Evaluation Report

OFFICE OF THE INSPECTOR GENERAL

EVALUATION OF THE
RESERVE COMPONENTS AUTOMATION SYSTEM

Report No. 97-019 **November 1, 1996**

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DEPARTMENT OF DEFENSE

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Acronym

ASD(C^3I)	Assistant Secretary of Defense, Command, Control, Communications, and Intelligence
AST	Advanced Software Technology
COTS	Commercial Off-the-Shelf
FP	Function Point
FP/MM	Function Point/Man-Month
GOTS	Government Off-the-Shelf
LAN	Local Area Network
O&M	Operations and Maintenance
OPA	Other Procurement-Army
PMO	Program Management Office
RCAS	Reserve Component Automation System

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202-2884

November 1, 1996

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE (COMPTROLLER)
ASSISTANT SECRETARY OF DEFENSE (COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE)
ASSISTANT SECRETARY OF DEFENSE (RESERVE AFFAIRS)
AUDITOR GENERAL, DEPARTMENT OF THE ARMY
CHIEF, NATIONAL GUARD BUREAU
OFFICE OF THE CHIEF, ARMY RESERVE

SUBJECT: Evaluation of the Reserve Component Automation System (Report No. 97- 019)

We are providing this report for your review and comment. We conducted the evaluation in response to a request from the Assistant Secretary of Defense for Reserve Affairs, acting upon congressional direction. We considered management comments on a draft of this report in preparing the final report.

DoD Directive 7650.3 requires that all recommendations be resolved promptly. Therefore, we request comments from the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) on Recommendation A.2., and the Chief, National Guard Bureau on Recommendation A.1.a.(2). by January 10, 1997.

We appreciate the courtesies extended to the evaluation staff. Questions on the evaluation should be directed to Mr. Kenneth H. Stavenjord, Technical Director, at (703) 604-8952 (DSN 664-8952), or Mr. Gregory R. Donnellon, Project Manager, at (703) 604-8946 (DSN 664-8946). If management requests, we will provide a formal briefing on the evaluation results. See Appendix F for the report distribution. The evaluation team members are listed inside the back cover.

Robert J. Lieberman
Assistant Inspector General
for Auditing

Office of the Inspector General, DoD

Report No. 97-019 **November 1, 1996**
(Project No. 6PT-5013)

Evaluation of the Reserve Component Automation System

Executive Summary

Introduction. The Assistant Secretary of Defense for Reserve Affairs, acting upon congressional direction, requested a technical assessment of the Reserve Component Automation System (RCAS). The RCAS contains a combination of commercial off-the-shelf, Government off-the-shelf, and developed hardware, software, and telecommunications components. We reviewed the RCAS requirements, architecture, telecommunications, software development, cost, schedule, funding, and fielding plan.

Objective. Our objective was to determine whether the RCAS was adequately funded, was executable, would meet the Army's National Guard and Reserve requirements, and would be fielded to all operational units according to an approved plan.

Technical Assessment Results. The RCAS commercial off-the-shelf infrastructure (personal computers, office automation software, and telecommunications) alone, without the developed software, will meet many Reserve Component operational requirements. When complete, the RCAS infrastructure and developed software should provide the U.S. Army and its Reserve Component decisionmakers the capability to effectively manage the information resources supporting readiness and mobilization preparedness. However, significant risks to successful RCAS Program execution concern data and application software development, telecommunication requirements and funding, and commercial off-the-shelf budget risks.

The RCAS Program Management Office underestimated costs and planned insufficient funding for the data and applications software development by approximately $160 million. Because of the insufficient funding, developing software in the required language will cause schedule slips and the Army National Guard and the Army Reserve requirements not being fully met (Finding A).

The Chief, National Guard Bureau, neither identified specific telecommunications requirements for equipment and services nor determined total communications cost for the RCAS program. As a result, the RCAS Program Management Office has not completed a documented, validated, and comprehensive telecommunications management plan to obtain the most cost-effective telecommunications circuit configuration and is unable to determine the total cost of the telecommunications portion of the RCAS program (Finding B).

Budgeted funds to purchase the RCAS commercial off-the-shelf infrastructure (personal computers, office automation software, and telecommunications) are at risk from other areas of the program that are underbudgeted. Insufficient infrastructure investment could force the Army National Guard and Army Reserve units to wait more than 6 years for the anticipated benefits from deploying the RCAS commercial off-the-shelf infrastructure (Finding C).

Summary of Recommendations. We recommend that the Chief, National Guard Bureau, cease further data and applications development effort until selection of Ada (or other approved computer language) and reestimate the cost and schedule of the project. We also recommend requiring full justification if an Ada waiver is proposed and cease the more than $2 million procurement of the structured query language server and the selected fourth-generation language products planned for FY 1997 unless an Ada waiver is granted and pilot applications are completed successfully.

Before procuring additional RCAS telecommunication equipment and services, we recommend that the Chief, National Guard Bureau, ensure that a baseline is established, telecommunications requirements are validated, the number of subscribers are identified, future users telecommunications requirements are validated, a configuration management plan is completed, the total cost is determined, budgetary costs are projected, and a funding program for the Army Reserve and National Guard is established.

We further recommend that the Chief, National Guard Bureau, formally baseline the commercial off-the-shelf infrastructure delivery schedule and quantities, and review the use of computer systems provided by other sources.

Management Comments. The National Guard concurred with our recommendation to baseline the commercial off-the-shelf hardware and software deliveries. However, the National Guard nonconcurred with the recommendations to cease development in the planned language or to seek a waiver from the Ada requirement. The Army rationale was that the fourth generation language was a COTS advanced software technology, so no waiver from Ada was needed. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) (ASD[C^3I]) agreed with the Army interpretation of the language policy. The National Guard Bureau nonconcurred with recommendations to baseline and validate the telecommunications requirements, because telecommunications plans were subsequently updated with the required data. The ASD(C^3I) partially concurred with the recommendations to baseline the telecommunications plan, acknowledging that required details were missing. However, ASD(C^3I) nonconcurred with the recommendation to perform site surveys, since RCAS will utilize excess capacity on other networks whenever possible. See Part I for a summary of management comments and Part III for the complete text of management comments.

Evaluation Response. The computer language regulation issues were satisfied by the RCAS Program Management Office prompt action in obtaining the ASD(C^3I) interpretation of the policy, resulting in a determination of compliance. However, designation of a fourth generation language as an advanced software technology avoids consideration of embedded programming language usage risks and life-cycle cost impact. The risks are particularly prevalent in areas of maintainability, portability, reliability, reusability, and clarity of source code. Also, the National Guard was non-responsive to the $12.1 million funding shortfall we calculated for software maintenance, claiming instead that it had planned for maintenance and software growth in future years. We are indicating a planning calculation error, not a methodology difference. We continue to recommend that software maintenance costs be recalculated.

In light of the approval action by ASD(C^3I), we withdrew Recommendation A.1.a.(1). to cease development until Ada is selected. Instead, we directed recommendations to the ASD(C^3I) to monitor and periodically assess the RCAS software development risk

management with a view to identifying and correcting variances in a timely manner. Concerning Recommendation A.1.a.(2)., an additional response is required. We request the additional comments by January 10, 1997.

Quick action by the RCAS Program Management Office in submitting cost and risk management data to the ASD(C^3I) and obtaining his endorsement of the program's approach met the intention of our telecommunications recommendation to baseline the system and validate the system's requirements. The Army actions in baselining the Acquisition Program for the delivery schedules and in deciding to utilize open architecture and existing National Guard and Army computer resources is responsive to our recommendations.

Concerns about telecommunications requirements were satisfied by the ASD(C^3I) requiring the Program Management Office to have a validated telecommunications plan, including missing requirements, for Major Automated Information System Review Council approval.

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Part I - Evaluation Results

Evaluation Background

The Reserve Component Automation System (RCAS) acquisition program is managed by the Chief, National Guard Bureau. The RCAS is an automated information management system that will assist soldiers in the Reserve Component with their day-to-day office administration and mobilization planning and execution applications. The Army Reserve Component consists of the Army National Guard and Army Reserve units. The RCAS consists of commercial off-the-shelf (COTS) telecommunications, computer equipment, and software, including the retrofit of currently fielded equipment; limited system sustainment; application software through the use of Government off-the-shelf (GOTS) software; and the development of new applications that satisfy the functional requirements for maintaining data, automating business processes, and interfacing with external systems.

In 1988, Congress directed that the Army procure the RCAS, using Office of Management and Budget Circular A-109, "Major Systems Acquisitions," April 1976. In 1991, the RCAS contract was awarded to Boeing Information Systems, Inc. Originally, the RCAS Program Management Office (PMO) planned to field hardware by 1994 and software by 1996. Time delays and an unfinanced requirement of more than $200 million resulted in a Secretary of the Army directive to examine the RCAS program. In February 1995, the Chief, National Guard Bureau, requested that a team of experts (the Red Team) consisting of the Active Army, Army National Guard, and Army Reserve be formed to review the program. The Red Team recommended changing to a personal computer COTS/GOTS-based architecture, removing multilevel security requirements, utilizing rapid prototyping of functional applications software, centralizing data at State Area Commands and Regional Support Commands, and establishing a Customer Focus Team.

In April 1995, a working group called the Validation Assessment Team was assembled to validate the Red Team's recommendations and develop a program-wide plan for implementation. The Validation Assessment Team objectives and schedule included determining cost implications of the Red Team recommendations, finalizing RCAS architecture and plans for implementation, and restructuring the RCAS contract to accommodate the revised solution. The Active Army, the National Guard, the Army Reserve, the Office of the Secretary of Defense, and the Congress reviewed the revised RCAS program and agreed with the new RCAS program structure.

The restructured RCAS contract was implemented February 1, 1996, with Boeing Information Services, Inc. The contractor is required to provide COTS telecommunications, computer equipment, and software, including the retrofit of currently fielded equipment; limited system sustainment; application software through the use of GOTS/COTS-based development and the development of new applications; and the program management, system engineering, and data modeling support required to integrate and prioritize the above activities within the current, design-to-cost and funding limitations. The period of performance for the restructured RCAS contract is February 1, 1996, through September 30,

2002, and is subject to annual renewal options. The total value of the signed RCAS contract is $760.9 million; the contract provides for connecting more than 56,100 workstations for supporting mobilization of the Army National Guard and Reserve units and performing office automation functions.

The Report of the House Appropriations Committee for FY 1996 directed the Assistant Secretary of Defense for Reserve Affairs to certify that the Department of Defense has a fully funded RCAS program that is executable, meets the requirements of the Army National Guard and the Army Reserve, and can eventually field the equipment to all operational units with valid requirements for the RCAS. The House Appropriations Committee directed that no more than half of the FY 1996 RCAS procurement funds be obligated before the certification. The Committee also directed that the Assistant Secretary of Defense arrange for an independent technical assessment by an organization that is independent of the Army. The Assistant Secretary of Defense requested the Inspector General, DoD, to conduct the technical assessment.

Evaluation Objective

The objective of our evaluation was to determine whether the RCAS program has been fully funded, is executable, will meet the requirements of the Army National Guard and the Army Reserve, and has a plan prepared to ensure fielding of the equipment to all operational units. See Appendix A for a discussion of the evaluation scope and methodology. Appendix B discusses prior audit coverage and other reviews. Appendix C discusses technical support available to the PMO. Also, see Appendix E for a list of organizations visited or contacted during the evaluation.

Finding A. Data and Application Software Development

The RCAS Program Management Office underestimated costs and planned insufficient funding for the data and applications software development by about $160 million. The PMO did not obtain a waiver to the Ada requirement, significantly overestimated the software development productivity, and underestimated the maintenance portion. As a result of the insufficient funding, the software development in the required language will cause schedule slips and the Army National Guard and the Army Reserve requirements will not be fully met.

Software Development Approach

RCAS is an integrated computing system developed primarily to enhance the readiness of the Reserve Component of the Army. The RCAS consists of a delivery system portion and a data and applications portion. The delivery system includes COTS hardware, software, and telecommunications that provide office automation and electronic mail. The data and application software to satisfy the functional requirements for maintaining data, automating business processes, and interfacing with external systems is a development effort.

The data and application software development will satisfy approximately three-fourths of the functional requirements with new applications and the remainder by integrating GOTS software. The PMO will use the evolutionary strategy to develop the new applications. This strategy develops a system in builds and acknowledges that the user needs and system requirements are only partially defined up front and then are refined in each succeeding build. A build is a version of software that meets a specified subset of the requirements that the completed software will meet.

The evolutionary strategy used by RCAS is a Rapid Application Fielding Methodology based on a widely accepted industry practice known as rapid application development. Rapid Application Fielding Methodology is characterized by the following:

o Extensive and on-going user involvement in the requirements and preliminary design phases.

o Development of applications in small increments (known as "timeboxes") under tightly controlled deadlines.

o Small development teams with developers, database analysts, test analysts, and users represented. Significant decisionmaking is delegated to the teams. Users on each team speak for all users of the timebox application.

o Extensive use of prototyping.

o Exploitation of opportunities for software reuse (including GOTS and COTS) and for use of modern software development tools.

o Information engineering techniques, such as data and process modeling.

The RCAS Validation Assessment Team and contractor used the function point analysis approach to size the software. Function points (FP) are the weighted sums of five factors (inputs, outputs, inquiries, files, and interfaces) that relate to user requirements. These counts are then multiplied by established values to adjust for the software's complexity. Based on prior experience, the final function point figure can be converted into a reasonably good estimate of required development resources.

The funding allocated to the Data and Applications software development time and materials portion of the contract was not sufficient for an Ada development approach. Therefore, the Validation Assessment Team selected a fourth-generation language approach based on its efficiency.

Development Language Issues

DoD policy is to use COTS software whenever it meets DoD requirements. However, when the DoD must develop unique software to meet its needs, DoD Directive 3405.1, "Computer Programming Language Policy," April 2, 1987, requires that software be written in the Ada programming language. Further, the Ada programming language is the single, common, high-order computer programming language for all computer resources used in the Army. Ada is presumed cost-effective over the life-cycle of the application by Army policy for all new development or modification of more than one-third of a DoD application regardless of size or cost. In such cases, Ada must be used unless a waiver is granted.

The Validation Assessment Team determined that the productivity levels associated with Ada coding were 3.5 to 4 function points per man-month. Current RCAS budget allocations cannot support the costs of this productivity level; therefore, a new approach was proposed minimizing the amount of Ada code that must be written. The Validation Assessment Team approach was to meet RCAS mission functionality primarily through the use of commercially available software and fourth-generation languages (4GLs) rather than custom-developed software in a high-order language such as Ada.

The RCAS Validation Assessment Team Final Report, July 24, 1995, stated:

> [the new software development] approach is a COTS-based approach and is consistent with direction contained in DoD Directive 3405.1, Computer Programming Language Policy that identifies the following priority preference based on an analysis of the life-cycle costs and impact:
>
> a. Off-the-shelf application packages and advanced software technology.
>
> b. Ada-based software and tools.
>
> c. Approved standard high order languages.

Fourth-generation languages generate code for an application. The existing policies; DoD Directive 3405.1, DoD Regulation 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs," March 15, 1996, and Headquarters, Department of the Army Letter 25-95-1, "Change to Headquarters, Department of the Army Letter 25-94-1, Implementation of the Ada Programming Language," July 17, 1995, do not adequately address code generators. The policies do state that a waiver is not required to use COTS applications and advanced software technology that is not modified or maintained by the Department of Defense. The RCAS PMO and the Army Director of Information Systems for Command, Control, Communications, and Computers have interpreted this guidance to include COTS 4GL code generators.

However, the RCAS use of a COTS code generator will require coding and maintenance at the generated code level. Because the PMO will develop and maintain software at the generated code level, DoD policy requires an Ada waiver. This position on the requirement for an Ada waiver is consistent with the interpretation provided to the Army by a ASD(C^3I) memorandum that states: "The Army needs to ensure that the code generator will do everything that needs to be done now and in the future. If at any time the actual code has to be modified (even slightly) and it is not Ada, the Army will be in violation of the policy."

The selected 4GL is predicated on the idea that the developer would modify the generated code to customize the user interface, processing, and application interfaces. The selected 4GL includes tools to facilitate such code level changes. The following are examples that require coding at the generated code level.

- o disabling a keystroke in a data window;
- o implementing cut, copy, and paste in the "Edit" menu;
- o scrolling row by row instead of scrolling by page or by group;
- o using shift-F1 for help;

o determining the last item clicked on a multi-select listbox;

o passing Windows messages into an application;

o providing text search in a drop down data window;

o conditionally preventing user input into columns;

o updating multiple database tables from the same data window;

o reading a file larger than 32,766 bytes;

o sending data from an application via e-mail; and

o determining whether a Windows application is running in Windows NT.

These and other routine requirements are highly likely in the RCAS applications and would require coding at the generated code level. Even if Ada was used whenever changes were needed to the selected 4GL applications, generated or C code changes would be necessary to transfer control and data between the languages. Therefore, without a waiver, the regulations require RCAS to use Ada.

If the PMO pursues an Ada waiver, the justification should include how the PMO will abate the additional risks of 4GL development. These 4GL development risks include the following.

o The RCAS applications may be too large for the code generator. Fourth-generation languages have been used extensively for prototyping and ad hoc application development. The large RCAS applications may cause overflows of internal tables and memory exceptions in the code generator.

o The applications will run too slowly and take too much memory. Fourth-generation languages automatically include application domain services that may or may not be used by the application. The RCAS contract specifies an interpretive 4GL. There is considerable risk that RCAS users will not accept the application start-up delays and response times. There is some risk that the applications will use too much disk space and that useful sets of applications cannot be loaded at the same time.

o Windows NT and code generator changes may cause additional application changes. Frequent changes in Windows NT and the code generator can be expected until the market place matures. These changes may cause additional application updates, testing, and redelivering. Application changes would cause support cost increases, delivery and reinstallation costs, and possible configuration variety in the field.

o Development and support tools for the code generator are inadequate. Production sizing, productivity, complexity measurement, execution tracing, and test case capture/replay tools may not be available. The code responsible

for execution problems may not be identified. The development at the code generator and generated code levels means that the testing and support must also be at multiple levels. The lower level changes may be forgotten or not changed to match the higher level changes. Test tools may not be available to test generated code changes.

o The RCAS applications may become unsupportable. The selected code generator uses a proprietary nonstandard language with no alternative source or translators. Currently about two dozen 4GL products are competing for top places in productivity, power, graphical user interface, and rapid application development project support. The selected 4GL may become obsolete or other 4GLs may dominate. The developed applications may become unsupportable and may need to be replaced.

In addition to these regulatory and risk issues, the RCAS PMO has not demonstrated that the selected 4GL has the flexibility and performance needed for RCAS by successfully completing the pilot applications. In fact, the RCAS PMO has not demonstrated that the selected 4GL provides all functions needed to develop a representative application. However, the PMO is buying the Structured Query Language server and the selected 4GL products with a contract sub-Contract Line Item Number for $2.2 million in FY 1996. No funds were budgeted for additional software licenses or updates that may be required within the 7 year planned software development.

Development Language Cost Impact

The Validation Assessment Team decomposed RCAS functionality into 136 timeboxes to be used for development and GOTS integration. The nominal timebox was 500 function points to be developed over 28 weeks, including 6 weeks of formal tests, by 4 contractor employees per timebox, which equates to 18 function points per man-month (FP/MM). The Validation Assessment Team then reduced the productivity to account for the DoD environment and learning curve with the new tool suite. The resultant productivity used for project planning and costing was from 10 to 18 FP/MM over the development period. The contractor, in its latest Contract Change Proposal, decomposed the RCAS functionality into 145 total timeboxes, 129 to be used for development and GOTS integration and 16 for maintenance. The contractor's productivity estimates were even higher, steadily increasing from 14 to 20 FP/MM over the development cycle. The Validation Assessment Team and contractor estimated productivity planning on 4GL development.

The contractor's proposal did not include any productivity factors associated with the use of third-generation languages, like Ada. Without a waiver, DoD and Army policies require RCAS to use Ada, and our development productivity and cost estimates are so based. Data collected from a large number of software development projects and used by the Validation Assessment Team indicates the overall software productivity rates in the United States average about five FP/MM and about eight FP/MM for Management Information Systems.

Military systems, however, average about three FP/MM due to more stringent development requirements. This average is consistent with the results of the Validation Assessment Team's modeling analysis showing a productivity rate of about three to five FP/MM based on RCAS historical development data. Larger systems tend to have more requirements growth during development, longer schedule delays, higher maintenance costs, and greater risk of failure than smaller development efforts. With approximately 60,000 function points, RCAS would be classified as one of the largest systems and, therefore, would have among the lowest productivity rates. In addition, a comparison of development languages indicates Ada has the lowest productivity rate of most comparable languages such as Basic, C, FORTRAN, COBOL, Pascal, and PL/1 and is much lower than newer languages such as C++, Visual Basic, SMALLTALK, and 4GLs.

In summary, the development productivity used in program planning was 14 to 20 FP/MM. But Ada or other approved high-order language is required and has a realistic development productivity of three to five FP/MM. Therefore, the planned productivity is five times the realistic productivity using an approved language. As a result, the time and materials funding planned is underestimated by $150 million. Our $150 million estimate is consistent with the Validation Assessment Team's cost model. The Validation Assessment Team reported that if 4GLs were excluded and all code was developed in Ada, a net increased cost for software and data would be $168.7 million.

Other Productivity Risks

The RCAS PMO and contractor did not consider other productivity adjustments in the above calculations for either Ada or the selected 4GL. Development productivity reductions for the very large project, the impact of the new development process Rapid Application Fielding Methodology, and the development contractor's Capability Maturity Model level were not considered.

The Carnegie Mellon University Software Engineering Institute Capability Maturity Model provides a benchmark of widely proven principles for quality, which is recognized by both engineering and manufacturing and has been demonstrated to be effective for software. The purpose of the model is to help organizations determine their current capabilities and identify their most critical issues. The model characterizes the level of an organization's maturity based on the extent to which measurable and repeatable software engineering and management processes are institutionalized. The Capability Maturity Model levels range from a low of one to a high of five.

The RCAS contract stipulates that, before the Government awards any Data and Application Task Orders beyond the first planned set, the contractor is required to achieve Software Engineering Institute Level 2 certification in software development procedures. The contractor will use the Software Engineering Institute Capability Maturity Model Plan approach to achieve Software Engineering Institute Level 2.

Capability Maturity Model Level 1, the initial level, characterizes the organization as having ad hoc or chaotic processes, such as:

- o no formal procedures, cost estimates, or project plans;
- o no management mechanism to ensure procedures are followed;
- o tools not well integrated;
- o change control is lax; and
- o senior management does not understand key issues.

Level 1 organizations suffer from chronic scheduling problems. When organizations plan inadequately and overcommit themselves, they have little time to perform even the basic tasks of development and testing. Product defects become numerous, rework increases, and detailed procedures are ignored. The intent of adopting the practices of Software Engineering Institute Level 2 is to provide a solid management foundation for software development. This foundation for software development results in a stable environment that enables further improvements. Process stability comes from the increase in accuracy and predictability of schedules, early identification and attention to problems, the management of commitments, and the control of changes to the product.

Capability Maturity Model Level 2, the repeatable level, characterizes the organization as being intuitive with the following characteristics:

- o process dependent on individuals;
- o basic project controls established;
- o strength in doing similar work, but new challenges present major risk; and
- o orderly framework for improvement lacking.

The three higher Capability Maturity Model levels are defined, managed, and optimized. While achievement of Capability Maturity Model Level 2 improves the management foundation of the software organization, the production amount and quality is still inconsistent from team to team and product to product. With RCAS system development, this inconsistency combined with the organization's growth does not support the planned, steadily increased productivity from 14 to 20 FP/MM.

Underestimated Software Maintenance

The contractor's data and applications development size estimates for the restructured program are:

39,590 FP - New application development

11,825 FP - Provided by GOTS software

2,960 FP - Integration of GOTS software

6,125 FP - Maintenance

60,500 FP - Total

This total estimate is equivalent to 4,300,000 source lines of Ada code. RCAS is a very large software-intensive program.

The contractor's maintenance estimate was based on a 15 to 16 percent annual change traffic. The 15-percent annual change traffic is based on historical data and assumes a 7-year life-cycle for software (7 years times 15 percent = 105 percent).

Our conservative calculation, based on the 15 percent annual change and the above size estimates, yields a range of 17,900 to 36,000 FPs. Fault repairs on fielded software are not included, but they must be estimated and added to get the total maintenance estimate. By selecting 18,125 FP, a conservative total maintenance estimate, we calculated that the software maintenance was underestimated by 12,000 FP (852,000 source lines of code).

Using the PMO estimate of $61.2 million for the total 60,500 FP, we determined the additional 12,000 FP will cost an additional $12.1 million.

In addition, the RCAS contractor has planned the maintenance timeboxes at the same productivity as the development. However, the software maintenance phase has historically had dramatic decreases in productivity. Productivity drops of 40:1 have been reported. The variety and undefined scope of the changes make software maintenance costs difficult to estimate. Software maintenance also includes considerable wheel-spinning activities, and the complexity of the software increases the longer the software is in the support phase. A maintenance productivity lower than the development productivity would provide more realistic project plans.

Summary

The data and application portion of RCAS is a large software application development effort. The RCAS PMO selected a 4GL for development instead of Ada, but did not obtain a waiver. DoD Directive 3405.1 requires that Ada be used for the development language unless a waiver is approved. Therefore, replanning is needed to allow for its lower development productivity.

The RCAS PMO has insufficient funding planned for development in Ada. The Ada development productivity is 5 times less than that for the language planned. The underestimate is $150 million. In addition, the maintenance plan for changing requirements was underestimated by 12,000 FP. This underestimate is $12.1 million. The combined development and maintenance underestimate is about $160 million.

The PMO must replan RCAS to allow for the lower development productivity of Ada and the estimated additional costs, or obtain a waiver.

Management Comments on the Finding and Evaluation Response

National Guard Bureau Comments. The National Guard nonconcurred with the finding, stating that the RCAS fully complies with the DoD Ada policy. The RCAS PMO interpreted the selected 4GL as an advanced software technology (AST). Ada policy treats ASTs with preference over Ada. The ASD(C^3I) agreed with the RCAS program office's approach in selecting a 4GL in a letter dated June 14, 1996, responding to our draft report. Additionally, based on the evaluation report, the PMO identified $10 million to be used for Ada development when required. Responding to the $12.1 million maintenance shortfall, the Guard stated that it had planned for maintenance and software growth and that this amount would be less than had Ada been used.

Assistant Secretary Comments. The ASD(C^3I) nonconcurred with the finding in a separate memorandum of July 12, 1996. The ASD(C^3I) explained its rationale for not requiring an Ada waiver by stating that the RCAS program was in compliance with existing policy. Further, the ASD(C^3I) concluded that the RCAS program office did an acceptable assessment of productivity gains, cost avoidance, and risk. The ASD(C^3I) also concluded that the program office selected a development strategy in line with acquisition reform and commercial best practices. Additionally, as the Major Automated Information System Review Council Chairman, the ASD(C^3I) will ensure RCAS develops all custom software in accordance with DoD Directive 3405.1, "Computer Programming Language Policy," April 2, 1987.

Evaluation Response. The finding was based on strong evidence that custom application development using the selected 4GL requires hands-on programming in the embedded third-generation language (3GL). Application software development using this 3GL language without a waiver would be a violation of policy.

The National Guard has designated the 4GL as a COTS AST, which the regulation favors over Ada and which does not require a waiver. The National Guard's interpretation was supported by the ASD(C^3I) which satisfies the regulatory issues of Finding A. However, the designation of the 4GL as an AST avoids consideration of the embedded programming language usage risks and life-cycle cost impact. Although the RCAS PMO provided assurances that it will use Ada and not the imbedded 3GL for any procedural language coding requirements, the decision to approve and use the 4GL language increases the supportability risk. The 4GLs have greater risk than Ada in such areas as maintainability, portability, reliability, reusability, and clarity of source code. Also, the National Guard did not adequately address the $12.1 million shortfall calculated for software maintenance, since the problem stemmed from a calculation error, not a difference in language or development methodology. See Appendix D for more detailed discussion of the report comments.

Recommendations, Management Comments, and Evaluation Response

Deleted and Redirected Recommendations. In light of the approval action by ASD(C^3I), we withdrew Recommendation A.1.a.(1). to cease development if Ada is selected. Instead, we directed recommendations to the Major Automated Information System Review Council to monitor and periodically assess the RCAS program development progress. Because timeboxes are the basic unit of software development, productivity at that level is necessary to ensure that specific development problems do not get buried by averages for the program. Complete management comments are in Part III.

A.1. We recommend that the Chief, National Guard Bureau:

a. Cease further data and applications development efforts until the following actions are completed.

(1). Select Ada (or other approved computer language) as required by DoD Directive 3405.1, "Computer Programming Language Policy," April 2, 1987, before the project is overcommitted to a fourth-generation language.

(2). Reestimate the cost and schedule of the project based on realistic development productivity and maintenance sizing or rescope the Data and Applications functions to fit the available cost and schedule.

National Guard Bureau Comments. The National Guard nonconcurred with Recommendation A.1. stating that the RCAS is in full compliance with the DoD Ada policy. Conservative costs and schedules have been proposed based on industry productivity data using 4GLs.

Evaluation Response. Prompt action by the RCAS PMO to obtain the ASD(C^3I) interpretation of the policy resulted in a determination of compliance. However, the additional $12.1 million for software maintenance is a minimum and should be recalculated by the RCAS PMO.

b. Require full justification, including a life-cycle cost analysis and a risk analysis that addresses technical performance and schedule impact, if an Ada waiver is proposed.

National Guard Bureau Comments. The National Guard nonconcurred, stating that an Ada waiver will not be proposed for RCAS. The RCAS Program Management Office stated that it reviewed the life-cycle costs and it established a risk management program that addresses technical performance and schedule impacts.

Evaluation Response. Prompt action by the RCAS PMO in submitting cost and risk management data to the ASD(C^3I) and obtaining the endorsement of the program's FY 1996 approach meets the intent of our recommendation.

c. Cease the more than $2 million procurement of Structured Query Language server and the selected fourth-generation language products planned for FY 1996, unless an Ada waiver is granted and pilot applications are completed successfully.

National Guard Bureau Comments. The National Guard partially concurred. Since RCAS is in compliance with the DoD Ada policy, the PMO will continue to acquire COTS development tools as planned for FY 1996.

Evaluation Response. Prompt action by the RCAS PMO to obtain the ASD(C^3I) approval of the policy resulted in a determination of compliance. This step, along with progress made in the pilot applications, meets the intent of our recommendation.

A.2. We recommend that the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence), as the chairman of the Major Automated Information System Review Council:

a. Monitor and periodically assess the Reserve Component Automation System software development risk management with a view to identifying and correcting variances in a timely manner by tracking:

(1). Planned-versus-actual function points completed.

(2). Planned-versus-actual function point productivity by completed timebox.

b. Ensure that any custom software development be accomplished in accordance with the policies in DoD Directive 3405.1, "Computer Programming Language Policy."

Finding B. Telecommunications Requirements and Funding

Specific telecommunications requirements for equipment and services for the RCAS program have not been established and total communications costs are unknown and undetermined. The RCAS Program Management Office (PMO) did not adequately determine, validate, or document telecommunications equipment and services requirements. Further, the RCAS PMO did not prepare site surveys in a manner to identify and validate the cost of preparing each site for the installation of telecommunications equipment and services. Telecommunications costs for RCAS are unknown because the RCAS PMO did not develop documented requirements to support the implementation of a telecommunications plan. As a result, the RCAS PMO is unable to prepare a telecommunications management plan to obtain the most cost-effective telecommunications circuit configuration and is unable to determine the total cost of the telecommunications portion of the RCAS program.

Background

The RCAS system was planned for deployment at 4,021 sites, to 10,540 units, and included the installation of 56,194 workstations. However, the program has funds available to purchase 46,194 workstations split between the components. Printer or personal computer requirements exceeding the total number provided by RCAS will be the responsibility of the components. Table 1 shows the Small Site (those with 16 or fewer workstations) and Large Site (those with 17 or more workstations) composition for sites, units, and workstations:

Table 1. RCAS Workstation Distribution

	Small Site	Site Percentage	Large Site	Site Percentage	Total
Sites	3,262	81.0	759	19.0	4,021
Units	5,223	49.5	5,317	50.5	10,540
Work-stations	17,936	32.0	38,258	68.0	56,194

RCAS Telecommunications Requirements. The baseline of existing telecommunications equipment and services for RCAS was not established and validated. Neither the RCAS PMO nor the vendor:

o identified the number of subscribers,

o determined proposed user requirements for future telecommunications equipment and services for each site, or

o assessed the validity of proposed user requirements to establish a telecommunications configuration management plan.

The RCAS PMO office rationale used to determine the quantity of telecommunications equipment and services resulted in an inadequate identification of requirements. Because of cost constraints, the requirements were established based on assumptions and on "recommended" minimum number of workstations for a type unit rather than mission requirements or priorities. Therefore, the RCAS PMO and the vendor were unable to prepare a documented and comprehensive telecommunications plan.

Vendor Approach

Design-To-Cost Strategy. The single overriding requirement for the RCAS was a design-to-cost constraint imposed on the functional design of the system. As a result, some detailed requirements are not met or are only partially met. For example, the requirement to allow 100 percent growth (quick expandability) in the quantity of users with no degradation of service will not be met.

Design-to-cost resulted in the shifting of responsibility for many technical support functions such as site preparation of telecommunications hubs, circuit ordering, and site local area network (LAN) wiring for small sites, from the vendor to the Army Reserve and National Guard Commands. However, those Commands may not have the expertise and resources necessary to perform those functions.

Further, because specific requirements for telecommunications equipment and services have not been established, the RCAS PMO has been unable to determine actual telecommunications costs. According to the RCAS PMO, new program costs, schedules, and technical baselines were to be established during third quarter FY 1996 through user test and pilot programs.

Site Surveys. Site surveys were not conducted at each location to obtain a valid estimate for the installation cost of telecommunications equipment and services for RCAS. Detailed site preparation cost data for each RCAS site were not obtained. The RCAS PMO and the vendor failed to require sites to provide cost data for needed improvements through the site survey process. A total of 2,400 National Guard and Army Reserve units have already been prepared and LANs installed under the old RCAS solution. The actual cost of LAN drops, electrical

power modifications, circuit scheduling, and physical plant improvements necessary to prepare the remaining 8,140 units (or 77 percent) for RCAS is unknown.

Proper site surveys are essential to identify requirements such as:

o electrical or LAN requirements;

o the need to install electrical and LAN wiring (to include ancillary equipment such as patch panels, racks, and cabinets);

o the need for upgrades within buildings and site main service distribution panelboards;

o the need for improvements in building and site power quality or reliability;

o the need to upgrade existing electrical utilities and grounding systems to meet National Electric Code requirements; and

o the need to furnish and install and upgrade existing heating, ventilation, and air conditioning as required.

Summary

As the result of the uncertainty of program requirements, the total cost for RCAS installation and telecommunications may be underfunded. The RCAS PMO and the vendor failed to:

o establish a baseline of existing telecommunications equipment and services;

o validate requirements for existing telecommunications equipment and services;

o obtain documented requirements for telecommunications services by identifying the number of subscribers, determining proposed user requirements for future telecommunications services, assessing the validity of such proposed requirements, and developing a telecommunications configuration management plan based on validated proposed user requirements; and

o conduct site surveys to determine the total cost of telecommunications equipment, services, and facilities necessary to install RCAS at the remaining sites.

Recommendations, Management Comments, and Evaluation Response

B. We recommend that the Reserve Component Automation System Program Manager cease further procurement of telecommunications services and equipment for the Reserve Component Automation System program until:

1. The Reserve Component Automation System Program Management Office establishes a baseline of existing telecommunications equipment and services and validates requirements for existing telecommunications equipment and services.

2. The Reserve Component Automation System Program Management Office identifies the number of subscribers, determines proposed user requirements for future telecommunications equipment and services for each site, assesses the validity of proposed user requirements, and establishes a telecommunications configuration management plan based on validated proposed user requirements.

3. The Reserve Component Automation System Program Management Office conducts site surveys to determine the total cost of the telecommunications equipment and services portion of the Reserve Component Automation System program.

4. The Reserve Component Automation System Program Management Office projects budgetary costs for the telecommunications equipment and services portion of the Reserve Component Automation System program and establishes a funding program for the Army Reserve Components.

Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) Comments. The Assistant Secretary partially concurred with Recommendations B.1., B.2., and B.4. but nonconcurred with Recommendation B.3. The Assistant Secretary stated that at the time of the evaluation, the draft telecommunications plan lacked some of the required substantive details. The Assistant Secretary stated that the Defense Information Systems Agency is responsible for validating the proposed telecommunications architecture and ensuring compliance with DoD telecommunications policies, including consistency and conformance with the Defense Information Systems Network, transition to the Defense Messaging System, and conformance with the DoD Technical Architecture for Information Management. The Assistant Secretary further stated that, to obtain approval from his office, the Telecommunications Plan must describe the functional telecommunications requirements, definition of responsibilities, detailed network description, all network interfaces, and traffic workload characteristics and that a RCAS Telecommunications Plan must be approved by his office before Major Automated Information System Review Council approval for deployment. Additionally, the Assistant Secretary stated that the Army National Guard and U.S. Army Reserves have agreed on the revised Telecommunications Plan and the prioritization of requirements and the

RCAS will use, with Defense Information Systems Agency approval, excess capacity on other networks provisioned by the Army National Guard and U.S. Army Reserves.

Evaluation Response. At the time of our evaluation, the RCAS PMO prepared only a draft Telecommunications Plan that was incomplete and missing substantive elements of operational requirements, baseline cost, and configuration management data. Therefore, we were unable to certify the viability of the new restructured RCAS. Also, at the time of our evaluation, the Reserve Component Automation System Program Management Office stated that new program costs, schedules, and technical baselines would be established during third quarter FY 1996 through user test pilots. However, because of time constraints to perform this evaluation, we did not assess the results of the pilot test to determine whether the deficiencies noted were corrected. Although the Assistant Secretary partially concurred with Recommendations B.1., B.2., and B.4., we consider the requirements the Assistant Secretary established for an approved Telecommunications Plan, Defense Information Systems Agency validation of the telecommunications architecture, and Major Automated Information System Review Council approval for deployment to meet the intent of our recommendations.

Although the Assistant Secretary did not concur with Recommendation B.3., concerning the need for the RCAS PMO to conduct site surveys, we consider that the actions taken subsequent to our evaluation meet the intent of the recommendation.

National Guard Bureau Comments. The Chief, National Guard Bureau, partially concurred with Finding B and nonconcurred with the recommendations. The Chief stated that the finding was partially accurate at the time that the evaluation was performed and that the Telecommunications Plan has been rewritten and submitted to the Defense Information Systems Agency, Army organizations, and the Office of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) for approval. The Chief stated that the fully completed and staffed plan would be presented at the Major Automated Information System Review Council Milestone III decision briefing during the fourth quarter FY 1996.

Concerning Recommendation B.1., the Chief stated that the baseline of RCAS telecommunications was documented in the Telecommunications Plan by the circuits installed during Phase II of the contract. Concerning Recommendation B.2., the Chief stated that telecommunication requirements were established by Customer Focus Team representatives to the Validation Assessment Team. Concerning Recommendation B.3., the Chief stated that the cost for telecommunications equipment is in the total hardware cost for the RCAS and that telecommunications services costs have been programmed over the life of the RCAS contract, using several fielding scenarios, which indicate a total cost estimate of $53 million. Concerning Recommendation B.4., the Chief stated that budgetary costs for telecommunications equipment and services are in the RCAS Program Operating Budget.

Evaluation Response. As stated in the response to the Assistant Secretary's comment, the RCAS Program Office prepared only a draft Telecommunications Plan that was incomplete and missing substantive elements of operational requirements, baseline cost, and configuration management at the time of our evaluation. Based on this missing information, we were unable to certify the viability of the new restructured RCAS. Also at the time of our evaluation, the RCAS PMO stated that new program costs, schedules, and technical baselines would be established during third quarter FY 1996 through user test pilots.

Although the Chief nonconcurred with our recommendations, the intent of our recommendations will be achieved by the actions taken and the actions proposed by the Assistant Secretary. The requirements established by the Assistant Secretary for an approved Telecommunications Plan, Defense Information Systems Agency validation of the telecommunications architecture, the Major Automated Information System Review Council review, and the other actions taken subsequent to our evaluation meet the intent of the recommendations.

Finding C. Commercial Off-the-Shelf Infrastructure Budget Risks

Budgeted funds to purchase the RCAS COTS infrastructure (personal computers, office automation software, and telecommunications) are at risk from other areas of the program that are underbudgeted. The RCAS program has year-to-year imbalances of Other Procurement-Army (OPA) funds needed to finance the Boeing contract. Additionally, as stated in Findings A and B, the RCAS PMO has underestimated software development and has not determined telecommunications costs. Insufficient infrastructure investment could force the Army National Guard and Army Reserve units to wait more than 6 years for the anticipated benefits from deploying the RCAS commercial off-the-shelf infrastructure.

Reserve Component Information Requirements

Reserve Component mobilization is the second highest priority among the Army's missions. All other missions must support contingency operations and mobilization. The purpose of mobilization is to provide mission-capable units to operational commanders. The Reserve Component manages the mobilization support information by gathering and maintaining unit administration data during peacetime and generating mobilization data during mobilization execution.

The Army and its Reserve Component decisionmakers must be able to effectively manage the resources supporting readiness and mobilization preparedness. The capability is directly related to the availability of information. The existing Army National Guard and Army Reserve information systems are unable to provide timely and accurate information to decision-makers to allow either mobilization planning or execution to be conducted as required to meet contingency plans.

Delays in the RCAS program caused the Army National Guard and Army Reserve unit deficiencies in needed computer resources. The controls imposed by the National Guard Bureau and U.S. Army Reserve Command regulated the procurement of computers for FYs 1988 through 1995. The controls implemented congressional restrictions that were stated in Defense Appropriations Acts and public law. The Army National Guard and Army Reserve units need the RCAS COTS infrastructure to perform their day-to-day administrative functions. The Army National Guard and Army Reserve units

must often manually compile information requested by commanders and higher headquarters. Additionally, updating information is time- and manpower-intensive and, therefore, is often not done as frequently as needed.

Due to the important need to provide timely and accurate information and to improve the accomplishment of administrative tasks, the Army National Guard and the Army Reserve requested that the PMO RCAS field the RCAS COTS infrastructure within 3 years. Additionally, the General Officer Steering Committee endorsed the Army National Guard and Army Reserve requests by recommending that the PMO RCAS pursue a high-level fielding strategy for FYs 1996 through 1998. However, the current program schedule still spreads the delivery of the RCAS COTS infrastructure to the Army National Guard and the Army Reserve over 7 years due to funding constraints.

RCAS COTS Infrastructure

The RCAS program restructure allowed change of the program direction to leverage new information management technology, improve user support, and meet users' requirements. The new design integrates COTS data processing capabilities for office automation and electronic mail. These COTS products form the infrastructure for the development of the RCAS functionality. The Data and Applications software development will provide the automation of the functional processes. The infrastructure design expands around personal computer-based workstations connected to servers via LAN communication. The LAN segments are connected to the higher command levels of the Reserve Component either by dedicated or dial-in communications. The site infrastructures are sized to meet the different units' requirements.

The RCAS COTS infrastructure alone, without the developed software, fully or partially meets 51 of the 71 user-defined operational and program requirements that remained after eliminating non-system requirements and requirements not met due to design-to-cost constraints. We did not identify the relative importance of each of the requirements.

The current requirements for COTS hardware, software, and telecommunications are budgeted for by the RCAS PMO and are the result of the program funding constraints. Although a faster RCAS COTS infrastructure deployment plan was desired, the Army National Guard and Army Reserve, through the General Officer Steering Committee, accepted the budgeted 7-year delivery schedule.

Budget Risks

To meet the COTS infrastructure delivery schedule, the RCAS PMO must manage the risk associated with the OPA budget imbalances and funding

shortfalls from previous findings. The RCAS PMO budget currently contains shortages between yearly OPA funds and yearly contract commitments. Also, the conditions discussed in Findings A and B may cause additional risk to funds designated for delivery of the COTS infrastructure.

The RCAS Program has $1.06 billion in its Program Objective Memorandum budget with which to provide the Army National Guard and Army Reserve the RCAS system. The funding profile includes both OPA and Operations and Maintenance (O&M) funds. Table 2 shows the RCAS Program Objective Memorandum funds for FYs 1996 through 2003; carryover funds from FY 1995 are also included.

Table 2. POM Funding Profile
(in millions of dollars)

	FY									
	95	96	97	98	99	00	01	02	03	Total
OPA	60.6	80.6	72.6	108.7	100.3	69.5	73.6	75.2	76.8	717.9
O&M	0.0	35.8	36.7	45.7	42.2	42.4	43.7	44.7	45.6	336.8

The RCAS PMO renegotiated the Boeing contract as part of the program restructure and implemented the modification February 1, 1996. The program restructure also changed the basic contract structure. Specifically, the contract moved from a hybrid cost-plus-award-fee and fixed-price with an award fee contract to a new structure that has three components. The core effort of the contract will be done on a cost-plus-award-fee basis; software development will be performed on a fixed rate, time and materials basis; and COTS hardware and COTS software will be purchased on an indefinite delivery/indefinite quantity basis.

OPA Budget Imbalances. The restructured Boeing OPA contract value is $716.7 million. The RCAS Program OPA funding for FYs 1996 through 2003 is $717.9 million.

Table 3. Current Yearly OPA Shortfalls
(in millions of dollars)

	FY									
	95	96	97	98	99	00	01	02	03	Total
OPA Funding	60.6	80.6	72.6	108.7	100.3	69.5	73.6	75.2	76.8	717.9
Boeing Contract	0.0	59.0	95.2	98.0	118.3	124.0	104.8	108.8	8.6	716.7
Difference	60.6	21.6	(22.6)	10.7	(18.0)	(54.5)	(31.2)	(33.6)	68.2	1.2

Currently, the program has a $1.2 million management reserve covering the life of the contract. However, year-to-year OPA imbalances exist between the OPA POM funds and the OPA contract commitments. To decrease the year-to-year shortage imbalances, the RCAS PMO has submitted a request to transfer $94.2 million from O&M to OPA. Table 4 shows the resultant OPA funding if the request is approved.

Table 4. Projected Yearly OPA Shortfalls
(in millions of dollars)

	FY									
	95	96	97	98	99	00	01	02	03	Total
OPA Contract-Difference	60.6	21.6	(22.6)	10.7	(18.0)	(54.5)	(31.2)	(33.6)	68.2	1.2
O&M	0.0	0.0	4.5	7.3	12.2	23.5	25.4	21.3	0.0	94.2
Difference	60.6	21.6	(18.1)	18.0	(5.8)	(31.0)	(5.8)	(12.3)	68.2	95.4

The RCAS PMO is aware that even if the O&M to OPA request is approved, imbalances still exist between yearly OPA funds and yearly contract commitments. To alleviate this problem, the PMO plans to reallocate RCAS COTS infrastructure funds and fielding funds between the program years to meet the OPA funding profile. The reallocation would result in the reduction of RCAS COTS infrastructure procurement to meet the yearly available funding profile.

Although FY 2003 has a $68.2 million management reserve, FYs 1999 to 2002 have funding imbalance shortfalls. Additionally, even though reallocation of funds is common practice, the reallocation jeopardizes the current fielding plan for the RCAS COTS infrastructure.

In addition to the $1.06 billion in RCAS Program funds, under the RCAS program restructure, the Army National Guard and Army Reserve have been asked to provide additional O&M funds to cover costs previously budgeted for RCAS PMO funds. Starting in FY 1998, the Army National Guard and the Army Reserve will pay for RCAS telecommunications, cable modernization, consumables, replacement training, COTS software maintenance, and additional COTS hardware maintenance. Therefore, the Army National Guard and the Army Reserve have requested $235.3 million in their Program Objective Memorandum for FYs 1998 through 2003 to cover RCAS O&M costs. Neither the Army National Guard nor the Army Reserve earmarked funds for RCAS O&M in FYs 1996 and 1997.

Funding Shortfalls Discussed in Findings A and B. The impact of the problems discussed under Findings A and B could negatively impact the OPA budget requirements. Often, contract requirements considered variable and acceptable for reallocation are later identified as areas that can be cut to meet actual funding amounts. Additionally, as stated in Finding A, software development productivity and cost are significantly underestimated. Further, as stated in Finding B, telecommunications costs are unknown and undetermined. Consequently, funds for the RCAS COTS infrastructure may be used to finance the core contract or software development.

Additional Computer Resources

Additional computer systems within the Reserve Component could be used to expand the RCAS infrastructure to other users. The RCAS PMO will upgrade about 10,000 of the existing computers to meet current delivery requirements within available funding. Also, other programs have provided automated data processing equipment to support specific functions. On May 16, 1996, the Inspector General, DoD, issued evaluation Report No. 96-121, "Army Reserve Component Procurement of Computers." The report identified an additional 16,000 computers that could meet the RCAS workstation requirements. Efforts should be made to ensure that multiple use of all existing systems is considered to further support the Reserve Component users. However, the 16,000 computers should not be construed as replacement systems for the computer systems planned for delivery under the RCAS program.

Summary

Budgeted funds designated to the delivery of the RCAS COTS infrastructure for the Reserve Component units are at risk. Year-to-year OPA funding imbalances produce funding risks to the RCAS COTS infrastructure. FYs 1999 to 2002 have funding imbalance shortfalls. Additionally, as discussed in Finding A, the RCAS PMO underestimated software development costs and did not fully determine telecommunications costs. Therefore, the risk to RCAS funding increases by $160 million for software development and is unknown for telecommunications. The Army and its Reserve Component decisionmakers must be able to effectively manage the resources supporting readiness and mobilization preparedness. This capability is directly related to the availability of information. To meet this need, the RCAS COTS infrastructure needs to be fielded. Transferring and using RCAS COTS infrastructure funds for other requirements is not an acceptable option.

Management Comments on the Finding and Evaluation Response

National Guard Bureau Comments. The National Guard Bureau nonconcurred with the finding, stating that the actions discussed in Findings A and B do not appear to be a cause of additional funding risks. The PMO has requested a funding realignment to correct the OPA funding imbalance and to meet the needs of the contract. The Bureau also reiterated that the funding profile dictated the fielding approach.

The PMO is attempting to modify the fielding strategy within the funding profile to reach as many Army Reserve National Guard and U.S. Army Reserve users as early as possible. The PMO actions to accomplish this early fielding include retrofitting the entire old RCAS equipment, modifying the Government-furnished personal computers, and installing communications hubs at all major commands.

Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) Comments. The ASD(C^3I) concurred with the finding, stating that the Army has adjusted the funding in the Program Objective Memorandum to align with current program requirements.

Evaluation Response. The National Guard Bureau comments are responsive to the finding. The cumulative effect of ASD(C^3I) approval of the language selection and the risk management programs satisfy the intent of Finding C with respect to program resources.

Recommendations, Management Comments, and Evaluation Response

C. We recommend that the Chief, National Guard Bureau:

1. Formally baseline the Reserve Component Automation System commercial off-the-shelf hardware and software infrastructure delivery schedule and quantities.

National Guard Bureau Comments. The Bureau concurred and continued to finalize the Acquisition Program Baseline for the DoD Major Automated Information System Review Council Milestone III decision briefing, which was scheduled for the fourth quarter of FY 1996.

Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) Comments. The ASD(C^3I) concurred and stated that the National Guard submitted the second draft of the Acquisition Program Baseline required by DoD 5000.2-R on June 28, 1996. Following the inclusion of final comments, the Acquisition Program Baseline will be staffed for the Milestone Decision Authority approval.

Evaluation Response. The actions are responsive to our recommendation.

2. Ensure that multiple use of existing computer systems is considered to further support the Reserve Component users.

National Guard Bureau Comments. The Bureau concurred and stated the RCAS solution will capitalize 10,000 existing computer resources from the Army Reserve National Guard and U.S. Army Reserve. Also, the RCAS PMO based the solution on an open architecture that allows each unit to connect other computer equipment to the RCAS system.

Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) Comments. The ASD(C^3I) concurred and stated the removal of restrictive congressional language allows the Bureau to use existing resources. The architecture chosen by RCAS also allows interconnection of additional resources acquired by RCAS users because of compliance with the Defense Information Infrastructure Common Operating Environment.

Evaluation Response. The actions are responsive to our recommendation.

Part II - Additional Information

Appendix A. Scope and Methodology

We performed our technical evaluation of the RCAS Program from October 1995 through April 1996. Our evaluation focused on the RCAS Program restructure. Reviewed documents were dated from February 1995 through April 1996. We gathered data through individual and group interviews and analyzed numerous documents, files, and records, including specifications, test and evaluation master plan for operational testing, Final RCAS Validation Assessment Team Report, final architecture specification, customer focus team report, proof of concept, software final report, final sustainment report, reengineering technical assessment, RCAS concept of operation, RCAS deployment risks and abatements, Operational Concept Description, software management plan, system specification, system architecture, system engineering management plan, program budget data, and program cost data.

We interviewed the Program Manager, management staff, contracting officer, prime contractor, and users from the Army National Guard and Army Reserve. We visited the Headquarters, National Guard Bureau; the Office of the Chief, Army Reserve; U.S. Army Reserve Command; and the Headquarters, U.S. Forces Command. Additionally, we visited Iowa Army National Guard Units and Army Reserve units in Pennsylvania and Georgia.

The evaluation team consisted of members of the Technical Assessment Division, Analysis, Planning, and Technical Support Directorate, Office of the Inspector General, DoD. The team members have expertise in computer science, hardware and software engineering, auditing, and acquisition management.

Appendix B. Prior Audits and Other Reviews

The Inspector General, DoD, published Report No. 96-121, "Army Reserve Component Procurement of Computers," dated May 16, 1996. The Army Reserve Component procured about 26,000 computers from FYs 1991 through 1995 outside the RCAS-funded program. The results of the review of procurement controls and practices provided reasonable assurances that during FYs 1991 through 1995, the Army National Guard and the Army Reserve managed the procurement of modern computers in consonance with congressional restrictions. The National Guard Bureau and the Office of the Chief of the Army Reserve provided guidance that accurately reflected language in the Defense Appropriations Acts to the purchasing authority levels within the Army Reserve Component structure. The evaluation found no evidence that acquisition actions by the Army Reserve Component violated laws, to include the Anti-Deficiency Act. The report did not contain recommendations.

The Inspector General, Department of the Army, published "Special Assessment of the Reserve Component Automation System," dated August 4, 1994. The report found general agreement among Active and Reserve forces that an automation system for the Reserve Components was needed. The report also found considerable risk involved in developing RCAS. The report stated that congressional oversight necessary to get the program started was too restrictive and precluded time and monetary benefits. The management functions were not optimized by the current structure, life-cycle costs for the RCAS were not kept current, RCAS electronic mail was slow and unreliable, and other office applications were not modern and were difficult to learn. The report also states that fielding of equipment was based on the number of full-time authorizations, rather than the actual number of personnel within units. The assessment made recommendations to correct the identified issues.

Appendix C. Other Matters of Interest

The RCAS PMO lacked personnel in key positions and lacked Government technical support for important management control functions. Eight technical leadership positions were vacant in the System Development Division. These position responsibilities include requirements, communications, data management, data standardization, automated data processing planning, and system development. Additionally, the RCAS PMO has no Central Design Activity, which could provide contractor-independent software technical advice. As a result, there could be an over-dependency on the contractor and the program may not be effectively and efficiently executed.

In addition, the contractor is dependent on Government-furnished information and on external interface agreements. This information includes documentation, data, software, and hardware for systems expected to become part of RCAS as GOTS or expected to be external interfaces to the RCAS. Each Government-furnished product or output must be provided by the Government one month before the beginning of the associated functional area planning activities. Technical management in the PMO is required for accurate and timely delivery of such technical information. A delay in Government-furnished information could negatively impact program cost and schedule.

The PMO is working closely with the Office of Personnel Management to fill the vacant technical positions. Some of the positions are military, and military personnel have been assigned to them. The PMO has acknowledged the need for long term support of RCAS and the value of a Central Design Activity.

Appendix D. Responses to Finding A Management Comments

The RCAS PMO provided detailed management comments on each section of Finding A of the draft Evaluation Report. The following provides a summary of the RCAS PMO comments and evaluation responses.

Software Development Approach

National Guard Bureau Comments. The RCAS PMO stated that it "applied a managed risk approach to software development," using "advanced 4GL tools in a prototyping environment with extensive user participation." The approach also exploits both Government and commercial off-the-shelf products. The PMO said that "[it] has established metrics and risk management programs to identify and address potential problems before they become critical program issues."

Evaluation Response. We stand by our original statement that the funding allocated was insufficient to support a system developed with Ada. We based our position on an internal assessment of the program funding and schedule, the COTS Integration Approach Business Case portion of the RCAS Validation Assessment Team (VAT) Software Report, July 1995.

Development Language Issues

National Guard Bureau Comments. The Evaluation Report states that coding will be required in the generated language. The RCAS PMO responses clearly disagreed. They state that "the selected 4GL is predicated on the idea that the developer will employ the tool alone to customize the user interface, processing and application interfaces. Code level modifications are not involved. Cases that might require code level changes are facilitated by tools included in the 4GL package. These artifacts are simply 'scripts' comparable to Microsoft Exec macros that define formulas, labels or constants within the spreadsheet." The PMO has set aside $10 million to support functionality that would require procedural language coding in Ada.

Evaluation Response. The finding was based on strong evidence that custom application development using the selected 4GL requires hands-on programming in the embedded third-generation language. That embedded third-generation language, PowerScript, is a proprietary, general purpose programming language, not just a macro language. PowerBuilder provides the capability to edit PowerScript code for purposes of customizing applications. The ability to

modify the code generated is inherent in the product. The basis for our contention is the descriptive material provided by PowerBuilder technical assistance. This material contains instructions and PowerScript code segments to help develop custom functions.

We accept the PMO statements that the contractor will use the selected 4GL for most of the application development and Ada, not PowerScript, for custom coded functionality. The computer programming language generated by an Advanced Software Technology tool and even edit access to this generated language is not a violation of policy if it is unused for general purpose programming. However, it will be difficult to enforce the PMO rules on the contractor regarding the use of Ada, not PowerScript, for writing development code.

The PMO establishment of metrics and risk management programs is an appropriate response to the risks of a 4GL development approach elaborated in the Evaluation Report. We are still concerned with the up front expenditure of $2.2 million for Sybase and PowerSoft software. Its acquisition was not spread over the contract period like the other COTS software (See Contract Number DAHC94-91-C-0002/P00296 Section B, Annex A SubCLINs xx08AA through xx08AK). We have seen other projects where up-front, volume discounts resulted in illusory benefits because the actual usage was far less than planned.

Development Language Cost Impact

National Guard Bureau Comments. The RCAS PMO provided further independent productivity information for PowerBuilder to substantiate its planning factors of 14 to 20 FP/MM. It concludes that the proposed 4GL development environment is in compliance with existing policy, no Ada waiver is required, the forecasted development productivity is realistic, and the funding is adequate. Therefore, an additional $150 million is not required.

Evaluation Response. The additional $150 million to develop the system using Ada will not be needed because the use of the 4GL language has been approved by the ASD(C^3I). However, selection and approval of the 4GL created additional program risk in such areas as maintainability, portability, reliability, reusability, and clarity of source code. Therefore, we directed recommendations to the ASD(C^3I) to monitor and periodically assess the RCAS software development risk management with a view to identifying and correcting variances in a timely manner.

Other Productivity Risks

National Guard Bureau Comments. The RCAS PMO has analyzed the Evaluation Report risks and has adopted a risk management plan.

Evaluation Response. The risk management approach adopted by RCAS is expected to provided appropriate oversight of the development risks.

Underestimated Software Maintenance

National Guard Bureau Comments. The RCAS PMO summarized its software maintenance planning. It did not recalculate maintenance costs based on the reported underestimate of $12.1 million.

Evaluation Response. Based upon the RCAS planning figures and the fielding plan in the Reserve Component Automation System Contract Change Proposal, Revision B17, January 1996, the software maintenance size and costs were underestimated by $12.1 million. If GOTS maintenance is excluded, the underestimate would be somewhat less. This issue is not a language issue. We are indicating a planning calculation error, not a methodology difference.

Appendix E. Organizations Visited or Contacted

Office of the Secretary of Defense

Under Secretary of Defense (Comptroller), Washington, DC
Assistant Secretary of Defense (Command, Control, Communications, and Intelligence), Washington, DC
Assistant Secretary of Defense (Reserve Affairs), Washington, DC

Department of the Army

Headquarters, U.S. Army Forces Command, Fort McPherson, GA
Chief, National Guard Bureau, Washington, DC
Headquarters, National Guard Bureau, Arlington, VA
Iowa National Guard Headquarters, Des Moines, IA
Office of the Chief, Army Reserve, Rosslyn, VA
Headquarters, U.S. Army Reserve Command, Atlanta, GA
99th Regional Support Command, Oakdale, PA
24th Infantry Division, Savannah, GA
Reserve Component Automation System, Program Executive Office, Newington, VA
Reserve Component Automation System, Program Management Office, Newington, VA

Other Defense Organization

Defense Contract Audit Agency, Alexandria, VA

Non-Government Organization

The Boeing Company, Vienna, VA

Appendix F. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense (Comptroller)
  Deputy Chief Financial Officer
  Deputy Comptroller (Program/Budget)
Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)
Assistant Secretary of Defense (Reserve Affairs)
Assistant to the Secretary of Defense (Public Affairs)
Director, Defense Logistics Studies Information Exchange

Department of the Army

Auditor General, Department of the Army
Chief, National Guard Bureau
Office of the Chief, Army Reserve
Reserve Component Automation System, Program Executive Office
Reserve Component Automation System, Program Management Office

Department of the Navy

Assistant Secretary of the Navy (Financial Management and Comptroller)
Auditor General, Department of the Navy

Department of the Air Force

Assistant Secretary of the Air Force (Financial Management and Comptroller)
Auditor General, Department of the Air Force

Defense Organizations

Director, Defense Contract Audit Agency
Director, Defense Information Systems Agency
Director, Defense Logistics Agency
Director, National Security Agency
  Inspector General, National Security Agency
Inspector General, Defense Intelligence Agency

Non-Defense Federal Organizations and Individuals

Office of Management and Budget
Technical Information Center, National Security and International Affairs Division, General Accounting Office

Chairman and ranking minority member of each of the following congressional committees and subcommittees

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on National Security, Committee on Appropriations
House Committee on Government Reform and Oversight
House Subcommittee on National Security, International Affairs, and Criminal Justice, Committee on Government Reform and Oversight
House Committee on National Security

Part III - Management Comments

Assistant Secretary of Defense, Command, Control, Communications, and Intelligence Comments

Final Report Reference

DR Myers
m 18 Jun
Cindy

ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

June 14, 1996

MEMORANDUM FOR DIRECTOR, ANALYSIS, PLANNING AND TECHNICAL SUPPORT, OFFICE OF THE INSPECTOR GENERAL

SUBJECT: Draft DoDIG Report - Project No. 6PT-5013, Evaluation of the Reserve Component Automation System (RCAS), dated May 2, 1996

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ndation
2. added.

This is a response to Finding A of subject report which states the RCAS Program Management Office (PMO) did not obtain a waiver to the Ada requirement. We disagree with the DoDIG finding. In our opinion, RCAS is in compliance with existing policy and does not require an Ada waiver.

DoD Directive 3405.1, dated April 2, 1987, makes provisions for the use of advanced software technologies. Section F.2 states that a waiver is not needed "for use of commercially available off-the-shelf advanced software technology that is not modified or maintained by the Department of Defense."

The RCAS PMO has done an acceptable assessment of productivity gains, cost avoidance, and risk, and has selected a development strategy that is well in line with commercial best practices and DoD acquisition reform.

My response to the remaining findings in the subject report is being developed and will be provided in a separate memorandum.

My point-of-contact for this action is Ms. Connie Leonard, who is assigned to the office of my Deputy Assistant Secretary of Defense for Command, Control and Communications, telephone number (703) 604-1489, or Mr. Thomas Bozek, (703) 604-1592.

Emmett Paige, Jr.

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

12 JUL 1996

MEMORANDUM FOR DIRECTOR, ANALYSIS, PLANNING, AND TECHNICAL SUPPORT, OFFICE OF THE INSPECTOR GENERAL

Subject: Draft DoDIG Report - Project No. 6PT-5013, Evaluation of the Reserve Component Automation System (RCAS), dated May 2, 1996

The subject evaluation report has been carefully reviewed. A response to Finding A, dealing with software acquisition policy and the use of Ada, was provided in my memorandum of June 16, 1996. The detailed response to the remainder of the report is attached.

Recent developments in acquisition policy described in DoDD 5000.1, such cost as an independent variable and integrated product teams, are addressed in my responses. These concepts recognize that requirements must be prioritized and constrained by available resources and that program managers together with users and acquisition officials must enter into an agreement through the Acquisition Program Baseline to definitize the performance, cost, and schedule requirements.

The RCAS program is following the direction desired by the functional users in the Army National Guard and the U.S. Army Reserves with the unqualified support of the Army through the Fiscal Year 98-03 POM. In addition, the program restructure approved by the RCAS General Officer's Steering Committee and the Major Automated Information System Review Council in August, 1995, is on track, largely based on improved program management and assistance from OSD/Army Integrated Process Teams. I strongly recommend that the Assistant Secretary of Defense (Reserve Affairs) certify the restructured RCAS program to Congress.

Anthony M. Valletta
Deputy Assistant Secretary of Defense
(C3I Acquisition)

cc:
USD(C)
ASD(RA)
C,NGB
OCAR

OSD(C3I) RESPONSE TO
DRAFT PROPOSED EVALUATION REPORT
"EVALUATION OF THE RESERVE COMPONENT AUTOMATION SYSTEM"
(PROJECT NO. 6PT-5013, May 2, 1996)

RESPONSE TO FINDINGS:

FINDING A: Data and Application Software Development
The RCAS Program Management Office underestimated costs and planned insufficient funding for the data and applications software development by about $160 million. The PMO did not obtain a waiver to the Ada requirement, significantly overestimated the software development productivity, and underestimated the maintenance portion. As a result of the insufficient funding, the software development in the required language will cause schedule slips and the Army National Guard and the Army Reserve requirements not being fully met.

IG Recommendations for Corrective Action for Finding A:
Chief, National Guard Bureau should: (1) Cease further data and applications development until Ada is selected as required by DoDD 3405.1 before the project is overcommitted to a fourth-generation language. (2) Reestimate the cost and schedule of the project based on realistic development productivity and maintenance sizing, or rescope the Data and Applications functions to fit the available cost and schedule. (3) Require full justification, including a life-cycle cost analysis and a risk analysis that addresses technical performance and schedule impact, if an Ada waiver is proposed. (4) Cease the more than $2 million procurement of Structured Query Language server and fourth-generation language products planned for FY 1996, unless an Ada waiver is granted and pilot applications are successfully completed.

OSD(C3I) Response: Non-concur. ASD(C3I) memorandum of June 14, 1996, provided the response to this finding. A copy of the memorandum is attached. Additionally, through the Major Automated Information System Review Council (MAISRC) oversight process prescribed by DoD Directive (DoDD) 5000.1 of March 15, 1996, the RCAS program is closely monitored. As the MAISRC Chairman, ASD(C3I) will ensure that any custom software development required is accomplished in accordance with policy prescribed by DoDD 3405.1.

FINDING B: Telecommunications Requirements and Funding
The Chief, National Guard Bureau, neither identified specific telecommunications requirements for equipment and services nor determined total telecommunications cost for the RCAS Program. The RCAS PMO did not complete and validate requirements for telecommunications equipment and services. Further, the RCAS PMO did not prepare site surveys to identify and validate the cost of preparing each site for the installation of telecommunications equipment and services. As a result, the RCAS PMO has not completed a documented, validated, and comprehensive telecommunications

management plan to obtain the most cost-effective telecommunications circuit configuration and is unable to determine the total cost of the telecommunications portion of the RCAS Program. Therefore, the total cost of RCAS communications is probably underestimated and the program is probably underfunded.

IG Recommendations for Corrective Action for Finding B:
Chief, National Guard Bureau ensure that prior to any further procurement of telecommunications equipment and services for RCAS, the following actions are completed: (a) Determine baseline of existing telecommunications equipment and services, and validate requirements for the baseline of existing telecommunications equipment and services. (b) Identify the number of subscribers; determine proposed user requirements for future telecommunications equipment and services for each site; assess the validity of proposed user requirements; and complete a documented, validated, and comprehensive telecommunications configuration management plan based on validated proposed user requirements. (c) Determine the total cost of the telecommunications equipment and services portion of the RCAS program; (d) Project budgetary costs for the telecommunications equipment and services portion of the RCAS program and establish a funding program for the Army Reserve and National Guard.

OSD(C3I) Response: Partially concur. Prior to MAISRC approval for deployment, an RCAS Telecommunications Plan must be approved by this office. Defense Information Systems Agency (DISA) is responsible for validating the proposed telecommunications architecture and ensuring compliance with DoD telecommunications policies, including consistency and conformance with the Defense Information Systems Network, transition to the Defense Messaging System, and conformance with the DoD Technical Architecture for Information Management. To obtain approval by this office, the Telecommunications Plan must include a description of the functional telecommunications requirements, definition of responsibilities for all parties involved in managing and operating the network, detailed network description and all interfaces, and traffic workload characteristics. It is recognized that at the time of your audit, the draft telecommunications plan lacked some of the substantive details required in these areas. An updated Telecommunications Plan has been drafted, with guidance and assistance from DISA and was provided to all Working-Level Integrated Product Team (WIPT) members for review on July 3, 1996. In addition, MG Kelley, Vice Director DISA was briefed on the RCAS telecommunications plan on June 21, 1996, and concurs that RCAS is moving in the proper direction for compliance with DISA plans and architecture. The Telecommunications Plan will be reviewed and approved prior to MAISRC approval for deployment.

Nonconcur with recommendations requiring total site surveys in advance of program initiation and establishment of a full funding program prior to commencement of the program. Total site surveys are cost prohibitive and often become outdated quickly. Moreover, the RCAS PMO has more definitive information on its sites than most programs because of the old installed base in existence at approximately 821 sites out of a total universe of approximately 4,000 sites. With regard to the cost of the

telecommunications for RCAS, the program is following guidance contained in DoDD 5000.1 for Cost as an Independent Variable (CAIV). Under this concept, acquisition managers establish realistic objectives for programs and follow through by trading off performance and schedule to achieve a balanced set of goals. The MAISRC Cost WIPT will evaluate costs and planned actions to validate that baselined requirements can be met prior to approval for deployment. Additionally, the Army National Guard (ARNG) and the U.S. Army Reserves (USAR) have agreed on the revised Telecommunications Plan and the prioritization of requirements. Further, RCAS will use, with DISA approval, excess capacity on other networks provisioned by the ARNG and the USAR.

FINDING C: Commercial Off-the Shelf Infrastructure Budget Risks
Budgeted funds to purchase the RCAS COTS infrastructure (personal computers, office automation software, and telecommunications) are at risk from other areas of the program that are underbudgeted. The RCAS program has year to year imbalances of Other Procurement Army funds needed to finance the Boeing contract. Additionally, as stated in Findings A and B, the RCAS PMO has underestimated software development and has not determined telecommunications costs. Insufficient infrastructure investment could result in the Army National Guard and Army Reserve units being forced to wait more than six years for the anticipated benefits from deploying the RCAS commercial off-the-shelf infrastructure.

IG Recommendations for Corrective Action for Finding C:
Chief, National Guard Bureau should: (1) Formally baseline the RCAS commercial off-the-shelf hardware and software infrastructure delivery schedule and quantities.
(2) Ensure that multiple use of existing computer systems is considered to further support the Reserve Component users.

OSD(C3I) Response: Concur. The Army POM submitted to OSD has adjusted the funding to align with the current program requirements. DoD 5000.2-R requires approval of the APB for each major AIS by the Milestone Decision Authority, ASD(C3I). On June 28, 1996, a second draft of the APB incorporating all comments of the members of the RCAS Programmatic WIPT was circulated to the WIPT members. Following inclusion of final comments, the APB will be staffed for MDA approval. In addition, the removal of restrictive Congressional language has provided a capability for use of existing computer resources in RCAS. The new RCAS architecture is compliant with the Defense Information Infrastructure Common Operating Environment. This will allow additional resources to be interconnected with equipment currently owned or acquired in the future by RCAS users.

Conclusion: OSD(C3I) supports the RCAS restructure decision presented to the MAISRC, initially in August 1995, and at the status briefing on April 15, 1996. The MAISRC staff is co-chairing, with the RCAS Program Manager, activities associated with preparing for the deployment of the RCAS infrastructure. All Army and OSD functional and technical principals, including the Office of the Assistant Secretary of Defense (Reserve Affairs) are involved in the efforts necessary to plan for the program

proposed by the Chief, National Guard Bureau. Upon completion of the proposed program plans, including the APB, and successful operational testing of the proposed system, ASD(C3I) will support the infrastructure fielding decision proposed by the Chief, National Guard Bureau and the RCAS General Officer's Steering Committee.

Recommendation: That the Assistant Secretary of Defense (Reserve Affairs) certify to Congress that RCAS is technically feasible, adequately funded, executable, and will meet the Army's National Guard and Reserve requirements. With the re-establishment of the RCAS General Officer's Steering Committee by the Chief, National Guard Bureau, the commitment of the Army to the RCAS program through its funding of the restructured RCAS program and the cooperation between the ARNG and the USAR user communities, make the RCAS program more viable than ever before.

National Guard Bureau Comments

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
NATIONAL GUARD BUREAU
2500 ARMY PENTAGON
WASHINGTON, D.C. 20310-2500

NGB-IR-C (36-2b) 27 June 1996

MEMORANDA THRU

~~Director of the Army Staff~~ DIRECTOR OF THE ARMY STAFF JUL 0 2 1996 7/7/96

Director, Information Systems for Command and Control Computer and Communication

Program Director, Policy, Followup and Training (SAAG-PMF-E)

FOR The Inspector General, Department of Defense (Auditing)

SUBJECT: Evaluation of the Reserve Component Automation System, (Project No. 6PT-5013)

1., Reference SAAG-PRF-E Memorandum, dated 15 May 1996, SAB

2. Per your request, the Audit Report has been reviewed and the response is enclosed.

The National Guard Bureau points of contact are Mr. Lane G. Haskew, 703-681-5989 or Mrs. Patricia A. Gallop, 703-681-4604, NGB-IR-C.

FOR THE CHIEF, NATIONAL GUARD BUREAU:

Encl
as

for JOHN H. TATE
Acting Director, Internal Review and Audit Compliance

Printed on Recycled Paper

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
NATIONAL GUARD BUREAU
WASHINGTON, D. C. 20310-2500

NGB-RCS-RA

25 JUN 1996

MEMORANDUM FOR DEPARTMENT OF DEFENSE INSPECTOR GENERAL,
400 ARMY NAVY DRIVE (ROOM 801),
ARLINGTON, VA 22202-2884

SUBJECT: Evaluation of Reserve Component Automation System (RCAS) Report -- Project No. 6PT-5013, Prepared by the Department of Defense Inspector General (DOD IG), May 2, 1996

1. I have reviewed the DOD IG evaluation of the RCAS and concur with the actions taken by the Program Management Office (PMO). Based on this review, I find that RCAS is technically feasible, adequately funded, executable, and will meet the Army's National Guard and Reserve requirements for an Automated Information System (AIS) to support unit administration and mobilization needs at all echelons of command well into the 21st century. Therefore, I see no justification to cease data and applications development or the procurement of telecommunications equipment and services.

2. An Executive Summary highlighting the actions taken by the RCAS PMO and a detailed response to the DOD IG findings is attached. The DOD IG findings were appropriately addressed. I know of no significant findings that should preclude this program from being certified to Congress.

3. The Acquisition Program Baseline will be presented for approval at the Major Automated Information System (MAISRC) Milestone III decision briefing (subject: Permission to field the RCAS infrastructure) scheduled for late in the fourth quarter of FY96. The PMO is utilizing the DODD 5000.1/DODR 5000.2-R Integrated Process Team (IPT) approach to obtain approval and buy-in from the appropriate DOD and U.S. Army approving agencies. To date, this process is on track to be successfully concluded at the MAISRC Milestone III decision. The IPTs, coupled with the RCAS General Officer Steering Committee's direct oversight of the program, will enable me to ensure that the program remains within budget and schedule baselines, and will provide the Guard and Reserve users with an operationally effective, suitable and affordable AIS.

Atch

EDWARD D. BACA
LTG, USA
Chief, National Guard Bureau

NGB-RCS-RA
SUBJECT: Evaluation of Reserve Component Automation System (RCAS) Report -- Project No. 6PT-5013, Prepared by the Department of Defense Inspector General (DOD IG), May 2, 1996

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Response to the
Evaluation of the Reserve Component Automation System
Prepared by the Office of the Inspector General
Department of Defense

Project No. 6PT-5013
May 2, 1996

EXECUTIVE SUMMARY

OVERVIEW. The Assistant Secretary of Defense for Reserve Affairs, (ASD(RA)) acting upon congressional direction, requested the Office of the Inspector General, Department of Defense (DOD IG), conduct a technical evaluation of the RCAS Program to determine if it was adequately funded, executable, and would meet the Army's National Guard and Reserve requirements. The evaluation report identified three major findings in software, telecommunications, and budgeting, each of which pose potentially significant risk to the Program. This paper is a response to those findings.

DISCUSSION.
Finding A.
Summary of Finding -- The IG stated that the costs of Data and Application Software Development were underestimated by $160M since the Program Management Office (PMO) based productivity assumptions on using a commercial off-the-shelf (COTS) product (PowerBuilder) rather than Ada. The IG's assertion was that the PMO needed to obtain a program-wide waiver for not using Ada.
Response -- RCAS is in full compliance with the DOD Ada policy which treats advanced software technologies (ASTs) as COTS with preference over Ada. Mr. Paige, Assistant Secretary of Defense for Command, Control, Communications and Intelligence (C3I), reviewed DOD IG Finding A and has concurred in writing with the program's approach. Additionally, based on the IG report, the PMO has earmarked $10 million to be used for Ada development when required.

Finding B.
Summary of Finding -- The IG could not verify the total telecommunications costs for RCAS because specific telecommunications requirements were not identified, site surveys had not been conducted, and the telecommunications management plan had not been completed.
Response -- While these findings were partially accurate at the time, the Telecommunications plan has been rewritten with the participation of Information Systems Engineering Command (ISEC), Army National Guard (ARNG) and the U. S. Army Reserve (USAR), and is being staffed to gain the concurrence of the Defense Information Systems Agency (DISA), ISEC, Office of the Secretary of Defense (OSD) C3I, and the Office of the Director of Information Systems for Command, Control, Communications and Computers (DISC4). The fully staffed plan will be completed and presented at the Major Automated Information System Review Council (MAISRC) Milestone III decision briefing in 4th Quarter FY96. Specific telecommunications requirements are defined in this plan. They were determined using an accepted business practice of modeling

the telecommunications requirements based on empirical and actual data collected from RCAS customers. The ARNG and USAR, who are responsible for all circuit provisioning, will capitalize on existing circuits and incorporate RCAS requirements into their future telecommunications plans. The RCAS technical architecture solution is robust and flexible enough to evolve with the changing telecommunications topology without causing added risk to the system operation.

Finding C.
Summary of Finding -- The IG Report suggested that funds to purchase COTS infrastructure were at risk due to possible funding shortfalls from Findings A and B, as well as from year-to-year imbalances in OPA funds.
Response -- The issues addressed in Finding A and B do not present a current budget shortfall to the program. The recently completed FY98-03 Army Program Objective Memorandum (POM) corrected the funding profile to align with the current contract requirements. The ARNG and USAR have both POMed for the appropriate Operations and Maintenance (O&M) funds in the out years to cover operating costs not previously addressed. The fielding approach requires seven years because of the funding profile. The PMO has been working with the ARNG and USAR to modify the fielding strategy within the seven years to touch as many users as possible as early as possible.

CONCLUSION. The DOD IG recommended that LTG Baca, Chief, National Guard Bureau, (CNGB) cease software development efforts and telecommunications procurement until their findings are resolved. In light of the above response to the DOD IG findings, that action is not necessary. The RCAS PMO continues to refine the Acquisition Program Baseline in preparation for an OSD MAISRC Milestone III decision to field the infrastructure. Additionally, the PMO continuously addresses and resolves any issues raised as a matter of normal practice through the Integrated Product and Process Development (IPPD) concept of using Integrated Process Teams (IPT) throughout the acquisition. The use of IPTs, as well as oversight by the Program Executive Office (PEO), CNGB, and the RCAS General Officer Steering Committee (GOSC) will continue after the MAISRC. To date, all required program plans are on schedule and the program is executable. The DOD IG findings were appropriately addressed; consequently, there are no significant technical or funding issues that should preclude this program from being certified to Congress.

RECOMMENDATION. Ms. Lee certify to Congress that RCAS is technically feasible, adequately funded, executable, and will meet the Army's National Guard and Reserve requirements well into the future.

DETAILED RESPONSE

Introduction
The Assistant Secretary of Defense for Reserve Affairs, acting upon congressional direction, requested the Office of the Department of Defense Inspector General (DOD IG), conduct a technical evaluation of the RCAS Program to determine if it was adequately funded, executable, and would meet the Army's National Guard and Reserve requirements for an Automated Infomation System to support unit administration and mobilization needs at all echelons of command. The DOD IG, from October 1995 through April 1996, conducted their technical evaluation of the RCAS Program. The DOD IG Evaluation Report, with enclosures, summarized the results of the technical assessment and identified three potentially significant risks to successful RCAS Program execution. These risks concern data and application software development, telecommunication requirements and funding, and commercial off-the-shelf (COTS) infrastructure budget risks. In light of these risks, the DOD IG recommends the Program cease further data and applications development efforts, cease procurement of RCAS telecommunication equipment and services, and establish a formal baseline for the delivery schedule and quantities of commercial off-the-shelf infrastructure.

In the remainder of this report, excerpts of the DOD IG Evaluation Report are provided in italics along with a response which addresses the concerns of the DOD IG.

Response to Findings
Finding A. Data and Application Software Development
The RCAS Program Management Office underestimated costs and planned insufficient funding for the data and applications software development by about $160 million. The PMO did not obtain a waiver to the Ada requirement, significantly overestimated the software development productivity, and underestimated the maintenance portion. As a result of the insufficient funding, the software development in the required language will cause schedule slips and the Army National Guard and the Army Reserve requirements not being fully met.

Non-Concur. The basis for Finding A rests solely on the premise that PMO RCAS did not obtain an Ada waiver, and therefore significantly overestimated software development productivity. This finding is moot in light of the following excerpts from the OSD/C3I Memorandum (attached TAB 1).

> "In our opinion, RCAS does not require an Ada waiver because it is in compliance with existing policy."
> "The RCAS PMO has done an acceptable assessment of productivity gains, cost avoidance, and risk, and has selected a development strategy that is well in line with commercial best practices and DOD acquisition reform."

Software Development Approach
... The funding allocated to the Data and Applications software development time and materials portion of the contract was not sufficient for an Ada development approach. Therefore, the Validation Assessment Team selected a fourth-generation language approach based on its efficiency.

PMO RCAS has applied a managed risk approach to software development. This approach exploits both Government and commercial off-the-shelf products, applying advanced 4GL tools in a rapid prototyping environment with extensive user participation in small timebox increments to maintain control over software development. In addition, the PMO has established metrics and risk management programs to identify and address potential problems before they become critical Program issues.

Development Language Issues
... the RCAS use of a COTS code generator will require coding and maintenance at the generated code level. Because the PMO will develop and maintain software at the generated code level, DOD policy requires an Ada waiver...

DOD Directive 3405.1, "Computer Programming Language Policy," 2 APR 87 prefers, based on an analysis of the life-cycle costs and impact, the use of off-the-shelf application packages and advance software technology. Further, a waiver need not be obtained for the use of commercially available off-the-shelf applications software or advanced software technology that is not modified or maintained by DOD. "Code" generated by these instances will be maintained by the tool only. RCAS software development strategy does not include modification of the tool set or its output by anything other than the tool set. Therefore these technologies are maintained by the vendor and not subject to the waiver consideration. Mr. Paige, ASD (C3I) has reviewed the program strategy and agrees.

The selected 4GL is predicated on the idea that the developer would modify the generated code to customize the user interface, processing, and application interfaces. The selected 4GL includes tools to facilitate such code level changes... Even if Ada was used whenever changes were needed to the selected 4GL applications, generated or C code changes would be necessary to transfer control and data between the languages. Therefore, without a waiver the regulations require RCAS to use Ada.

The selected 4GL is predicated on the idea that the developer will employ the tool alone to customize the user interface, processing, and application interfaces. Code level modifications are not involved. Cases that might require code level changes are facilitated by tools included in the 4GL package. These artifacts are simply "scripts" comparable to Microsoft Excel macros that define formulas, labels or constants within the spreadsheet.

PowerBuilder 5.0 from PowerSoft is a central component of the RCAS software engineering environment. PowerBuilder 5.0 differs from classic code generators in that

it does not generate code which is then modified by the developer to make the generated code functional. Rather, it produces executable code (components) for generic windows services, etc. that may be used in conjunction with Powerscript (a scripting language internal to the PowerBuilder 5.0 development environment). PowerBuilder generates object code for execution of the designed windows, and provides the developer with 'events' and user functions which can be scripted by the programmer.

C code changes are NOT necessary to transfer control and data between languages. PowerBuilder 5.0 can directly access Ada components without a C language interface.

None of the examples cited in the Evaluation Report require coding external to the PowerBuilder 5.0 development environment. The following bullets identify specifically how the examples listed could be implemented using the PowerBuilder 5.0 development environment.

- *Disabling a keystroke in a data window* -- can be implemented in an event script using key down function; can be set up when establishing a data window by setting the tab order; the mouse can be deactivated; the data window can be set read only.

- *Implementing cut, copy, and paste in the "Edit" menu* -- can be implemented on the menu, using common window functions.

- *Scrolling row by row instead of scrolling by page or by group* -- can be implemented with a single line of script; scroll by row is default scrolling.

- *Using shift-F1 for help.* -- Shift-F1 is context sensitive help - topic is passed to help application; can be accomplished in a script with standard PowerBuilder functions: get focus; get object at pointer (in a data window).

- *Determining the last item clicked on a multi-select listbox* -- can be implemented using standard PowerBuilder functions which perform normal search until find last; search at current item for lists; search at next item for data window.

- *Passing Windows messages into an application* -- can pass windows messages using Windows Software Development Kit for NT or Resource Kit for NT.

- *Providing text search in a drop down data window* -- can be implemented using standard PowerBuilder functions which perform text search returning the row; use data window with child window as the drop down list box, then perform find.

- *Conditionally preventing user input into columns* -- can be implemented using standard PowerBuilder functions which use Item Changed event, check values, or make some data windows read-only on certain conditions.

- *Updating multiple database tables from the same data window* -- can use shared data windows to accomplish this update.

- *Reading a file larger than 32,766 bytes.* Current limit is 64K bytes. If larger size is needed, a database blob type can be used. The real limit is the memory on the PC.

- *Sending data from an application via e-mail.* There are MAPI functions available to pass data via mail.

- *Determining if a windows application is running in Windows NT.* Windows NT functions can be called directly to determine whether an application is running.

The RCAS Validation Assessment Team (VAT) estimated that approximately 5% of RCAS functionality may be developed using Ada. The PMO has set aside $10 million to support this functionality development. To support the PMO in identifying the approximate cost of this development Boeing utilized the same model used to build the estimate in support of the restructure. This will allow the PMO to plan for and monitor the cost of any Ada development.

If the PMO pursues an Ada waiver, the justification should include how the PMO will abate the additional risks of 4GL development. These 4GL development risks include the following:

- *The RCAS applications may be too large for the code generator. Fourth-generation languages have been used extensively for prototyping and ad hoc application development. There is a risk that the large RCAS applications will cause overflows of internal tables and memory exceptions in the code generator.*

RCAS is not being developed as one single executable icon but rather as a series of integrated applications. The applications design accounts for performance and capacity issues to specifically preclude table overflows and memory exceptions. PowerBuilder 5.0 has removed or greatly reduced the dependency on internal tables. Furthermore, we have constructed sample PowerBuilder 4.0 and 5.0 applications which are similar in size and complexity to a typical RCAS timebox and experienced no such problems to date.

The strategy employs an "N-Tiered" application architecture. The Graphical User Interface is not directly tied to the database. This layered structure involves the use of brokered services that provide flexibility in locating the business logic layer at the server or client. This aspect increases reuse and decreases maintenance due to modularized, object-oriented components. Fielded applications will have a layer of abstraction that will isolate change traffic over time.

- *The applications will run too slowly and take too much memory. Fourth-generation languages automatically include application domain services that may or may not be used by the application. The RCAS contract specifies an interpretive 4GL. There is considerable risk that RCAS users will not accept the application start-up delays and response times. There is some risk that the applications will use too much disk space and that useful sets of applications cannot be loaded at the same time.*

PowerSoft has implemented native code generation built on compiler technology. This enhancement improves application performance in key areas such as script execution, mathematical expressions, function calls and array processing.

- *Windows NT and code generator changes may cause additional application changes. Frequent changes in Windows NT and the code generator can be expected until the market place matures. There is a risk that these changes will cause additional application updates, testing, and redelivering. Application changes would cause support cost increases, delivery and reinstallation costs, and possible configuration variety in the field.*

Historically COTS upgrades of Windows-based products have provided compatibility with previous versions. We see no reason for this to change. In fact, products such as PowerBuilder 5.0, that are compliant with Windows standards and Object Linking and Embedding (OLE) architecture, will be less likely to cause coding changes than non-compliant 3GL languages. In addition, PowerBuilder 5.0 provides the capability of porting applications developed in Windows NT to other platforms (e.g. Windows 3.1, Windows 95, UNIX) without any modifications.

- *Development and support tools for the code generator are inadequate. Production sizing, productivity, complexity measurement, execution tracing, and test case capture/replay tools may not be available. There is a risk that the code responsible for execution problems will not be identified. The development at the code generator and generated code levels means that the testing and support must also be at multiple levels. There is a risk that the lower level changes will be forgotten or not changed to match the higher level changes. There is a risk that test tools will not be available to test generated code changes.*

We have selected development and support tools that more than adequately support PowerBuilder life cycle development. These include Rational ROSE CASE tool, which provides round trip engineering capabilities for Ada, PowerBuilder, and C++ for UNIX and Windows NT environments; SQA Team Test tool, which provides the ability to capture and replay test cases for PowerBuilder applications, and automatically creates test cases from PowerBuilder. Additionally, numerous support tools are available at the Internet Web Site.

- *The RCAS applications may become unsupportable. The selected code generator uses a proprietary nonstandard language with no alternative source or translators. There are currently about two dozen 4GL products competing for top places in productivity, power, graphical user interface, and rapid application development project support. There is a risk that the selected 4GL will become obsolete or that other 4GLs will dominate. There is a risk that the developed applications would become unsupportable and that they would have to be replaced.*

There is no reason to believe that PowerBuilder will become obsolete, and the trend within DOD appears to be in the opposite direction. PowerBuilder has a 40% market share in client server application development tools (Century Market Research, Fall 95). PowerSoft's parent company Sybase reported 1995 revenues of $957 million. Sybase is the sixth largest independent software company in the world. PowerBuilder's strength is that it does not require any language compiler. In the event that we decide to reengineer PowerBuilder 5.0 objects into Ada or C++ we would accomplish this using Rational ROSE round trip engineering capabilities.

In addition to the regulatory and risk issues presented above, the RCAS PMO has not demonstrated that the selected 4GL has the flexibility and performance needed for RCAS by successfully completing the pilot applications. In fact, the RCAS PMO has not demonstrated that the selected 4GL provides all the functions needed to develop a representative application. However, the PMO is buying the Structured Query Language server and the selected 4GL products with a contract sub-Contract Line Item Number for $2.2 million in FY 1996. No funds were budgeted for additional software licenses or updates that are probably required within the 7 year planned software development.

The RCAS Pilot is currently underway, including a PowerBuilder 5.0 application which will demonstrate the flexibility and performance of the tool. Funds are budgeted for additional software licenses and updates for the Software Engineering Environment throughout the program life cycle.

Development Language Cost Impact

... In summary, the development productivity used in program planning was 14 to 20 FP/MM. But Ada or other approved high-order language is required and has a realistic development productivity of three to five FP/MM. Therefore, the planned productivity is five times the realistic productivity using an approved language. As a result, the time and materials funding planned is underestimated by $150 million. Our $150 million estimate is consistent with the Validation Assessment Team's cost model. The Validation Assessment Team reported that if 4GLs were excluded and all code was developed in Ada, there would be a net increase cost for software and data of $168.7 million.

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The following is an extract from a Capers Jones source on software productivity.

The numeric levels of various languages provide a convenient shortcut for converting size from one language to another. For example, if an application requires 1000 non-commentary COBOL statements (level 3), then it would take only 500 statements in a level 6 language (such as NATURAL) and only 250 statements in a level 12 language (such as OBJECTIVE C).

The correlation between the level of a language and development productivity is not linear. For most large software projects, coding amounts to only about 30 percent of the effort. Assume a program is written in a language that is twice the level of a similar program, for instance level 6 versus level 3. In this example, the coding effort might be reduced by 50 percent. But the total project might be improved by only 15 percent, since coding only comprised 30 percent of the original effort. Double the level of the language again to a level 12. That will only give an additional 7.5 percent net savings. Once again, coding is halved. But coding is not a major factor for very high level languages.

More accurate economic productivity rates can be gained by examining the average monthly Function Point rates associated with various language levels. Table 1 looks at how language levels affect productivity.

Table 1. Language Level Relationship to Productivity

LANGUAGE LEVEL	PRODUCTIVITY AVERAGE PER STAFF MONTH
1 - 3	5 to 10 Function Points
4 - 8	10 to 20 Function Points
9 - 15	16 to 23 Function Points
16 - 23	15 to 30 Function Points
24 - 55	30 to 50 Function Points
Above 55	40 to 100 Function Points

Table 2. Programming Languages and Levels

LANGUAGE	LEVEL	AVERAGE SOURCE STATEMENTS PER FUNCTION POINT
Ada 83	4.50	71
Ada 95	6.50	49
PowerBuilder	20.00	16

Software Productivity Research
Programming Languages Table, Release 8.2, MAR 96
http://www.spr.com/library/langtbl.htm

Table 2 above is an extract of programming languages and levels for Ada 83, Ada 95, and PowerBuilder for a comparison of estimates. The development productivity (14 to

20 FP/MM) used in program planning fits well within the Caper Jones range of 15 to 30 FP/MM. Furthermore, this estimate is extremely conservative given that it was used to estimate only the effort within the development timebox. The cost of other activities such as enterprise modeling, data engineering, functional area planning, and development management were estimated separately. Since the industry average productivity rates reported by Capers Jones typically include many of these costs, the organizational productivity assumed for the RCAS developer is somewhat lower than the 14 to 20 FP/MM reported. Within this context of economic productivity correlation detailed in the Software Productivity Research documentation, the 5:1 ratio of planned to realistic productivity set forth in the Evaluation Report is not accurate.

In conclusion, the proposed 4GL development environment is in compliance with existing policy and that no Ada waiver is required, the forecasted development productivity is realistic and the funding adequate. Therefore, an additional $150 million is not required.

Other Productivity Risks
The RCAS PMO and contractor did not consider other productivity adjustments in the above calculations for either Ada or the selected 4GL. Development productivity reductions for the very large project, the impact of the new development process Rapid Application Fielding Methodology, and the development contractor's Capability Maturity Model level were not considered...

...While achievement of Capability Maturity Model Level 2 improves the management foundation of the software organization, the production amount and quality is still inconsistent from team to team and product to product. This inconsistency combined with the organization's growth during RCAS does not support the planned, steadily increased productivity from 14 to 20 FP/MM.

PMO RCAS carefully considered other productivity adjustments in the calculations for the selected 4GL. Statement of Work paragraph (Contract Number DAHC94-91-C-0002/P00296), **C.3.1.18 Software Engineering Institute Capability Maturity Model Certification** states, "The Contractor shall achieve a Level II formal assessment in accordance with the Software Engineering Institute's Capability Maturity Model Version 1.1. This certification shall be achieved on or before the Government's acceptance of the software contained in LDP1."

A key aspect of the RCAS managed risk approach is the Integrated Program Performance Analysis (IPPA). IPPA consists of: Cost Performance Reports, Risk Management, and Integrated Scheduling. Production amount and quality consistency from team to team and product to product is the focus of the SEI-based Risk Management Program. The attributes of the Rapid Application Fielding Methodology as described in the report section entitled, "Software Development Approach" are specifically designed to abate the productivity risks enumerated in the original report.

Underestimated Software Maintenance
... The contractor's maintenance estimate was based on a 15-16 percent annual change traffic. The 15 percent annual change traffic is based on historical data and assumes a 7-year life cycle for software (7 years times 15-percent = 105 percent).

Our very conservative calculation, based on the 15-percent annual change and the above size estimates, yields a range of 17,900 to 36,000 FPs. Fault repairs on fielded software are not included, but they must be estimated and added to get the total maintenance estimate. By selecting 18,125 FP, a conservative total maintenance estimate, we calculated that the software maintenance was underestimated by 12,000 FP (852,000 source lines of code).

Using the PMO estimate of $61.2 million for the total 60,500 FP, we determined the additional 12,000 FP will cost an additional $12.1 million.

The RCAS VAT estimates for Post-Deployment Software Support (PDSS) include both fault repairs (bug fixes) and enhancements. The estimate is based on annual change volume of 15% of installed software, with 25% of that amount for fault repair and 75% for enhancement. However, since very little software is fielded in the first two years, maintenance costs are minimal for the first half of the program.

Maintenance of the 4GL software will be done using the same 4GL tool. Since this tool is more of a prototyping language which allows both user and developer to see the results of their efforts much more quickly than with a 3GL language, and since the user will be intimately involved in the timebox development effort, there should be significantly less need for maintenance to correct misinterpreted user requirements. In addition, because the 4GL is a higher order language than Ada with a 1:5 ratio in equivalent lines of code, the total volume of code to be maintained will be significantly less than if it were written completely in Ada.

Recommendations for Corrective Action
A. We recommend that the Chief, National Guard Bureau:
1. Cease further data and applications development efforts until the following actions are completed.
A. Select Ada (or other approved computer language) as required by DOD Directive 3405.1, "Computer Programming Language Policy," April 2, 1987, before the project is overcommitted to a fourth-generation language.
B. Reestimate the cost and schedule of the project based on realistic development productivity and maintenance sizing, or rescope the Data and Applications functions to fit the available cost and schedule.

Non-Concur. RCAS is in full compliance with the DOD Ada policy which treats advanced software technologies (ASTs) as COTS with preference over Ada. Mr. Paige, ASD (C3I), reviewed DOD IG Finding A and has concurred in writing with the Program's

approach. Conservative costs and schedules have been proposed based on industry productivity data using 4GLs such as PowerBuilder.

2. Require full justifications, including a life-cycle cost analysis and a risk analysis that addresses technical performance and schedule impact, if an Ada waiver is proposed.

Non-Concur. An Ada waiver will not be proposed for RCAS. Nonetheless, the PMO has reviewed life-cycle and maintenance costs. A risk management program has been established which will address technical performance and schedule impacts.

3. Cease the more than $2 million procurement of Structured Query Language server and the selected fourth-generation language products planned for FY 1996, unless an Ada waiver is granted and pilot applications are completed successfully.

Partial Concur. Since RCAS is in compliance with the DOD Ada policy, the Program will continue to acquire COTS development tools as planned for FY 1996.

Finding B. Telecommunications Requirements and Funding
The Chief, National Guard Bureau, neither identified specific telecommunications requirements for equipment and services nor determined total communications cost for the RCAS Program. The RCAS PMO did not complete and validate requirements for telecommunications equipment and services. Further, the RCAS PMO did not prepare site surveys to identify and validate the cost of preparing each site for the installation of telecommunications equipment and services. As a result, the RCAS PMO has not completed a documented, validated, and comprehensive telecommunications management plan to obtain the most cost-effective telecommunications circuit configuration and is unable to determine the total cost of the telecommunications portion of the RCAS Program. Therefore, the total cost of RCAS communications is probably underestimated and the program is probably underfunded.

Partial-Concur. While these findings were partially accurate at the time, the Telecommunications plan has been rewritten with participation of Army National Guard (ARNG) and the U.S. Army Reserve (USAR), and is being staffed to gain the concurrence of Defense Information Systems Agency (DISA), Information Systems Engineering Command (ISEC), Office of the Secretary of Defense (OSD) (C3I), and Director of Information Systems for Command, Control, Communications, and Computers (DISC4). This staffing will be completed and presented at the MAISRC Milestone III decision briefing in 4th Quarter FY 96. Specific telecommunications requirements are identified in this plan. They were determined using an accepted business practice of modeling the telecommunications requirements based on empirical and actual data collected from RCAS customers. The ARNG and USAR, who do all circuit provisioning, will capitalize on existing circuits and incorporate RCAS requirements into their future telecommunication plans. The RCAS technical

architecture solution is robust and flexible enough to evolve with the changing telecommunications topology without causing added risk to the system operation. The USAR and ARNG have indicated their concurrence with the Telecommunications Plan in the attached memoranda at TABs B and C.

Telecommunications Requirements
... Neither the RCAS PMO nor the vendor validated the baseline of existing telecommunications equipment and services for RCAS. Specifically, the RCAS PMO nor the vendor:

- *validated the number of subscriber workstations and proposed user requirements for future telecommunications equipment and services for each site, or*
- *assessed the validity of proposed user requirements to establish a telecommunications configuration management plan*

A Validation Assessment Team consisting of representatives from the prime contractor, the ARNG, the OCAR and the USARC, validated the number of subscriber workstations. The ARNG, the OCAR, and the USARC represent the user community. The number of subscriber workstations was based on input from the previously validated RCAS Functional Description, which was refined and revalidated under Contract Change Proposal (CCP) 022. The customer representatives participating on the Customer Focus Team of the Validation Assessment Team accepted these numbers as meeting the basic requirements of the ARNG and USAR.

The RCAS PMO assessed proposed user requirements for future telecommunications equipment and services for RCAS sites. One of the design requirements is to provide a migration path from legacy electronic mail systems to the Defense Message System (DMS). At the time, the RCAS was restricted by public law (the Brooks Act) from providing services other than those offered by FTS2000. However, with the repeal of the Brooks Act, consolidation of telecommunications requirements with other ARNG and USAR requirements, such as Distance Learning, is possible and those requirements are being incorporated into the RCAS Telecommunications Plan, the ARNG Telecommunications Plan, and the USAR Telecommunications Plan. A Migration Transition Plan has been developed for DMS by Boeing (System Evolution Plan, CDRL D036, Appendix B).

The telecommunications infrastructure is a constantly changing environment. The RCAS Program will utilize existing telecommunications resources. The Program has specifically addressed this by insuring that RCAS is flexible and modular in design so that it can be easily adapted into the customer's LAN. All modeling and budgeting were done on a worse case scenario. In reality, we should be able to save money by using existing capacity.

The RCAS PMO rationale to determine the quantity of telecommunications equipment and services resulted in an inadequate identification of requirements. Because of cost

constraints, the requirements were established based on assumptions and on "recommended" minimum priorities. Therefore, the RCAS PMO and the vendor have not completed a documented, validated, and comprehensive telecommunications plan.

A comprehensive survey of over 4000 sites would be required to resolve this issue. This information would likely be out of date by the time the sites are fielded. Our basis of estimate was therefore taken from the approximately 2,100 units that have been surveyed and fielded, the Installation Plan and the site database provided by the Government. Subsequently, 25% of the mini-hub site surveys have been performed and validated; actual costs are well within the estimates. Existing equipment for GFE will be identified during the Memorandum of Understanding (MOU) process.

The number of workstations authorized per unit was established as a result of extensive analysis during phase 1 and documented in the Issue Plan (IP). At the time of the MOU, the command has an opportunity to adjust quantities between units up to a finite number of workstations per command identified by the ARNG and USARC during the MOU process. The IP provides a planning document for sizing of the telecommunication network. The site survey process captures the existing customer telecommunication plan and defines the requirements just in time for the receiving unit. The RCAS prime contractor then produces a facilities requirement engineering document (FRED) and the associated bill of materials (BOM) for each receiving unit.

Telecommunications Design

Design-to-Cost Strategy. The single overriding requirement for the RCAS was a design-to-cost constraint imposed on the functional design of the system. As a result, some of the detailed requirements are not met or are only partially met. For example, the requirement to allow 100-percent growth (quick expandability) in the quantity of users with no degradation of service will not be met.

The driving force was the exploitation of existing capabilities in a constantly changing environment. The customer's telecommunication system is growing exponentially in support of other initiatives (e.g. Distant Learning). The telecommunications requirement for RCAS is compatible with these initiatives. RCAS' first priority is to utilize existing telecommunications systems when possible and establish communications capability where necessary to meet its requirements.

We utilized cost as an independent variable to insure that we could meet the user requirements within the current funding profile for the RCAS. The ARNG and USAR Customer Focus Team developed a database of prioritized user needs prior to the imposition of the funding profile. The prime contractor then developed a system design that would satisfy all the needs identified by the ARNG and USAR. The Customer Focus Team reviewed this system design and, using the prioritized user needs database as a guide, eliminated lowest priority needs in order to meet the funding profile. In the case of the given example, the Customer Focus Team decided that maintaining a one-hundred percent excess capacity was not in the best interest of the

ARNG, the USAR, or the Government, from a cost point of view. They determined that a growth capability less than one-hundred percent is acceptable and would meet the requirements for the RCAS.

Design-to-cost shifted the responsibility for many technical support functions, such as site preparation of telecommunications hubs, circuit ordering, and site local area network (LAN) wiring for small sites from the vendor to the Army National Guard and the Army Reserve. However, the Army National Guard and the Army Reserve may not have the expertise and resources necessary to perform those function.

Site preparation of telecommunications hubs remains the responsibility of the RCAS PMO through the prime contractor. The Customer Focus Team representatives, representing their respective organizations, accepted the responsibility for Local Area Network (LAN) wiring for small sites and circuit ordering. The Customer Focus Team assumed these responsibilities as an overall cost savings measure. The Customer Focus Team stated that providing funds to the contractor to perform these functions was unnecessary because their available resources and expertise can satisfy these technical support functions at no additional cost to the RCAS Program. The RCAS Program funds previously allocated to contractor efforts in these areas could then be reprogrammed to meet some of the lower priority user needs.

Many of the customers already have existing LANs in their facilities. RCAS will maximize the use of the existing infrastructure and enhance it where applicable. This approach has been validated in Iowa where we are riding excess bandwidth that meets our requirements. Additionally, we are evaluating the ability of customers to perform all their site preparation.

Mainstream COTS products, such as Microsoft, Cisco, Bay networks, etc., were carefully chosen for the solution. These are dominant vendors in the industry who provide excellent support and educational services. All telecommunications components are pre-configured before they are shipped. We will also use a straight-forward approach to network design. (e.g., we will use Routing Internet Protocol (RIP) rather than a more sophisticated protocol like OSPF, for the WAN because it is the most simple to support). Funds have been allocated for training System Administrators.

Further, because specific requirements for telecommunications equipment and services have not been established, the RCAS PMO has been unable to determine actual telecommunications costs.

The RCAS PMO used modeling to determine telecommunications costs. Modeling is an accepted industry practice. Modeling is a quick, cost-effective method for accurately estimating workload and costs. The model used by the RCAS to estimate telecommunications costs for equipment and services is based on empirical data, assumptions approved by the Customer Focus Team, industry standards, and industry practice. While a model will not provide actual costs, it does provide an accurate

estimate which can be incorporated into the program cost model with a high level of confidence. Actual costs can only be determined after costs are incurred. However, the PMO will be constantly assessing telecommunications costs throughout the life cycle of the program.

Site Surveys. *The RCAS PMO and the vendor did not conduct site surveys at each location to obtain a valid estimate for the installation cost of telecommunications equipment and services for RCAS.*

Since modeling produces accurate estimates, conducting site surveys at this point in the RCAS life cycle would greatly increase cost with no added benefit to the Program. Site surveys are expensive, time consuming, and produce results that are no more accurate than those produced by modeling. Additionally, lessons learned from Phase II of the RCAS, show that performing a site survey more than six months prior to actual fielding will result in a second site survey visit. It would be cost prohibitive to attempt to obtain these estimates any sooner due to the constant reorganizations and relocations within the Reserve Component. Instead of conducting site surveys, an approved model was used to estimate the costs for installation of telecommunications equipment.

Recommendations for Corrective Action

B. We recommend that the Chief, National Guard Bureau, ensure that prior to any further procurement of telecommunications equipment and services for the Reserve Component Automation System Program, the following actions are completed:

a. Determine the baseline of existing telecommunications equipment and services, and validate requirements for the baseline of existing telecommunication equipment and services.

Non-Concur. The installed base of RCAS telecommunications is well documented. This baseline, described in the RCAS Telecommunications Plan, consists of those circuits installed during Phase II of the RCAS contract. The requirement for these telecommunications circuits and equipment will be eliminated as those currently fielded sites are retrofit into the new RCAS configuration. Control of the circuits was transferred to the ARNG and the USAR, along with funding to sustain them until they are no longer needed. Existing telecommunication equipment is identified for reuse where appropriate. For example, there are sufficient Secure Data Devices (SDD) so that, when redistributed within the RCAS Program, no additional SDDs will need to be purchased.

b. Identify the number of subscribers; determine proposed user requirements for future telecommunications equipment and services for each site; assesses the validity of proposed user requirements; and complete a documented, validated, and comprehensive telecommunications configurations management plan based on validated proposed user requirements.

Non-Concur. The number of RCAS users was identified by the ARNG and USAR. The Customer Focus Team has concurred that the current fielding plan meets the basic requirements for the ARNG and USAR.

The requirements for RCAS telecommunications equipment and services are documented in the System Specification and Delivery Subsystem Specification. The RCAS, as designed, satisfies those requirements identified by the VAT CFT for implementation. Other user requirements for the ARNG and USAR are being identified and documented by the RC. These requirements are documented in their telecommunications plans. The RCAS PMO recognizes the need to consolidate these requirements, and has designed a modular system, which can easily integrate with other systems, as they are designed, developed, and implemented. The RCAS PMO is working closely with the RC to ensure that integration and consolidation occurs, where possible and appropriate.

The user needs were established by the Customer Focus Team representatives to the Validation Assessment Team. User requirements, are documented in the RCAS System Specification, Delivery Subsystem Specification, and Data and Application Subsystem Specification.

The RCAS performs configuration management planning and execution as an integrated effort. While there is no requirement for a telecommunications specific configuration management plan, the configuration management plan addresses telecommunications components as integrated critical components to the RCAS. The RCAS Telecommunications Plan has been rewritten by an integrated product team (IPT) with participation of the ARNG and USAR, and has been staffed to gain concurrence of DISA, OSD(C3I), ISEC, and DISC4. The plan will be considered final and complete with the concurrence of these organizations prior to MAISRC Milestone III decision briefing in the 4th Quarter of FY 96.

c. Determine the total cost of the telecommunications equipment and services portion of the Reserve Component Automation System Program.

Non-Concur. The cost for telecommunications equipment is included in the total hardware cost for the RCAS. From a deployment perspective, it makes sense to program the cost of telecommunications infrastructure along with the equipment being supported by that infrastructure, such as servers, workstations, and printers. Telecommunications services, such as Frame Relay, Dial lines, and Direct Digital Service, are estimated and programmed, along with non-recurring installations costs. These costs have been programmed over the life of the RCAS contract, using several fielding scenarios, which indicate a total cost estimate of $53 million. The various fielding scenarios proposed affect the cost of telecommunications services, since accelerated fielding will incur costs for services sooner and for a greater period of time.

d. Project budgetary costs for the telecommunications equipment and services portion of the Reserve Component Automation System Program and establishes a funding program for the Army Reserve and the National Guard.

Non-Concur. Budgetary costs for telecommunications equipment and services are included in the RCAS Program budget. The NGB and OCAR have submitted Program Operation Memorandum (POM) to establish funding for the RCAS telecommunications costs.

Finding C. Commercial Off-the-Shelf Infrastructure Budget Risks
Budgeted funds to purchase the RCAS COTS infrastructure (personal computers, office automation software, and telecommunications) are at risk from other areas of the Program that are underbudgeted. The RCAS Program has year-to-year imbalances of Other Procurement Army (OPA) funds needed to finance the Boeing contract. Additionally, as stated in Findings A and B, the RCAS PMO has underestimated software development and has not determined telecommunications costs. Insufficient infrastructure investment could result in the Army National Guard and Army Reserve units being forced to wait more than 6 years for the anticipated benefits from deploying the RCAS commercial off-the-shelf infrastructure.

Non-Concur. Findings A and B are addressed in previous sections of this report and do not appear to be a cause of additional funding risk. The PMO has submitted a request for a realignment of funding to correct the imbalance and meet the needs of the contract for additional OPA funding. The fielding approach requires seven years because of the funding profile.

Reserve Component Information Requirements
... Due to the important need to provide timely and accurate information and to improve the accomplishment of administrative tasks, the Army National Guard and the Army Reserve requested that the PMO RCAS field the RCAS COTS infrastructure within 3 years. Additionally, the General Officer Steering Committee endorsed the Army National Guard and Army Reserve requests by recommending that the PMO RCAS pursue a high-level fielding strategy for FYs 1996 through 1998. However, the current program schedule still spreads the delivery of the RCAS COTS infrastructure to the Army National Guard and the Army Reserve over a 7-year period due to funding constraints.

The fielding approach requires seven years because of the funding profile. The PMO has been working with the ARNG and USAR to modify the fielding strategy within the seven years to touch as many users as possible as early as possible. In the first three years we are retrofitting the entire old RCAS, upgrading all government furnished PCs (10K), installing mini hubs at all major commands (by April 97), and providing funding for the customer site preparation.

Budget Risks

To meet the COTS infrastructure delivery schedule, the RCAS PMO must manage the risk associated with the OPA budget imbalances and funding shortfalls from Findings A and B. The RCAS PMO budget currently contains shortages between yearly OPA funds and yearly contract commitments. Also, the conditions discussed in Findings A and B may cause additional risk to funds designated for delivery of the COTS infrastructure...

Findings A and B are addressed in previous sections of this report and do not appear to be a cause of additional funding risk.

Although there is a $68.2 million management reserve in FY 2003, there are funding imbalance shortfalls for FYs 1999 to 2002. Additionally, even though reallocation of funds is common practice, the reallocation jeopardizes the current fielding plan for the RCAS COTS infrastructure.

The RCAS Program finalized a complete restructure on 31 January 1996. Fundamental to the cost as an independent variable (CAIV) analysis was the portability of funds across appropriations in the Program Objective Memorandum (POM) years. Our POM request, submitted on 19 April 1996, implemented the changes consistent with the restructured program requirements. The realignment of funding was essential in order to correct the imbalance and meet the needs of the contract for additional OPA funding.

In establishing the funding adequacy and executability of the program, only funds from FY 96 through 02 have been considered. In the recently completed POM development cycle, funding was requested for FY 03 to accommodate a smooth program transition from the program management office to whatever organization will take over management of the system. As a result of the POM, the program is currently funded for $46.7 million in FY 03, but as stated previously, these funds have not been considered as part of the CAIV target funding. These funds are not management reserve.

Correcting O&M and OPA Imbalance (Feb 96)
($000)

RCAS Schedule 8	FY98	FY99	FY00	FY01
[illegible]	-4,000	-5,900	-10,500	-11,400
[illegible]	-4,100	-7,300	-14,800	-16,200
[illegible]	+8,100	+13,200	+25,300	+27,600

...the Army National Guard and the Army Reserve have requested $235.3 million in their Program Objective Memorandum for FYs 1998 through 2003 to cover RCAS O&M costs. Neither the Army National Guard or the Army Reserve have funds earmarked for RCAS O&M in FYs 1996 and 1997.

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PMO RCAS has budgeted for the O&M costs for telecommunications through FY99 and the customer proponents assume the costs starting in FY00, and have assumed responsibility for acquiring the necessary funds through the POM process.

RCAS Schedule 80	FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03
[illegible]	1716	3712	4457	4951	248	239	213	226
[illegible]	1052	2275	2732	3034	152	146	130	138
[illegible]					7897	9067	9262	9462
[illegible]					9000	9000	11,500	15,981

Recommendations for Corrective Action

C. We recommend that the Chief, National Guard Bureau:

1. Formally baseline the RCAS commercial off-the-shelf hardware and software infrastructure delivery schedule and quantities.

Concur. The RCAS PMO continues to finalize the Program Baseline in preparation for a DOD MAISRC Milestone III decision to field the infrastructure. The MAISRC Milestone III decision briefing is scheduled for late in the 4th Quarter of FY 96.

2. Ensure that multiple use of existing computer systems is considered to further support the Reserve Component users.

Concur. The RCAS solution will capitalize on already existing investments in computer systems. The ARNG and USAR have committed to providing 10,000 of their existing computer resources as part of the RCAS solution. The Specification Control Drawing for the Workstation Configuration Items (CI) specifies the minimum system requirements necessary for the RCAS solution. In addition, the RCAS solution is based on an open architecture which allows each unit to connect other computer equipment at their discretion.

CONCLUSION: The PMO has reviewed the findings and recommendations of the DOD IG and believes the issues have been adequately addressed and mechanisms established which will monitor these and other risk areas without having to cease progress on the Program. The PMO feels strongly that the Program can continue to move forward while tracking these and other risk areas.

Department of the Army Comments

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY RESERVE COMMAND
3800 NORTH CAMP CREEK PARKWAY SW
ATLANTA, GA 30331-5099

REPLY TO ATTENTION OF

AFRC-IMP (25)

19 JUN 1996

MEMORANDUM THRU Program Management Office, Reserve Component Automation System, 8510 Cinderbed Road, Newington, VA 22122-8510

FOR Inspector General, Department of Defense, ATTN: ROS, 400 Army Navy Drive, Arlington, VA 22204-2884

SUBJECT: Evaluation of the Reserve Component Automation System (RCAS) Telecommunication Plan

1. The purpose of this memorandum is to express the United States Army Reserve (USAR) concurrence that the RCAS Telecommunication Plan represents a baseline telecommunication design and plan which will support the data and e-mail requirements of the Army Reserve. However, the USAR and PMO have agreed to maximize the use of all existing telecommunications resources where USAR RCAS requirements can be handled by existing networks. Where no telecommunication network exists, the RCAS Telecommunication Plan will be implemented.

2. The RCAS model was built on assumptions provided by the United States Army Reserve Customer Focus Team representatives during the Validation Assessment Team process. The workload assumptions reflect the projected workload for the USAR as presented by the original functional area inputs and subsequent updates. We accept the projections as the best possible data available.

3. The cost estimates generated as a result of the model reflect the projected cost for the baseline RCAS design. The RCAS Program Management Office has transferred funds to the Army Reserve to support RCAS telecommunications for the remainder of FY 96. The RCAS will continue to transfer funds to USARC through FY 99, at which time the United States Army Reserve will accept the telecommunications costs. Modeling and cost estimates indicate a significant overall telecommunication cost reduction when data (RCAS) and other communication services are combined.

AFRC-IMP
SUBJECT: Evaluation of the Reserve Component Automation System (RCAS) Telecommunication Plan

The USAR has submitted Program Objective Memorandum (POM) to support the integrated RCAS telecommunication costs through the end of its life cycle.

4. The USAR will support the current RCAS telecommunication plan for the Operations Integration Site (OIS) test based upon an agreement by the PM RCAS to aggressively pursue migration to a new integrated telecommunications solution on or before the next contract period.

5. The United States Army Reserve stands ready to work with the Army National Guard, the PM RCAS, Information Systems Engineering Command, U.S. Army, Program Manager, Defense Message System-Army, the Defense Information Systems Agency, and Boeing Information Services, Inc., to identify the most cost effective telecommunications solution for both the ARNG and the USAR. We further look forward to our working together with the concerned parties to consolidate requirements and eliminate any and all duplication of telecommunication resources.

6. For further information on this action, please contact the USARC RCAS Coordination Office, (404) 629-8941 (LTC Kirby) or (404) 629-8203 (LTC Gray).

CAROLYN E. RUSSELL
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CF:
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DEPARTMENTS OF THE ARMY AND THE AIR FORCE
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NGB-AIS (25-1a) JUN 13 1996

MEMORANDUM THRU PROGRAM MANAGEMENT OFFICE, RESERVE COMPONENT AUTOMATION SYSTEM, 8510 CINDERBED ROAD, NEWINGTON, VA 22122-8510

FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE, ATTN: ROS, 400 ARMY NAVY DRIVE, ARLINGTON, VA 22204-2884

SUBJECT: Evaluation of the Reserve Component Automation System (RCAS) Telecommunication Plan

1. The purpose of this memorandum is to express the Army National Guard (ARNG) concurrence that the RCAS Telecommunication Plan represents a baseline telecommunication design and plan which will support the data and e-mail requirements of the Army National Guard. However, the ARNG and PMO have agreed to maximize the use of all existing telecommunications resources where ARNG RCAS requirements can be handled by existing networks. To that end, the most cost effective design for satisfying the RCAS requirements is to integrate the RCAS data traffic into the ARNG ATM backbone network (GUARDNET XXI) and other existing state networks. Where no telecommunication network exists, the RCAS Telecommunication Plan will be implemented.

2. The RCAS model was built on assumptions provided by the Army National Guard Customer Focus Team representatives during the Validation Assessment Team process. The workload assumptions reflect the projected workload for the ARNG as presented by the original functional area inputs and subsequent updates. We accept the projections as the best possible data available.

3. The cost estimates generated as a result of the model reflect the projected cost for the baseline RCAS design. The RCAS Program Management Office has transferred funds to the Army National Guard to support RCAS telecommunications for the remainder of FY96. The RCAS will continue to transfer funds to NGB through FY99, at which time the Army National Guard will accept the telecommunications costs. Modeling and cost estimates indicate a significant overall telecommunication cost reduction when data (RCAS) and other communication services are combined. The ARNG has submitted Program Objective Memorandum (POM) to support the integrated RCAS telecommunication costs through the end of its life cycle.

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SUBJECT: Evaluation of the Reserve Component Automation System (RCAS) Telecommunication Plan

4. The ARNG will support the RCAS telecommunication plan for the Operations Integration Site (OIS) test based upon an agreement by the PM RCAS to aggressively pursue migration to the GUARDNET XXI solution on or before the next contract period.

5. The Army National Guard stands ready to work with the U.S. Army Reserve, the PM RCAS, Information Systems Engineering Command, U.S. Army, Program Manager, Defense Message System-Army, the Defense Information Systems Agency, and Boeing Information Services, Inc., to identify the most cost effective telecommunications solution for both the ARNG and the USAR. We further look forward to our working together with the concerned parties to consolidate requirements and eliminate any and all duplication of telecommunication resources.

6. The Point of Contact for this action is Mr. Gene A. McDaniel, DSN 327-9631.

FOR THE CHIEF, NATIONAL GUARD BUREAU:

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