer  
Deputy Comptroller (Program/Budget)

### **Department of the Army**

Assistant Secretary of the Army (Financial Management and Comptroller)  
Deputy Assistant Secretary of the Army (Cost and Economics)  
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Naval Inspector General  
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# Department of the Army



REPLY TO  
ATTENTION OF  
SAFM-CEA-R

DEPARTMENT OF THE ARMY  
OFFICE OF THE ASSISTANT SECRETARY  
FINANCIAL MANAGEMENT AND COMPTROLLER  
109 ARMY PENTAGON  
WASHINGTON DC 20310-0109

23 MAR 2004

MEMORANDUM FOR Director, Acquisition Management, Inspector General  
Department of Defense, 400 Army Navy Drive, Arlington, VA 22202

SUBJECT: Army Comments to IG Report Project No. D2003AE-0181  
"Reliability of the Automated Cost Estimating Integrated Tools Software Model"  
dated 5 Feb 2004

1. This is in reply to subject DOD IG memorandum "Report on Reliability of the Automated Cost Estimating Integrated Tools Software Model" requesting comment to the draft report. The overall objective of the audit was to assess the reliability of the ACEIT software model used to prepare life cycle costs to determine whether the data generated was sufficiently reliable and accurate.
2. **Overview.** Although the report accurately captures the Automated Cost Estimating Integrated Tools (ACEIT) enhancement development process we strongly disagree with the suggestion that the model may not be reliable. As noted in the report there are significant resources dedicated to supporting the tried and proven Alpha and Beta testing process. Our current testing process already ensures that the data generated by the model is reliable when a new version of ACEIT is released.
3. **Findings.** The primary finding stated, "Acquisition program managers who use ACEIT cannot provide milestone decision authorities with full assurance that lifecycle cost estimates developed can be fully relied on for making important program decisions". This conclusion was reached based on the lack of a formal Verification, Validation and Accreditation (VV&A) process as described in DOD Instruction 5000.61.
4. **Comment.**
  - a. We strongly non-concur with the suggestion that the lifecycle cost estimates generated by ACEIT may be unreliable. In fact, as compared to past practices in the Army, ACEIT ensures reliability and efficiency by replacing spreadsheets that analysts' develop on their own in each local cost office without a VV&A process. Further, ACEIT has shown to be effective in finding errors resident in spreadsheet models.

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SFAM-CEA-R

SUBJECT: Army Comments to IG Report Project No. D2003AE-0181  
"Reliability of the Automated Cost Estimating Integrated Tools Software Model"  
dated 5 Feb 2004.

- ACEIT is not a traditional model that must duplicate a real world system, entity or process. For example, a missile fly-out model must duplicate the flight path of a missile. While the flight path can be mathematically modeled it cannot be determined with 100% certainty prior to actually flying the missile. The VV&A process must determine whether or not the calculated representation of the missile flight represents the actual flight.
- The calculations that ACEIT performs are all based on well-known mathematical formulas and are not subject to uncertainty and external factors. ACEIT performs many different types of calculations ranging from basic addition and subtraction to complex learning curve computations and risk analyses. However, in all cases the expected result of the calculations are known and can be tested based on approved mathematical concepts and formulas. There is no uncertainty. Our Alpha and Beta test process ensures that the results of the model are reliable and accurate with certainty. This does not mean that every cost estimate will match the final program cost, an attribute that is impossible to achieve for any cost estimate or model. ACEIT takes the uncertainty out of the calculations, permitting the analyst to ensure that the best data, assumptions and methodologies are used. When using ACEIT, any uncertainty of a cost estimate is based on the use of specific data, assumptions, and the selection of methodologies that are independent of the basic ACEIT model. Therefore, deviation between the cost estimate and the final program cost is due to invalid data, assumptions or methodologies. This audit only reviewed the ACEIT model and did not review a specific program office's cost estimate developed using the ACEIT model.

b. We strongly non-concur with the report's conclusion that ACEIT was not developed in accordance with the intent of the requirements of DODI 5000.61.

SFAM-CEA-R

SUBJECT: Army Comments to IG Report Project No. D2003AE-0181  
"Reliability of the Automated Cost Estimating Integrated Tools Software  
Model" dated 5 Feb 2004

- The DODI 5000.61 permits the tailoring of the VV&A process based on individual model requirements. Our tailored approach to testing ensured the model is reliable and our statement of work and deliverables served as the primary documentation to record user requirements. We do not see the need to maintain separate software requirements documentation. User requirements do not necessarily impact or affect reliability. While many of the latest enhancements were incorporated to improve usability, none were to fix model errors. If an enhancement impacted the cost calculations then the results were tested to ensure that the calculations still provided the expected numeric results.
  - The report confirms that our software developer, Tecolote Research Incorporated, follows internal standards for development, programming and testing similar to industry best standards.
- c. We will adopt the report's recommendation to upgrade documentation of the VV&A of ACEIT for the next major release, but we see no need to change our VV&A process. The Army and Air Force will determine the best approach to fulfill this requirement. It is estimated that it will require one work-year to document the VV&A process including the software requirements document. The next major software release is currently scheduled for September 2005.

5. Please contact David Henningsen, (703) 601-4163 for any further action on this matter.



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Deputy Assistant Secretary of the Army  
(Cost and Economics)

CF:  
Auditor General, Department of the Army  
Assistant Secretary of the Air Force (Financial Management & Comptroller)  
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# Department of the Air Force Comments



Office of the Assistant Secretary

DEPARTMENT OF THE AIR FORCE  
WASHINGTON, DC

7 APR 2004

MEMORANDUM FOR ASSISTANT INSPECTOR GENERAL FOR AUDITING  
OFFICE OF THE INSPECTOR GENERAL  
DEPARTMENT OF DEFENSE

FROM: SAF/FM

SUBJECT: DoDIG Draft Report, Reliability of the Automated Cost Estimating Integrated  
Tools Software Model, 5 February 2004, Project Code D2003AE-0181

This is in reply to subject DOD IG memorandum "Report on Reliability of the Automated Cost Estimating Integrated Tools Software Model" requesting comment to the draft report. The overall objective of the audit was to assess the reliability of the ACEIT software model used to prepare life cycle costs to determine whether the data generated was sufficiently reliable and accurate. Although the report fairly accurately captures the Automated Cost Estimating Integrated Tools (ACEIT) enhancement development process, we concur with the Army's response and strongly disagree with the DOD IG suggestion that ACEIT may not be reliable. As noted in the report, the Army and Air Force dedicate significant resources supporting the Alpha and Beta testing process. We believe the current testing process already ensures the estimates generated by ACEIT are reliable whenever a new version is released.

The primary finding stated, "Acquisition program managers who use ACEIT cannot provide milestone decision authorities with full assurance that lifecycle cost estimates developed can be fully relied on for making important program decisions." This statement is made based on the lack of a formal Verification, Validation and Accreditation (VV&A) process as described in DOD Instruction 5000.61. We strongly concur with the Army that the conclusion reached by the DOD IG is invalid. ACEIT is a tool used to build cost estimating models, not a model in and of itself. And because no model can predict reality with 100% certainty, the reliability of a cost estimate is based more on the skill and judgment of the analyst, than on the tools used for estimation. The DOD IG report seems to assume ACEIT is a "black box model" whose internal calculations are hidden from the user. Instead, the calculations ACEIT performs are all based on well-known mathematical formulas that can be tested, line-by-line, based on already approved mathematical concepts and formulas. Therefore, there is no uncertainty in the calculations. For these reasons, we concur that the Alpha and Beta test process is more than adequate to ensure the results of the ACEIT tool are reliable and accurate.

While we are aware that ACEIT was not developed in accordance with all the requirements of DODI 5000.61, the VV&A process can be tailored based on individual model requirements. If an ACEIT user enhancement impacted the cost calculations, then the results

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were tested to ensure the calculations still provided the expected numeric results. The report did state the ACEIT software developer, Tecolote, used internal standards for development, programming and testing that were similar to industry best standards.

We concur with the report recommendation to perform and document our tailored VV&A of ACEIT and agree to work with the Army to determine the best approach to fulfill this requirement.



MICHAEL MONTELONGO  
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