# Audit Report

OFFICE OF THE INSPECTOR GENERAL

## HOTLINE COMPLAINT ON MANAGEMENT OF THE COOPERATIVE ENGAGEMENT CAPABILITY PROGRAM

Report No. 95-143

March 10, 1995

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**Acronyms**

| | |
|---|---|
| ACAT | Acquisition Category |
| CEC | Cooperative Engagement Capability |
| COR | Contracting Officer's Representative |
| DDS | Data Distribution System |
| DTSE&E | Director, Test, Systems Engineering and Evaluation |
| FAR | Federal Acquisition Regulation |
| IOC | Initial Operational Capability |
| OSD | Office of the Secretary of Defense |
| PCO | Procuring Contracting Officer |
| SPAWAR | Space and Naval Warfare Systems Command |
| TEMP | Test and Evaluation Master Plan |

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

March 10, 1995

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY
ASSISTANT SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT)
DIRECTOR, OPERATIONAL TEST AND EVALUATION

SUBJECT: Report on the Hotline Complaint on Management of the Cooperative Engagement Capability Program (Report No. 95-143)

We are providing this report for your review and comments. This audit resulted from a complaint to the DoD Hotline concerning the Navy's management of the Cooperative Engagement Capability Program. We received comments on a draft of this report from only the Director, Operational Test and Evaluation. We considered those comments in preparing the final report. Based on those comments, we revised Recommendation B.2. and redirected the recommendation to the Assistant Secretary of the Navy (Research, Development and Acquisition).

DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Therefore, we request that the Assistant Secretary of the Navy (Research, Development and Acquisition); the Director, Test, Systems Engineering and Evaluation; the Commander, Naval Sea Systems Command; and the Program Manager, Cooperative Engagement Capability Program, provide final comments on the recommendations by May 9, 1995. The recommendations are subject to resolution in accordance with DoD Directive 7650.3 in the event of nonconcurrence or failure to comment. We also ask that your comments indicate concurrence or nonconcurrence with the material internal control weaknesses highlighted in Part I.

We appreciate the courtesies extended to the audit staff. If you have any questions on this report, please contact Mr. John E. Meling, Program Director, at (703) 604-9091 (DSN 664-9091) or Mr. Jack D. Snider, Project Manager, at (703) 604-9087 (DSN 664-9087). Appendix G lists the distribution of this report. The inside back cover lists the audit team members.

Robert J. Lieberman

Robert J. Lieberman
Assistant Inspector General
for Auditing

## Office of the Inspector General, DoD

**Report No. 95-143**
(Project No. 4AE-8005)

**March 10, 1995**

# HOTLINE COMPLAINT ON MANAGEMENT OF THE COOPERATIVE ENGAGEMENT CAPABILITY PROGRAM

## EXECUTIVE SUMMARY

**Introduction.** This audit resulted from a complaint to the DoD Hotline that the Navy was not effectively managing the Cooperative Engagement Capability (CEC) Program. The CEC Program, an acquisition category IC effort, is intended to improve the Navy's anti-air warfare capability by coordinating all anti-air warfare sensors into a single real-time, fire control, radar picture. The CEC Program began in FY 1985 and was a classified program until December 1993. While technically not the prime contractor for the CEC Program, the Johns Hopkins University/Applied Physics Laboratory (the Laboratory) oversees engineering and development for the Program. The Navy estimated the CEC Program costs to be $2.5 billion for research, development and procurement in FY 1993 dollars. In March 1995, the Navy plans to hold a Milestone II, Development Approval, decision for the CEC Program. The Navy plans to declare attainment of initial operational capability (IOC) for the CEC Program in late FY 1996 before operational testing and a Milestone III, Production Approval, decision.

**Objectives.** The audit objective was to evaluate the DoD Hotline allegations concerning the CEC Program and the effectiveness of the milestone review process. We assessed the adequacy of the acquisition strategy and program documentation, including information in support of major milestone and program reviews. The audit also evaluated the adequacy of internal controls related to the objective.

**Audit Results.** The results of our review substantiated 11 of the 13 Hotline assertions and allegations. Specifically, the CEC Program Office:

o had not established adequate controls to manage and develop the CEC Program effectively. As a result, the CEC Program Office could not ensure that the Laboratory provided fair and reasonable contract prices and could not oversee and measure the Laboratory's performance against contract cost, schedule, and performance requirements (Finding A).

o was not planning to operationally test production CEC equipment before fielding it. As a result, the Navy may declare the attainment of IOC for the CEC Program based on an operational assessment of a prototype before decisionmakers have evidence that the system will meet user requirements and is operationally effective and suitable (Finding B).

**Internal Controls.** The audit identified material internal control weaknesses. The Navy did not implement necessary internal controls to:

o manage the Laboratory's cost, schedule, and performance in the CEC contract and

o verify the CEC Program's operational effectiveness and suitability through operational testing before the planned IOC date.

We identified those weaknesses even though the CEC Program Office identified DoD Internal Management Control Program assessable units and conducted vulnerability assessments of the CEC Program in July 1992 and August 1994. The Program Office assigned a low overall vulnerability rating in those assessments. Internal controls assessed are summarized in Part I of this report.

**Potential Benefits of Audit.** We could not quantify the monetary benefits to be realized by implementing the recommendations but system effectiveness and readiness for production would be improved. Implementation of the recommendations will ensure that the CEC Program Office:

- o obtains fair and reasonable prices on the CEC contract from the Laboratory;
- o establishes CEC contract cost, schedule, and performance controls; and
- o declares the CEC Program's IOC date if operational test results show that the CEC Program is operationally effective and suitable (Appendix E).

**Summary of Recommendations.** We recommend that the Commander, Naval Sea Systems Command award a separate CEC contract for the engineering and manufacturing development phase of the acquisition process and incorporate cost and pricing data requirements into the contract. We also recommended that the CEC Program Manager submit the Test and Evaluation Master Plan to the Director, Test, Systems Engineering and Evaluation, for review and approval; that the Assistant Secretary of the Navy (Research, Development and Acquisition) request Congress to extend the IOC date so that the attainment of IOC can be based on an operational test of production equipment; and that the Director, Test, Systems Engineering and Evaluation, evaluate the system's developmental testing results before the system is allowed to proceed with the dedicated phase of operational testing to support the planned production decision.

**Management Comments.** We received comments to a draft of this report from the Director, Operational Test and Evaluation. However, we did not receive comments from the Office of the Under Secretary of Defense for Acquisition and Technology and the Navy. The Director, Operational Test and Evaluation, stated that, procedurally, his approval of the Test and Evaluation Master Plan is based on provisions in the Plan for a dedicated operational test and evaluation to support a beyond low-rate initial production and not a declaration of the attainment of IOC. Therefore, his office did not have the authority to withhold approval of the Test and Evaluation Master Plan unless it includes the performance of a dedicated operational test and evaluation of the CEC Program before declaring the attainment of IOC. Part II contains a discussion of the Director's comments and Part IV contains the complete text.

**Audit Response.** Based on the Directors' comments, we revised and redirected the recommendation to the Navy. Since the Navy is basing the attainment of IOC on an operational assessment of prototype CEC equipment, rather than on an operational test of production CEC equipment, to meet a congressionally mandated IOC in FY 1996, the Navy should request Congress to extend the IOC date so that the IOC can be based on an operational test of production CEC equipment. We request that the Assistant Secretary of the Navy (Research, Development and Acquisition); the Director, Test, Systems Engineering and Evaluation; the Commander, Naval Sea Systems Command; and the Program Manager, Cooperative Engagement Capability Program, provide comments on the recommendations in the final report by May 9, 1995.

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The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, prepared this report.

# Part I - Introduction

# Background

**Hotline Allegations.** The DoD Hotline received a complaint that the Navy had not established adequate controls to manage the Cooperative Engagement Capability (CEC) Program effectively. Appendix A of this report addresses each of the 13 Hotline assertions and allegations, and the results of our review.

**Cooperative Engagement Capability Program.** The CEC Program is an acquisition category (ACAT) IC program that the Navy managed as a classified program until December 1993. (See Appendix B for definitions of terms in this report.) The CEC Program is intended to improve battle force anti-air warfare capability by coordinating all Naval force radars into a single real-time, fire control, radar picture. The CEC Program requires an E-2C "Hawkeye" aircraft to maximize the over-the-horizon distance between ships and to compensate for the curvature of the earth and the effects of weather conditions. Additionally, Congress wants the Army and the Air Force to incorporate the CEC Program into specific weapon systems, such as the Army's Patriot Air Defense Guided Missile System and the Air Force's E-3 Airborne Warning and Control System aircraft.

**Concept.** In the mid-1980s, the Johns Hopkins University/Applied Physics Laboratory (the Laboratory) developed the CEC concept. In September 1985, the Office of the Chief of Naval Operations approved the concept exploration phase and, in FY 1989, the demonstration and validation phase for the CEC Program. A milestone program review and decision did not precede either of those phases; however, the Navy has scheduled a Milestone II, Development Approval, decision for March 1995. The Navy plans to declare attainment of initial operational capability (IOC) in late FY 1996 but will not conduct operational testing until FY 1999.

**Development Effort.** The CEC Program is comprised of four primary development efforts: the Cooperative Engagement Processor (the CEC processor), the Data Distribution System (DDS), the Common Equipment Set, and systems integration with existing Navy weapon systems. The Laboratory is developing the CEC processor software and managing systems integration. E-Systems, ECI Division, is developing the CEC processor hardware, the DDS, and the Common Equipment Set and performing systems integration. The Navy estimated the Program will cost $2.5 billion for research, development, and procurement in FY 1993 dollars. The Navy plans to procure 178 Common Equipment Sets comprised of 121 shipboard units, 47 airborne units, and 10 land-based test sites.

**Johns Hopkins University/Applied Physics Laboratory.** The Laboratory, an educational research and development facility, is the CEC Program's technical direction agent and design agent. The Laboratory, as the technical direction agent, provides Program technical direction beyond the expertise of the Naval Sea Systems Command CEC Program Office. In this role, the Laboratory provides Program direction to all CEC contractors and

subcontractors. The Laboratory is the technical direction agent for the CEC Program as well as the design agent for the CEC processor and is developing the CEC processor software.

**Omnibus Contracts.** The Space and Naval Warfare Systems Command (SPAWAR) has an omnibus cost-plus-fixed-fee research and development contract, N00039-91-C-0001, with the Laboratory. Under this omnibus contract, the Laboratory performs the CEC development effort. From December 1990 through September 1994, the Navy provided the Laboratory with about $144.8 million toward the development of the CEC Program. The Navy awarded this contract on a sole-source non-competitive basis. The contract expired September 1994. In November 1994, SPAWAR awarded a new omnibus contract for about $425 million to the Laboratory. The contract will include two option years for about $400 million each that will result in a cumulative contract total of about $1.2 billion. Of this $1.2 billion, SPAWAR estimated that about $72 million will be for engineering and manufacturing development of the processor software for the CEC Program. The CEC Program Office estimated that it will require an additional $96 million to complete engineering and manufacturing development of the CEC processor software. For the CEC effort, SPAWAR personnel perform the contract functions of the procuring contracting officer (PCO), the contracting officer's representative (COR), and the administrative contracting officer.

**E-Systems Contracts.** The CEC Program Office awarded E-Systems two sole-source non-competitive cost-plus-award-fee contracts for demonstration and validation of the CEC processor hardware and the DDS. On September 30, 1988, the Program Office awarded contract N00024-88-C-5256, totaling $72.0 million, that was effective through February 20, 1994. On June 1, 1992, the Program Office awarded contract N00024-92-C-5230, totaling $138.4 million, that is effective through January 30, 1996; however, as of September 29, 1994, only $11 million remained available for obligation. After the Milestone II decision in March 1995, the CEC Program Office plans to award E-Systems a sole-source, cost-plus-award-fee contract, totaling about $292 million, for engineering and manufacturing development of the CEC processor hardware, the DDS, and the Common Equipment Set. The Naval Sea Systems Command administers the E-Systems contracts.

## Objectives

The audit objective was to evaluate the DoD Hotline allegations concerning the CEC Program and the effectiveness of the milestone review process. We assessed the adequacy of the acquisition strategy and program documentation, including information provided in support of major milestone and program reviews. The audit also evaluated the adequacy of internal controls related to the objective.

## Scope and Methodology

We conducted the program audit from February 1994 through November 1994 and reviewed data dated from June 1989 through November 1994. To accomplish the objective, we:

o reviewed the 13 DoD Hotline assertions and allegations to determine their validity,

o examined the CEC portions of contract N00039-91-C-0001 with the Laboratory,

o examined contracts N00024-88-C-5256 and N00024-92-C-5230 with E-Systems,

o evaluated the effectiveness of the milestone review and program review process for the CEC program, and

o discussed issues relating to the effectiveness of the CEC milestone review process with personnel from the Office of the Secretary of Defense (OSD).

We conducted the audit in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD, and accordingly included such tests of internal controls as we deemed necessary. We did not rely on computer-processed data to support our findings and recommendations because the areas reviewed did not contain computer-processed data. Appendix F lists the organizations visited or contacted.

## Internal Controls

**Internal Controls Evaluated.** We evaluated internal controls related to the effectiveness of the milestone review process and the adequacy of the information provided to the milestone decision authorities in support of major milestone and program reviews for the CEC Program. The DoD Directive 5000.1, "Defense Acquisition," February 23, 1991; DoD Instruction 5000.2, "Defense Acquisition Policies and Procedures," February 23, 1991; and DoD Manual 5000.2-M, "Defense Acquisition Management Documentation and Reports," February 23, 1991, specify those controls and procedures. We also assessed implementation of the requirements of DoD Directive 5010.38, "Internal Management Control Program," April 14, 1987, including performance of vulnerability assessments and management control reviews.

**Internal Control Weaknesses Identified.** We identified material internal control weaknesses as defined by DoD Directive 5010.38. Specifically, the Navy did not implement internal controls necessary to:

o manage the Laboratory's cost, schedule, and performance in the CEC contract and

o verify the CEC Program's operational effectiveness and suitability through operational testing before the planned initial operational capability date.

We identified those weaknesses even though the CEC Program Office identified DoD Internal Management Control Program assessable units and conducted vulnerability assessments of the CEC Program in July 1992 and August 1994. The Program Office assigned a low overall vulnerability rating to those assessments.

**Internal Control Weaknesses Correction.** The recommendations in this report, if implemented, will correct the internal control weaknesses. Monetary benefits associated with the implementation of our recommendations are not quantifiable because benefits will depend on future actions by OSD and the Navy. We will provide a copy of the final report to the senior official responsible for internal controls in the Navy.

## Prior Audits and Other Reviews

Since 1989, neither the General Accounting Office nor the Inspector General, DoD, have issued reports directly related to the audit objective. However, the Inspector General, DoD, issued a report concerning the noncompetitive award of a contract to the Laboratory without adequate justification. We synopsized the report in Appendix C.

# Part II - Findings and Recommendations

# Finding A. Program Management and Development

The CEC Program Office had not established adequate controls to manage and develop the CEC Program effectively. This condition occurred because:

o the Space and Naval Warfare Systems Command (SPAWAR) contract used for the development of the CEC Program was not structured for the development and management of an acquisition category IC program, and

o the Laboratory was not required to provide cost and pricing data for each task or significant subcontract.

As a result, the CEC Program Office could not ensure that the Laboratory provided fair and reasonable contract prices and could not oversee and measure the Laboratory's performance against contract cost, schedule, and performance requirements.

## Background

The FAR, subparts 1.6 and 15.8, "Contracting Authority and Responsibilities" and "Price Negotiation," respectively, provide guidance concerning contract oversight and cost and pricing data. The DoD Instruction 5000.2 provides guidance concerning systems engineering management, quality control, software development, and cost/schedule control systems for ACAT IC programs. The Defense Systems Management College Mission Critical Computer Resources Management Guide provides guidance concerning the use of software metrics in systems development.

## Management and Development Controls

Our review of the Hotline allegations disclosed that the CEC Program Office did not establish controls to manage and develop the CEC Program effectively. (Appendix A discusses the allegations and our audit results concerning the allegations.) The Program Office did not obtain cost and pricing data supporting CEC omnibus contract taskings, require a work breakdown structure and a detailed statement of work, acquire systems engineering management data on the CEC omnibus contract, adequately monitor contractor software development, and require the Laboratory to establish a cost/schedule control system.

**Cost and Pricing Data.** The PCO was unable to perform cost or price analyses on Laboratory cost estimates because the Program Office did not require the Laboratory to provide cost and pricing data for each task or significant subcontract. The FAR, subpart 15.8, requires contractors to submit cost and pricing data for the award of any negotiated contract (except for undefinitized actions such as letter contracts) expected to exceed $500,000. Additionally, any modification of a negotiated contract, when the modification involves a price adjustment expected to exceed $500,000, requires cost or pricing data regardless of whether the original contract required cost and pricing data. The cost or pricing data enables the Government to perform cost or price analysis and ultimately allow the Government and the contractor to negotiate fair and reasonable contract prices. From January 1, 1991, through September 30, 1994, SPAWAR awarded the Laboratory seven modifications on the omnibus contract in the form of administrative letters that each totaled more than $500,000 as shown in the following table:

**Omnibus Contract Modifications Exceeding $500,000**

| Administrative Letter Number | Performance Period | Dollar Value (in thousands) |
|---|---|---|
| 13200-20 | 01/01/91 through 12/31/91 | $ 8,725 |
| 13198 | 02/01/91 through 12/31/91 | 20,100 |
| 13350-16 | 01/01/92 through 12/31/92 | 22,548 |
| 13408 | 02/01/92 through 12/31/92 | 6,900 |
| 13448 | 06/01/92 through 12/31/92 | 10,600 |
| 13500-20 | 01/01/93 through 09/30/93 | 27,000 |
| 13700-24 | 10/01/93 through 09/30/94 | 48,900 |
| | | $144,773 |

**Work Breakdown Structure.** The work breakdown structure is the foundation for all reporting of contractor performance. However, the CEC Program Office did not require the Laboratory to provide a work breakdown structure. The DoD Instruction 5000.2 requires a work breakdown structure to establish the essential framework for program and technical planning, cost estimating, resource allocations, performance measurement, and status reporting. The Program Office asserted that the Laboratory followed an informal work breakdown structure; however, the Laboratory stated that it did not prepare or follow a work breakdown structure for the CEC Program.

**Detailed Statement of Work.** A statement of work is that portion of a contract that establishes and defines all performance requirements for contractors' efforts either directly or with specific, cited documents. Due to the lack of a clearly defined statement of work, CEC contracting personnel could not determine whether the Laboratory met the performance requirements necessary for the CEC Program to achieve its objectives. The SPAWAR used administrative letters to serve as the Laboratory's statement of work. However, the PCO and

Defense Contract Audit Agency personnel stated that the information in the letters did not clearly define the Laboratory's performance requirements. We agree.

**Systems Engineering Management.** The Laboratory and E-Systems, as design agents, are responsible for overall CEC system integration. As of the June 1994 operational assessment, the CEC Program Office had not required the Laboratory to prepare and follow a systems engineering management plan based on a completed CEC Program operational requirements document. The DoD Instruction 5000.2 requires program offices to apply systems engineering throughout the program's life-cycle as a comprehensive management process to translate an operational need into a configured system, integrate the technical inputs of the entire development community, and ensure the compatibility of all functional and physical interfaces. Further, the systems engineering management plan will document:

- o the systems engineering processes,
- o the integration of required technical specialties,
- o the performance reporting, and
- o the key engineering milestones and schedules.

Personnel in the Office of the Chief of Naval Operations, the user's representative, indicated that they would work with the Laboratory to prepare the operational requirements document before the Milestone II decision. Previously, however, the CEC Program Office made program decisions without a systems engineering process and an approved systems engineering management plan.

After we completed our audit fieldwork and staffed our working draft report, the CEC Program Office provided us a draft systems engineering management plan, dated November 1994, that the Program Executive Office, Theater Air Defense, prepared.

**Quality Control.** The CEC Program Office had not reviewed the Laboratory's quality control procedures to determine whether the procedures were adequate. The DoD Instruction 5000.2 states that the program office will emphasize and integrate quality control throughout the program, including the systems engineering effort. Quality control consists of the quality of system design, quality of conformance, and fitness for use.

**Software Development.** The CEC Program Office did not require the Laboratory to prepare a software development plan. However, subsequent to the completion of our fieldwork and staffing of a working draft report, the CEC Program Office provided a software development plan for the CEC processor, dated October 1994. The DoD Instruction 5000.2 requires the program office to manage computer resource development as an integral part of the overall program development. In this regard, the Instruction requires that a software development plan be prepared that defines the software processes, including

corporate policies, practices, and standards that the contractor must follow throughout the software development process. Also, the program office is to verify that the developer understands the scope of the software development effort and is capable of meeting user's needs.

**Software Metrics.** Software metrics are documentation showing software cost, schedule, and performance objectives. Additionally, software metrics verify the delivery of a product that will satisfy the user's needs. CEC Program Office personnel stated that the CEC processor software was the primary component of the CEC Program to which all other components of the CEC Program must conform. However, the Program Office did not require the Laboratory to provide software metrics in accordance with DoD Directive 5000.2.

After we completed our audit fieldwork and staffed our working draft report, the CEC Program Office identified several documents as being the CEC software metrics. However, those documents were not CEC software metrics but summaries of trouble status reports prepared by the Naval Surface Warfare, Dahlgren Division, Dahlgren, Virginia.

**Metrics Requirement.** The Defense Systems Management College Mission Critical Computer Resources Management Guide states that program offices should use software metrics to balance cost, schedule, and performance objectives. Software metrics are divided into:

o management metrics, which indicate progress against the plan;

o quality metrics, which effect performance, user satisfaction, supportability, and ease of change; and

o process metrics, which provide feedback for process improvement.

**Metric Data.** The CEC Program Office stated that the Laboratory did not have the level of sophistication to manage multiple software baselines. The lack of metrics data indicated a weakness in the contractor's ability to manage software development properly and to provide progress visibility to the program office. The CEC Program Office plans to obtain an IOC software baseline from the Laboratory without the benefit of metrics data.

**Software Capability Evaluation.** The Laboratory evaluated its own software capability.[1] The evaluation disclosed that the Laboratory had a weakness in requirements generation and system integration. Regardless, the CEC Program Office did not require the Laboratory to provide software metrics so the Program Office could monitor the contractor's requirements generation and system integration. CEC Program Office personnel stated that the

[1]In 1984, the Air Force placed the Software Engineering Institute under contract to investigate the transition of new software technology, analyze software development environments, and provide education in software and systems engineering processes. As part of the contract, the Software Engineering Institute developed the software capability evaluation to assess a contractor's strengths and weaknesses in software development.

Laboratory should be treated as a Government field office not subject to providing software metrics. However, the Laboratory is not a Government entity and is not exempt from providing software metrics.

**Cost/Schedule Control System.** The Navy did not require the Laboratory to provide documentation to support the CEC Program cost, schedule, and performance objectives. The DoD Instruction 5000.2 requires cost/schedule control systems criteria on research, development, test, and evaluation contracts and subcontracts of more than $60 million in FY 1990 dollars for all acquisition programs, including highly sensitive classified programs. The criteria provide the contractor and the Government program managers with accurate data to monitor execution of their programs and an adequate basis for the contractor and the Government to make responsible decisions.

Officials in the CEC Program Office stated that they would have liked to have received cost/schedule control system data on the CEC Program, but the current SPAWAR omnibus contract prevented them from requesting the information from the Laboratory. In our opinion, the CEC Program Office must obtain this data as part of a separate engineering and manufacturing development contract with the Laboratory.

## Contract Structure and Oversight Responsibilities

CEC Program Office controls to manage and develop the CEC Program effectively were inadequate because the SPAWAR contract used for the development of the CEC Program was not structured for the development and management of a major acquisition category IC program.

**Contract Structure.** The PCO and SPAWAR counsel stated that they were not aware that the omnibus contract included taskings for an ACAT IC program. They believed that all taskings on the omnibus contract were for research and development efforts and, therefore, did not structure the contract to obtain documentation needed to manage an ACAT IC program. After they became aware that the CEC Program was an ACAT IC program, they agreed that the CEC Program Office should award its own separate contract with the Laboratory for the CEC Program.

## Effect on Contract Management

Without controls to manage the CEC Program effectively, the CEC Program Office could not ensure that the Laboratory provided fair and reasonable contract prices and could not observe and measure the Laboratory's performance against contract cost, schedule, and performance requirements.

**Fair and Reasonable Prices.** Since the Laboratory did not provide cost and pricing data for each task or significant subcontract, the PCO could not determine whether the contract tasking prices were fair and reasonable.

**Performance Measurement.** Because the omnibus contact was not structured to manage an ACAT IC program, the Program Office was deprived of the necessary base for program and technical planning, cost estimating, resource allocations, performance measurement, and status reporting. Further, the CEC Program Office could not verify that the Laboratory could produce a system that could meet users' needs. Without receiving cost/schedule control data, a work breakdown structure, a clearly defined statement of work, a software development plan, and software metrics, the CEC Program Office could not validate that the Laboratory's work progress properly related cost, schedule, and technical accomplishment. Without the Laboratory preparing and following an approved systems engineering management plan, the CEC Program Office could not verify that development decisions were based on operational requirements. Without a quality control program, the CEC Program Office did not have sufficient information to determine whether the Laboratory's quality control procedures were adequate, reliable, and integrated throughout the CEC Program, including the systems engineering effort.

## Conclusion

Since the CEC Program is an ACAT IC program, the Naval Sea Systems Command should issue a separate contract for the CEC processor and be obtaining information necessary to manage and develop the CEC Program effectively. Documentation requirements in the CEC processor contract should include a work breakdown structure, a clearly defined statement of work, an approved systems engineering management plan, an adequate quality control program, software metrics, and cost/schedule control system criteria. Because SPAWAR's omnibus contract was not intended to develop an ACAT IC program, the Naval Sea Systems Command needs to award a separate contract for the CEC Program during the engineering and manufacturing development phase of the acquisition process to comply with system acquisition requirements in DoD Instruction 5000.2. The award of a separate engineering and manufacturing development contract would enable the CEC Program Office to manage the CEC Program properly and incorporate cost and pricing data requirements.

After we completed our audit fieldwork and staffed our working draft report, the CEC Program Office provided:

- a draft systems engineering management plan, dated November 1994;
- summaries of software trouble reports; and
- a software development plan for the CEC processor, dated October 1994.

If the CEC Program Office awards the CEC processor contract to a contractor other than the Laboratory, the new contractor will have to prepare a software development plan.

## Recommendations, Management Comments, and Audit Response

**We recommend that the Commander, Naval Sea Systems Command:**

**1. Award a separate contract for the Cooperative Engagement Capability processor for the engineering and manufacturing development phase of the acquisition process. The contract should include requirements for a work breakdown structure, a clearly defined statement of work, a systems engineering management plan, an adequate quality control program, a software development plan, software metrics, and cost/schedule control system criteria as required by DoD Instruction 5000.2, "Defense Acquisition Policies and Procedures," February 23, 1991.**

**2. Require that the procuring contracting officer assigned to the Cooperative Engagement Capability processor engineering and manufacturing development contract incorporate cost and pricing data requirements into the contract in accordance with Federal Acquisition Regulation, subpart 15.8, "Price Negotiation."**

**Management Comments.** As of the date of this final report, we had not received comments from the Program Manager, CEC Program, to a draft of this report issued December 8, 1994. We requested the comments by February 6, 1995.

**Audit Response.** The DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Therefore, we request that the Navy provide comments on this final report.

# Finding B. Initial Operational Capability

The CEC Program Office was planning to declare initial operational capability (IOC) for the CEC Program in FY 1996 based on an operational assessment of prototype CEC equipment, rather than on an operational test of production CEC equipment. This condition occurred because Congress and the Navy wanted to field the CEC Program as soon as possible to provide Navy ships with an improved anti-air warfare capability. In addition, the condition occurred because the CEC Program Office did not:

o include and fund functional and structural software testing and include the performance of a dedicated operational test and evaluation of a production CEC configuration in the draft Test and Evaluation Master Plan (TEMP) before planning to declare the attainment of IOC;

o submit the revised draft TEMP to the Director, Test, Systems Engineering and Evaluation (DTSE&E),[2] for review and approval; and

o work effectively with the DTSE&E to ensure that adequate CEC developmental test results would be available before IOC.

As a result, the CEC Program Office will not be able to provide decisionmakers with adequate developmental and operational testing data to demonstrate that the CEC Program is operationally effective and suitable and satisfies user requirements at the planned IOC date.

## Background

**DoD Policy**. DoD Instruction 5000.2 establishes DoD policy for conducting developmental and operational testing to determine whether a system meets contract technical requirements and is operationally effective and suitable before a system is fielded. In this regard, the Instruction requires that TEMP for all acquisition category I programs be approved by the DTSE&E and the Director, Operational Test and Evaluation; and program offices grant the DTSE&E and the Director, Operational Test and Evaluation, full and timely access to all available developmental and operational test information. Additional guidance concerning developmental and operational testing is in Appendix D.

**Initial Operational Capability.** DoD Instruction 5000.2 defines IOC as the first attainment of the capability to employ effectively a system of approved characteristics operated by a trained, equipped, and supported military unit or force.

[2]Before November 1, 1994, name was Director, Test and Evaluation.

**Status of Program Requirements and Testing Documentation.** As of November 1994, the CEC Program Office did not have an approved operational requirements document detailing the minimum acceptable CEC operational requirements or a TEMP detailing the measures of effectiveness with appropriate quantitative criteria to provide substantive evidence for analysis of hardware, software, and system maturity at the conclusion of testing. The CEC Program Office plans to have the two documents approved before the Milestone II, Development Approval, decision scheduled for March 1995.

**Congressional Direction for FY 1995.** The CEC Program Office interpreted the Report of the Committee on Appropriations to accompany House Report No. 4650, "Department of Defense Appropriations Bill 1995" (House Report No. 103-562), June 27, 1994, to require the Navy to field the CEC by FY 1996. Specifically, the Committee Report stated that

> The Committee has been very concerned about programs to protect Navy ships from sea-skimming, low-observable, anti-ship cruise missile attack since the time when 37 sailors died in the attack on the U.S.S. Stark. The Committee commends the Assistant Secretary of the Navy for Research, Development, and Acquisition for her attention to these programs and for her responsiveness to the Committee. She is the first and only Defense Department witness to testify before the Committee to state that Congressional direction to field certain classified capabilities by 1996 will be accomplished. In addition, the Navy has embarked on an aggressive program to field cooperative engagement capability in the E-2 aircraft much earlier than any previous plan.

## Adequacy of Operational Assessment Supporting the Program's Initial Operational Capability

The CEC Program Office was planning to use an operational assessment of the CEC prototype to support and declare the attainment of IOC in FY 1996 instead of waiting for the test results from the dedicated operational test of a production CEC test article to be completed in FY 1999. The CEC Program Office was planning to declare prematurely the attainment of IOC for the CEC in FY 1996 in reaction to congressional direction that required the Navy to field the CEC by FY 1996. The IOC declaration will be premature because:

o the CEC Program Office did not require the Laboratory or E-Systems to do CEC prototype functional and structural software testing before the June 1994 developmental test of the CEC supporting the operational assessment and

o the Commander, Operational Test and Evaluation Force, the Navy's independent operational tester, did not prepare the operational assessment to support the IOC date based on an operational test of a representative CEC system configuration tested under realistic combat conditions.

Further, DoD Instruction 5000.2 specifically states that operational assessments may be made at any time using prototypes but *will not substitute for the independent operational test and evaluation* necessary to support decisions to field production units (emphasis added).

**Functional and Structural Software Testing**. The Defense Systems Management College states in its "Mission Critical Computer Resources Management Guide" (undated) that functional and structural software testing is done to determine the integrity of the software. The Guide states that developmental testers should verify that the software works before it is integrated into the hardware because integrating untested software with untested hardware makes it difficult to determine whether a program malfunction is hardware or software related. Functional testing entails testing a software unit with valid and invalid data to judge the quality of the output and stressing the software to failure to determine the ability of the software to recover from abnormal events or to fail in a controlled manner. Structural testing entails testing the internal logic of the software unit. Specifically, the testing minimizes errors in the delivered code and provides reasonable assurance that the software performs to specifications before it is integrated into the hardware.

Although the Naval Surface Warfare Center, Dahlgren Division, submitted proposals to the CEC Program Office to accomplish this essential software testing, the CEC Program Office had not required the Laboratory or E-Systems to do functional or structural software testing of the CEC software before the June 1994 developmental test of the CEC.

**Operational Assessment**. The June 1994 developmental test and operational assessment of the CEC prototype hardware and software was not based on a representative CEC system configuration tested under realistic combat conditions.

**Incomplete System Configuration.** A CEC-configured E-2C "Hawkeye" aircraft, a critical component of the CEC Program, was not available to enable the CEC to coordinate all force radars, including radars of ships over-the-horizon, into a single real-time, fire control, radar picture. A production CEC-configured E-2C "Hawkeye" aircraft will not be available for testing until FY 1999. In addition, the Navy was not able to test the composite identification software adequately, another critical component of the CEC Program. Composite identification software allows ships with CEC to use identification friend-or-foe sensor readings. The Laboratory stated that the composite identification software could not be adequately tested because it was not interoperable with Link-11, an existing Navy command and control system, through which the Navy processes identification friend-or-foe data. The existing Link-11 processor cannot handle the amount of data that the CEC Program provides. Accordingly, the CEC Program Office will have to resolve the data processing limitations of the Link-11 processor before the CEC-dedicated operational test and CEC Program fielding.

**Developmental Test Environment.** The developmental test involved the use of five ships of the Eisenhower Battlegroup equipped with upgraded CEC prototype equipment and a P-3 Orion aircraft configured with upgraded

CEC prototype equipment to emulate an E-2C "Hawkeye" aircraft. The Navy intends to use this equipment in the field until production Common Equipment Set components become available. When compared to the prototype and to meet user requirements, the Common Equipment Set components will have to be substantially smaller with increased processing power. The Common Equipment Set will weigh about 1,500 pounds and 500 pounds for shipboard and airborne units, respectively. The current shipboard and airborne CEC prototype units weigh about 8,000 pounds and 4,800 pounds, respectively.

Although the CEC Program Office contended that the conditions of the developmental test were similar to the requirements of an operational test, personnel from the Office of the Director, Operational Test and Evaluation, who witnessed the test, stated that they did not regard the test as an operational test. Specifically, they stated that the CEC Program Office planned the test so that:

- the likelihood of problems was remote;
- the contractors, who developed the CEC Program, participated extensively in the testing; and
- the weather at the test site was conducive to the assessment.

Also, Laboratory and Chief of Naval Operations personnel stated that the ship alignment was not representative of a typical operational scenario. Further, personnel from the Office of the Director, Operational Test and Evaluation, concluded that the assessment was useful for CEC development, but it was not adequate to certify that the CEC Program was ready for operational fielding.

## Test and Evaluation Oversight

**Classified Program and Milestone Review.** The DTSE&E had limited oversight of the CEC Program. This condition occurred because the CEC Program was a classified program until 1993 and had not previously had a formal milestone review by the Navy Acquisition Executive. By not having a formal milestone review, the CEC Program did not have an approved program baseline and the Under Secretary of Defense for Acquisition and Technology had not required the CEC Program to submit quarterly Defense Acquisition Executive Summary reports concerning the CEC Program's performance against program cost, schedule, and performance requirements.

**Test and Evaluation Master Plan Approval.** Through November 1994, the Office of the Director, Operational Test and Evaluation, has reviewed the operational requirements document and the draft TEMP for the CEC Program. However, the Office has withheld TEMP approval until the Navy included adequate measures of effectiveness to measure the success of planned operational tests in FY 1999. With respect to CEC tests, the CEC Program

Office stated that the Office of Commander, Operational Test and Evaluation Force, will not be formally involved with CEC testing until the FY 1999 dedicated operational tests.

**Sufficient Developmental Testing.** The Office of the DTSE&E did not learn of the existence of the CEC Program until 1993. Until December 1993, the Program was a classified program. Later, the CEC Program Office did not allow the Office of the DTSE&E to review the draft TEMP for the CEC Program before the Milestone II decision scheduled for March 1995 as required by DoD Instruction 5000.2. As a result, personnel in the Office of the DTSE&E stated that they did not know enough about the CEC Program to determine whether the CEC Program Office planned to accomplish sufficient developmental testing to justify that a dedicated phase of operational testing was warranted in FY 1999. The Office of the DTSE&E also agreed that the Navy should conduct formal operational tests before declaring that the CEC had attained IOC.

## Effect of Developmental and Operational Testing on the Planned Initial Operational Capability Date

Since the CEC Program Office plans to declare the attainment of IOC for the CEC Program based on an operational assessment of prototype CEC equipment, rather than on an operational test of CEC production equipment, Navy decisionmakers will not have adequate developmental and operational testing data to be confident that the CEC will meet user requirements and is operationally effective and suitable. The level of developmental testing accomplished will preclude Navy decisionmakers from knowing whether the CEC Program:

- has achieved contract technical performance requirements and
- is ready for operational test and evaluation to demonstrate that the CEC Program is ready for fielding.

The absence of dedicated operational tests will preclude Navy decisionmakers from knowing whether the CEC Program:

- is operationally effective and suitable,
- meets the overall degree of mission accomplishment when operated by representative personnel in the environment planned or expected for operational use, and
- can be placed satisfactorily in the field.

## Recommendations, Management Comments, and Audit Response

**1. We recommend that the Program Manager, Cooperative Engagement Capability Program,**

**a. Revise the draft Test and Evaluation Master Plan to:**

**(1) Include and fund functional and structural software testing before the dedicated operational test and evaluation planned in FY 1999.**

**(2) Include the performance of a dedicated operational test and evaluation of a production configuration of the Cooperative Engagement Capability Program before declaring the attainment of initial operational capability.**

**b. Submit the revised draft Test and Evaluation Master Plan to the Director, Test, Systems Engineering and Evaluation, for review and approval before the Milestone II, Development Approval, decision scheduled for March 1995 as required by DoD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures."**

**Management Comments.** As of the date of this final report, we had not received comments from the Program Manager, CEC Program, to a draft of this report issued December 8, 1994. We requested the comments by February 6, 1995.

**Audit Response.** The DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Therefore, we request that the Program Manager, CEC Program, provide comments on this final report.

**2. We recommend that the Assistant Secretary of the Navy (Research, Development and Acquisition) request Congress to extend the date for attainment of initial operational capability for the Cooperative Engagement Capability Program to a date where the attainment can be based on an operational test of production representative equipment rather than an operational assessment of incomplete prototype equipment.**

**Management Comments.** The Director, Operational Test and Evaluation (the Director), stated that he did not have the authority to implement the draft report recommendation. In the draft report, we recommended that the Director not approve the TEMP until it includes the performance of a dedicated operational test and evaluation of a production configuration of the CEC Program before declaring the attainment of IOC. Procedurally, the Director stated that his approval of the TEMP was based on provisions in the TEMP for a dedicated operational test and evaluation to support a beyond low-rate initial production and not a declaration of the attainment of IOC. The Director further stated that,

procedurally, the Navy decides when to field the CEC system with interim or full capability and declares IOC. The complete text of the Director's comments is in Part IV.

**Audit Response.** Based on the Directors' comments, we revised and redirected Recommendation B.2. to the Assistant Secretary of the Navy (Research, Development and Acquisition). Since the Navy's decision to declare the attainment of IOC on an operational assessment of incomplete prototype CEC equipment was based on the requirement to meet a congressionally mandated FY 1996 IOC, we recommend that the Assistant Secretary request relief from Congress so that the IOC attainment date can be based on an operational test of production CEC equipment rather than an operational assessment of incomplete prototype CEC equipment. We request that the Navy provide comments on this final report.

**3. We recommend that the Director, Test, Systems Engineering and Evaluation, evaluate the Cooperative Engagement Capability Program's developmental testing results to determine whether the Program is ready for operational testing.**

**Management Comments.** As of the date of this final report, we had not received comments from the Director, Test, Systems Engineering and Evaluation, to a draft of this report issued December 8, 1994. We requested the comments by February 6, 1995.

**Audit Response.** The DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Therefore, we request that the Director, Test, Systems Engineering and Evaluation, provide comments on this final report.

# Part III - Additional Information

# Appendix A. Results of Hotline Allegations Review

We substantiated 11 of 13 Hotline assertions and allegations concerning the CEC Program. The results of our review of each item follow.

**Assertion 1. The Johns Hopkins University/Applied Physics Laboratory (the Laboratory) was the prime contractor for the CEC Program and had the authority to make technical program decisions concerning the Program, an acquisition category (ACAT) IC program.**

**Partially Substantiated.** While technically not the prime contractor for the CEC Program, the Laboratory oversees engineering and development for the CEC Program, an ACAT IC program. The DoD Instruction 5000.2, "Defense Acquisition Policies and Procedures," February 23, 1991, defines a prime contractor as a contractor having responsibility for design control and delivery of a system. The Laboratory was the Cooperative Engagement Processor (the CEC processor) design agent and the CEC Program's technical direction agent.

**Design Agent.** As design agent, the Laboratory designed and developed the CEC processor software, the most critical CEC Program objective. As the CEC processor developer, the Laboratory has approval from the Office of Management and Budget to act as a commercial contractor. The Laboratory's omnibus contract with the Navy guarantees profit to the Laboratory based on the amount of work it performs for the Government.

**Technical Direction Agent.** The CEC Program Office designated the Laboratory as the technical direction agent to make technical program decisions concerning the CEC Program. This designation occurred because the CEC Program Office did not have the expertise to make technical program decisions. The Naval Sea Systems Command Instruction 5400.57A, "Delegation of Technical Responsibility and Authority to Engineering Agents," December 6, 1985, allows a program office to designate the contractor or a Government organization as the technical direction agent. In our discussions with Laboratory personnel, they stated that the Laboratory was a research and development facility with expertise in rapidly producing prototypes; however, they did not consider themselves suited to be prime contractors for ACAT I weapon systems.

**Allegation 2. The Laboratory was not held to the standards required of a contractor for an ACAT IC program.**

**Substantiated.** The CEC Program Office made the Laboratory the CEC processor software contractor without requiring it to adhere to DoD acquisition regulations for an ACAT IC program. The DoD Instruction 5000.2 requires that a contractor for an ACAT IC program:

- o establish a work breakdown structure,

- o prepare a software development plan,
- o prepare cost performance measurement reports,
- o establish software metrics,
- o adhere to a clearly defined statement of work, and
- o have a documented quality control program.

The Federal Acquisition Regulation also requires contractors to provide cost and pricing data for each tasking on cost-type contracts.

The CEC Program Office did not require the Laboratory to comply with the above requirements. Conversely, the CEC Program Office required E-Systems, the developer of the CEC Program's Data Distribution System, to comply with the above requirements.

After we completed our fieldwork and staffed our working draft report, the CEC Program Office provided a software development plan for the CEC processor prepared by the Laboratory. The plan was dated October 1994.

**Allegation 3. Laboratory personnel had subcontracts on the CEC Program.**

**Unsubstantiated.** We did not find evidence that Laboratory employees held subcontracts on the CEC Program. Further, Laboratory personnel stated that they did not allow this practice, which is against their code of ethics.

**Allegation 4. The Laboratory was not providing the CEC Program Office with adequate documentation.**

**Substantiated.** As stated in Allegation 2, the Laboratory was not providing the CEC Program Office with adequate documentation. However, the CEC Program Office's administrative letters did not specify a requirement for the Laboratory to provide the documentation. The DoD Instruction 5000.2 requires the program office to obtain adequate documentation to manage a major acquisition program effectively.

**Allegation 5. The Laboratory did not prepare a CEC processor software development plan.**

**Substantiated.** The Laboratory did not have a formal CEC processor software development plan until October 1994. The software development plan is an agreement between a program office and the contractor stating how the contractor will develop the software. The software development plan provides the program office with a baseline to measure progress or deviations that indicate whether the contractor is experiencing difficulty in developing the software or may be developing software that will not satisfy user requirements. Before October 1994, the CEC Program Office was missing a key management tool to evaluate the Laboratory's performance effectively.

**Allegation 6. The CEC Program did not have an integrated test program schedule.**

**Substantiated.** The CEC Program Office provided insufficient direction to the Laboratory concerning test and evaluation procedures. Provisions in the omnibus contract required the CEC Program Office to state in the administrative letter for each contract tasking any testing that the Laboratory must accomplish. Laboratory personnel stated that the CEC Program Office did not task them to establish an integrated test program schedule for the CEC Program because the CEC Program Office was operating under a schedule-driven acquisition strategy. Additionally, the Director, Operational Test and Evaluation, and the Director, Test, Systems Engineering and Evaluation, had not approved the CEC Program Test and Evaluation Master Plan (TEMP). DoD Instruction 5000.2 states that a program's TEMP generates detailed test and evaluation plans and ascertains schedule and resource implications associated with the test and evaluation program. However, as of the June 1994 Operational Assessment, the CEC Program did not have an approved TEMP. The Office of the Director, Operational Test and Evaluation, stated that the CEC Program's TEMP lacked specific measures of effectiveness necessary to evaluate the CEC Program's performance when tested. The Office of the Director, Test, Systems Engineering and Evaluation, stated that the Navy had not requested it review and approve the draft TEMP.

**Allegation 7. The CEC Program Office had not reviewed the Laboratory's quality control procedures.**

**Substantiated.** The CEC Program Office had not reviewed the Laboratory's quality control procedures to determine whether the procedures were adequate. The DoD Instruction 5000.2 requires the program office to emphasize and integrate quality control throughout a program by integrating quality control into the systems engineering effort. As a result, the CEC Program Office had not assured itself that the Laboratory's quality control procedures were adequate for developing the CEC processor software.

**Allegation 8. The Laboratory did not follow DoD acquisition regulations.**

**Substantiated.** See discussion for Allegation 2. Also, Laboratory personnel stated that they did not envision the CEC Program becoming an acquisition program. They considered the Program to be a research and development effort. As a result, the Laboratory did not establish procedures to adhere to DoD acquisition regulations pertaining to the acquisition of weapon systems. As stated in Allegation 4, the CEC Program Office was responsible for requiring and obtaining acquisition documentation necessary to manage the Program effectively.

**Allegation 9. The Laboratory did not allow the CEC Program Office to observe its development process.**

**Unsubstantiated.** The CEC Program Office observed the Laboratory's deployment process; however, it did not require the Laboratory to provide information to enable the CEC Program Office to make fully informed management decisions.

**Allegation 10. The CEC system will have performance shortfalls when provided to the Navy.**

**Substantiated.** The CEC Program Office did not require the Laboratory to conduct any Government acceptance testing of the CEC hardware and software and stress testing of the CEC software. The CEC Program Office tasked the Naval Surface Warfare Center, Dahlgren Division (the Center), the CEC software support agent, to conduct acceptance and stress testing. However, the Center did not conduct the tests because of inadequate funding and equipment. Further, the CEC Program Office accomplished operational assessments and other developmental tests to date without an approved TEMP. As a result, the CEC Program Office cannot be certain that software and hardware delivered to the Navy will be free from defects and able to meet user requirements effectively and economically when the Navy plans to declare the attainment of initial operational capability for the CEC Program in FY 1996.

**Allegation 11. The Laboratory was not providing the CEC Program Office with software metrics.**

**Substantiated.** The CEC Program Office has not required that the Laboratory provide software metrics. As a result, the Program Office does not have adequate documentation to measure the Laboratory's progress in developing the CEC processor software.

**Allegation 12. The Laboratory did not prepare a work breakdown structure.**

**Substantiated.** The CEC Program Office did not require the Laboratory to develop a work breakdown structure for program and technical planning, cost estimating, resource allocations, performance measurement, and status reporting. As a result, the Laboratory did not prepare a work breakdown structure.

**Allegation 13. The Defense Contract Audit Agency did not audit the Laboratory contract for the CEC Program.**

**Partially Substantiated.** The Defense Contract Audit Agency was on site at the Laboratory; however, the Defense Contract Audit Agency was unable to provide sufficient audit coverage because of the lack of required DoD acquisition documentation, such as contract cost and pricing data, a work breakdown structure, and a clearly defined statement of work.

# Appendix B. Definitions of Terms

**Acquisition Category ID and IC.** These acquisition categories (ACATs) are assigned to major defense acquisition programs that have unique statutorily imposed acquisition strategies, execution, and reporting requirements. The programs are estimated by the Under Secretary of Defense for Acquisition and Technology (the Under Secretary) to require an eventual total expenditure for research, development, test, and evaluation of approximately $300 million in FY 1990 constant dollars and procurement of approximately $1.8 billion in FY 1990 constant dollars. The Under Secretary designates the programs as either ACAT ID, making himself the milestone decision authority, or ACAT IC, making the cognizant DoD Component Head the milestone decision authority. The DoD Component Head can further delegate to the Component Acquisition Executive the authority as the milestone decision authority.

**Administrative Letter.** Laboratory and program office modifications to the omnibus contract that describe the work and the cost of the work.

**Approved Program Baseline.** An approved program baseline embodies the cost, schedule, and performance objectives for the program. The milestone decision authority approves the baseline at milestone reviews. Minimum acceptable requirements known as thresholds accompany the objectives. If program results do not meet these thresholds, the milestone decision authority requires a reevaluation of alternative concepts or design approaches. At Milestone II, the milestone decision authority approves the development baseline for the engineering and manufacturing development effort.

**Common Equipment Set.** The Common Equipment Set is the objective hardware configuration for the CEC Program consisting of the CEC antenna, CEC processor, and the Data Distribution System. The Common Equipment Set will be substantially smaller than the current prototype equipment and have more processing power. The Common Equipment Set will weigh approximately 1,500 pounds and 500 pounds for shipboard and airborne units, respectively. The current shipboard and airborne CEC prototype units weigh about 8,000 pounds and 4,800 pounds, respectively.

**Cooperative Engagement Processor and Software.** The Cooperative Engagement Processor and software allow the CEC user to operationally execute the CEC anti-air warfare capability.

**Cost/Schedule Control System Criteria.** The DoD Instruction 5000.2 states that the purpose of cost, schedule, control systems criteria is to provide the contractor and Government program managers with accurate data to monitor the execution of their programs and to provide an adequate basis for responsible decisionmaking by requiring the contractor's internal management control systems to produce data that:

- o indicate work progress;
- o relate cost, schedule, and technical accomplishment;

o provide valid, timely, and auditable information; and

o provide DoD Component managers with information summarized at a practical level.

Further, the Instruction requires research and development cost-type contracts and subcontracts, totaling $60 million or more, to have cost/schedule control systems criteria. The Instruction does not require compliance with cost/schedule control systems criteria on firm fixed-price or level-of-effort contracts; however, the milestone decision authority can make exceptions to the Instruction when deemed necessary.

**Data Distribution System.** The Data Distribution System is the communications portion of the CEC Program. It is comprised of hardware and software that allow CEC-equipped units to share the information processed by the CEC processor.

**Defense Acquisition.** The DoD Directive 5000.1 establishes policies for translating operational needs into stable, affordable programs; acquiring quality products; and organizing for efficiency and effectiveness. The Directive states that the program office will structure the acquisition process in discrete logical phases separated by major decision points called milestones and acquisition strategies are to be event-driven and link major contractual commitments and milestones decisions to demonstrated accomplishments in development and testing.

**Deploy/Deployment.** Deploy/Deployment is fielding of the weapon system by placing it into operational use with trained units in the field or fleet.

**Design Agent.** The CEC Program Office refers to its contractors (system developers) as design agents.

**Integrated Test Plan.** An integrated test plan records individual test plans for the subcontractor, prime contractor, and the Government. The plan includes all developmental tests that the prime contractor and the subcontractor perform at the system and subsystem levels. The plan is a detailed, working-level document that assists the program office in identifying risk as well as duplicative or missing test activities. A well-maintained plan facilitates the most efficient use of test resources.

**Integrated Test Program Schedule.** An integrated test program schedule is a chart in a program's TEMP that displays a program's time sequencing of the critical test and evaluation phases, related activities, and planned cumulative funding expenditures by appropriation.

**Link-11.** Link-11 is a Navy command and control system that provides for communication between ships.

**Milestone Decision Authority.** At each decision point, the milestone decision authority for an ACAT ID and IC program assesses the status of the program relative to the user's needs, the established program baseline and acquisition strategy, and approved financial plans. The milestone decision authority also:

o evaluates the updated acquisition strategy and the plans for conducting the next phase and managing risk;

o makes cost-performance-schedule trade-offs;

o assesses the affordability of what is being proposed; and

o determines whether the program should be terminated, redirected, or allowed to continue into the next phase.

**Milestone Decision Points.** At milestone decision points, the program office provides the milestone decision authority information concerning the readiness of the program to proceed to the next phase of the acquisition process. At:

o Milestone I, Concept Demonstration and Approval, the milestone decision authority determines whether a program office should start a new acquisition program;

o Milestone II, Development Approval, the milestone decision authority determines whether the program office should continue a demonstration and validation program;

o Milestone III, Production Approval, the milestone decision authority determines whether the program office should build, deploy, and support a program; and

o Milestone IV, Major Modification Approval, the milestone decision authority determines whether the system currently in production warrants major modifications.

**Omnibus Contract.** This legal agreement between the Space and Naval Warfare Systems Command and the Laboratory provides for the Laboratory to develop 286 items concurrently for the Government.

**Operational Requirements Document.** An operational requirements document is a document containing operational effectiveness and operational suitability parameters for a proposed system or concept.

**Software Development Plan.** A software development plan defines the software processes, including corporate policies, practices, and standards that the contractor must follow throughout the software development process. The Government must verify that the developer understands the scope of the software development effort and that the developer can meet the user's needs.

**Systems Engineering.** Systems engineering establishes the basis for integrating the technical efforts of the design team to meet program cost, schedule, and

performance objectives. The objectives include an optimal design solution that encompasses the system and its associated manufacturing, test, and support processes.

**Systems Integration.** Systems integration is the engineering efforts needed so a weapon system will function effectively with other existing weapon systems.

**Technical Direction Agent.** The technical direction agent is a contractor that assists the program office in:

- o establishing initial program concepts;
- o performing or directing research, development, tests, and simulations to investigate problems;
- o probing alternative technical approaches; and
- o evaluating design agent achievements.

**Test and Evaluation Master Plan.** A test and evaluation master plan documents the overall structure and objectives of the test and evaluation program.

# Appendix C. Prior Audit

The Inspector General, DoD, issued a report concerning the Johns Hopkins University/Applied Physics Laboratory (the Laboratory). Report No. 95-001, "Navy Proposed Follow-On Research and Development Contract for Johns Hopkins University Applied Physics Laboratory," October 3, 1994, stated that the Navy intended to award a $1.2 billion contract noncompetitively to the Laboratory without adequate justification. The task order structure of the proposed contract did not require task sponsors to seek competition for the individual task orders issued under the contract and caused management and control problems for contracting personnel and other oversight groups. Additionally, the Navy had not evaluated the use of the fee* paid to the Laboratory since 1962. The report recommended that the Navy:

o clearly define the essential capabilities that the Navy wanted to maintain at the Laboratory,

o demonstrate that the Laboratory was uniquely qualified to provide those capabilities,

o determine whether sources other than the Laboratory could provide the services being procured from the Laboratory,

o prepare a basic ordering agreement to replace the task order contract with the Laboratory, and

o reassess the fee arrangement with the Laboratory.

In response to the recommendations, the Navy stated that it intended to:

o conduct a study to determine whether other organizations could provide the same types of services as those obtained from the Laboratory,

o award follow-on contacts in the basic ordering agreement format to other smaller university-affiliated laboratories,

o transition the Laboratory's contract to a basic ordering agreement, and

o assess the fee paid to the Laboratory.

In the final report, the Inspector General, DoD, stated that the Navy comments were responsive to the recommendations and requested that the Navy provide the completion dates for planned action by December 5, 1994.

*The fee establishes a stabilization and contingency fund to provide the Laboratory staff with stable funding, to ensure reasonable continuity in the event that the relationship between the Government and the Laboratory substantially changes, to pay management costs and non-reimbursable items, to protect against major contract disallowances, and to reimburse the Johns Hopkins University for costs incidental to the operation of the Laboratory.

# Appendix D. Developmental and Operational Testing Guidance

**Developmental Testing.** DoD Instruction 5000.2, "Defense Acquisition Policies and Procedures," February 23, 1991, requires program offices to structure developmental test and evaluation programs in the TEMP that are designed to identify potential operational and technical limitations of a program and to substantiate the achievement of contract technical requirements.

**Operational Testing.** DoD Instruction 5000.2 requires program offices to structure operational and evaluation programs in the TEMP that are designed to determine the operational effectiveness and suitability of a weapon system under realistic combat conditions and to determine whether the weapon system will satisfy the minimum acceptable operational requirements as specified in the operational requirements document.

**Operational Assessments.** DoD Instruction 5000.2 requires the Military Department's independent test organization to conduct an early operational assessment in support of the Milestone II, Development Approval, decision. The purpose of the early operational assessment is to note significant trends in development efforts, areas of program risk, adequacy of requirements, and the ability of the program to support adequate operational testing. The Instruction specifically states that operational assessments may be made at any time using prototypes but *will not substitute for the independent operational test and evaluation* necessary to support full production decisions (emphasis added).

**Operational Test and Evaluation.** Before the full production decision, DoD Instruction 5000.2 requires the Military Department's independent test organization to conduct a dedicated phase of operational test and evaluation (dedicated operational test) using production test articles. The use of system contractors in support of the dedicated operational test is restricted by Title 10, United States Code, Section 2399, "Operational Test and Evaluation of Defense Acquisition Programs." The purpose of the dedicated operational test is to determine whether the weapon system is operationally effective and suitable under realistic combat conditions.

# Appendix E. Summary of Potential Benefits Resulting From Audit

| Recommendation Reference | Description of Benefit | Amount and/or Type of Benefit |
|---|---|---|
| A.1. | Internal Control and Program Results. Will provide effective management of the CEC Program. | Nonquantifiable because benefits depend on future Navy actions. |
| A.2. | Internal Control. Will incorporate cost and pricing data into the CEC engineering and manufacturing development contract. | Nonquantifiable because benefits depend on future Navy actions. |
| B.1.a. | Internal Control and Program Results. Will ensure that the Test and Evaluation Master Plan for the CEC Program includes and funds functional and structural software testing and includes the performance of a dedicated operational test and evaluation before the initial operational capability date. | Nonquantifiable because benefits depend on future OSD and Navy actions. |
| B.1.b. | Internal Control and Program Results. Will ensure that the Test and Evaluation Master Plan is submitted for review and approval before the Milestone II, Development Approval, decision. | Nonquantifiable because benefits depend on future OSD and Navy actions. |
| B.2. | Internal Control and Program Results. Will ensure that the CEC Program is operationally effective and suitable before the Navy declares the CEC Program initial operational capability date. | Nonquantifiable because benefits depend on future Navy actions. |
| B.3. | Internal Control and Program Results. Will ensure that development test results support that the CEC Program is ready for operational testing. | Nonquantifiable because benefits depend on future OSD and Navy actions. |

# Appendix F. Organizations Visited or Contacted

## Office of the Secretary of Defense

Under Secretary of Defense for Acquisition and Technology, Washington, DC
  Director, Test, Systems Engineering and Evaluation, Washington, DC
Under Secretary of Defense (Comptroller), Washington, DC
  Director, Program Analysis and Evaluation, Washington, DC
Assistant Secretary of Defense (Command, Control, Communication and Evaluation), Washington, DC
Director, Operational Test and Evaluation, Washington, DC

## Department of the Navy

Chief of Naval Operations, Washington, DC
Commander in Chief, U. S. Atlantic Command, Norfolk, VA
Assistant Secretary of the Navy (Financial Management), Washington, DC
Naval Sea Systems Command, Arlington, VA
  Cooperative Engagement Capability Program Office, Arlington, VA
  Naval Surface Warfare Center, Dahlgren Division, Dahlgren, VA
Space and Naval Warfare Systems Command, Arlington, VA
  Naval Technical Representative Office, Applied Physics Laboratory, Laurel, MD
Office of Naval Research, Arlington, VA

## Department of the Air Force

Assistant Secretary of the Air Force (Acquisition), Washington, DC

## Other Defense Organizations

Defense Contract Audit Agency, Alexandria, VA
  Defense Contract Audit Agency, Applied Physics Laboratory, Laurel, MD
  Defense Contract Audit Agency, E-Systems, ECI Division, Saint Petersburg, FL
  Defense Contract Audit Agency, Lockheed Aeronautical Systems Company, Calabasas, CA
  Defense Contract Audit Agency, Lockheed Aeronautical Systems Company, Marietta, GA
Defense Logistics Agency, Alexandria, VA
  Defense Contract Management Command, Alexandria, VA
  Defense Contract Management Area Operations, Clearwater, FL
Director, Joint Staff, Washington, DC

## Non-Defense Federal Organizations

U.S. Department of Transportation, Washington, DC
U.S. Department of Treasury, Washington, DC

## Contractors

E-Systems, ECI Division, Saint Petersburg, FL
Johns Hopkins University/Applied Physics Laboratory, Laurel, MD

# Appendix G. Report Distribution

## Office of the Secretary of Defense

Under Secretary of Defense for Acquisition and Technology
  Principal Deputy Under Secretary of Defense (Acquisition and Technology)
    Director, Acquisition Program Integration
    Director, Test, Systems Engineering and Evaluation
  Deputy Under Secretary of Defense (Acquisition Reform)
Under Secretary of Defense (Comptroller)
  Director, Program Analysis and Evaluation
Assistant Secretary of Defense (Command, Control, Communications and Intelligence)
Director, Operational Test and Evaluation
Assistant to the Secretary of Defense (Public Affairs)
Director, Administration and Management

## Department of the Army

Auditor General, Department of the Army

## Department of the Navy

Secretary of the Navy
Assistant Secretary of the Navy (Financial Management)
Assistant Secretary of the Navy (Research, Development and Acquisition)
Comptroller of the Navy
Naval Air Systems Command
Naval Sea Systems Command
  Cooperative Engagement Capability Program Office
  Naval Surface Warfare Center, Dahlgren Division
Space and Naval Warfare Systems Command
  Naval Technical Representative Office, Applied Physics Laboratory
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

## Other Defense Organizations

Director, Defense Contract Audit Agency
  Defense Contract Audit Agency, Applied Physics Laboratory, Laurel, MD
Director, Defense Information Systems Agency
Director, Defense Logistics Agency
  Commander, Defense Contract Management Command
    Defense Contract Management Area Operations, Clearwater, FL
Director, National Security Agency
Director, Joint Staff
Inspector General, Central Imagery Office
Inspector General, National Security Agency
Director, Defense Logistics Studies Information Exchange

## Non-Defense Federal Organizations

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 National Security
  House Committee on Government Reform and Oversight
  House Subcommittee on National Security, International Affairs, and Criminal Justice, Committee on Government Reform and Oversight

# Part IV - Management Comments

# Director, Operational Test and Evaluation, Comments

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, DC 20301-1700

OPERATIONAL TEST AND EVALUATION

13 FEB 1995

MEMORANDUM FOR DEPARTMENT OF DEFENSE INSPECTOR GENERAL

SUBJECT: Draft of Proposed Audit Report on the Cooperative Engagement Capability (CEC) Program

Thank you for the opportunity to review and comment on the findings and recommendations in your proposed report. The report findings address issues in two areas: (1) Finding A, program management and development and (2) Finding B, initial operational capability (IOC). I have no comment regarding Finding A and associated recommendations.

With respect to Finding B and associated recommendations, I have provided detailed comments below. Please note my comment on the portion of the recommendation that "the Director, Operational Test and Evaluation, not approve the Test and Evaluation Master Plan unless it includes the performance of a dedicated operational test and evaluation of a production-representative configuration of the Cooperative Engagement Capability Program before declaring the attainment of (IOC)."

There are several criteria that must be satisfied before I will approve a TEMP. Among these is adequate provision for dedicated OT&E prior to the beyond low-rate initial production (B-LRIP) decision. That OT&E serves as the basis for my B-LRIP Report to the Congress, which must precede the B-LRIP decision. There is no TEMP approval criterion keyed to declaration of IOC by a Service. My detailed comments are attached.

Philip E. Coyle
Director

Attachment
As stated

Final Report Reference

COMMENTS ON DOD IG WORKING DRAFT
OF A PROPOSED AUDIT REPORT ON THE
COOPERATIVE ENGAGEMENT CAPABILITY (CEC) PROGRAM

The subject report presents two findings with associated conclusions and recommendations. The report findings address issues in two areas: (1) Finding A, program management and development and (2) Finding B, initial operational capability (IOC). I have no comment regarding Finding A and associated recommendations. The following comments are with regard to test and evaluation matters associated with Finding B and its associated recommendations.

1. Page 16, **DoD Policy.** It is stated in the report that DoD Instruction 5000.2 established DoD policy for conducting developmental and operational testing to determine whether a system meets contract technical requirements and is operationally effective and suitable before a system is fielded. Comment: DoDI 5000.2 establishes defense acquisition management policies and procedures. It states that test and evaluation programs shall be structured to "provide essential information for assessment of acquisition risk and for decisionmaking" and to "verify that systems are operationally effective and suitable for intended use." Operational test and evaluation (OT&E) is a process to provide acquisition executives an independent assessment of operational effectiveness and suitability prior to their deciding on whether or not to commit to low-rate initial production or full rate production. Further, I report to the Congress, based on the results of dedicated OT&E, whether the testing was adequate and whether the system under test is operationally effective and operationally suitable, prior to the decision to proceed beyond low-rate initial production. The fielding of a military system with interim or full capability is a Service decision. 15

2. Page 18. According to the report, DoDI 5000.2 states that operational assessments may be made at any time using prototypes but will not substitute for the independent operational test and evalaution necessary to support decisions to field production units. Comment: DoDI 5000.2, Part 8 Test and Evaluation, states (1) that OT&E does not include an operational assessment based exclusively on computer modeling, simulation or an analysis of certain information contained in program documents (Section 2.b); (2) that early operational assessments shall be emphasized to assist in identifying risks (Section 2.e); and (3) that a final independent phase of operational test and evaluation shall be required for beyond low-rate production decisions (Section 2.h.(2)). 17

3. Page 19. According to the report, under **Developmental Test Environment**, personnel from the Office of the Director, Operational Test and Evaluation, stated that, the CEC Program 17-18

**Final Report Reference**

Operational Test and Evaluation, stated that, the CEC Program Office planned the test so that: (1) the weather at the test site was conducive to the assessment; and (2) the assessment was not adequate to certify that the CEC Program was ready for operational fielding. Comment: (1) The DOT&E staff assistant stated that tests were not conducted during a period of heavy rainfall that occurred during the test period and that the Caribbean Sea environment is characterized by ducting, which facilitates data link communication at extended distances. (2) The DOT&E Staff assistant stated that the assessment was not adequate for reaching conclusions on operational effectiveness and operational suitability of the CEC system.

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4. Page 20. According to the report, under **Test and Evaluation Master Plan Approval**, the Office of Director, Operational Test and Evaluation has reviewed the draft TEMP and has withheld TEMP approval until the Navy included adequate measures of effectiveness to measure the success of planned operational tests in FY 1997. Comment: Provision of adequate measures of effectiveness is one of several criteria considered during TEMP review. A Navy-approved TEMP for CEC has not been submitted for review by the Office of the Secretary of Defense.

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5. Pages 21-22. The report recommends that the Director, Operational Test and Evaluation, not approve the TEMP unless it includes the performance of a dedicated operational test and evaluation of a production-representative configuration of the CEC Program before declaring the attainment of initial operational capability. Response: Adequate provision in a TEMP for dedicated OT&E to support a beyond low-rate initial production (B-LRIP) decision is among the criteria that must be met before I will approve a TEMP. There is no TEMP approval criterion keyed to declaration by a Service of partial capability or full capability.

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