United States General Accounting Office

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Report to the Chairman, Subcommittee on Defense, Committee on Appropriations, House of Representatives

July 1991

BATTLEFIELD AUTOMATION

Army Tactical Command and Control System Development Problems

GAO/NSIAD-91-172

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-244274

July 31, 1991

The Honorable John P. Murtha
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

As you requested, we reported[1] on the status of the Army Tactical Command and Control System's cost, schedule, testing, and performance. The system has encountered technical problems, schedule slippage, and cost increases throughout its approximate 5-year life. This report focuses on weaknesses in the Army's efforts to develop three segments of the Army Tactical Command and Control System—All Source Analysis System, Maneuver Control System, and Common Hardware and Software.

Background

The Army Tactical Command and Control System program, initiated in fiscal year 1986, is the Army's comprehensive approach to automating its tactical command and control systems and improving its communications systems. The program, which is estimated to cost over $17 billion, includes over 14,000 common computers. It is being designed to enhance the coordination and control of combat forces through automated management of five key battlefield functional areas. These areas and their systems are (1) planning, direction, and control of artillery—Advanced Field Artillery Tactical Data System; (2) status monitoring of troop movements and general battlefield conditions—Maneuver Control System; (3) control of short-range air defense weapons—Forward Area Air Defense Command, Control, and Intelligence; (4) management of supply, maintenance, transportation, medical, and personnel activities—Combat Service Support Control System; and (5) reception, analysis, and distribution of intelligence and electronic warfare information—All Source Analysis System.

The voice and data communications capabilities that will link the battlefield areas and their component systems will be provided by three communications systems (the Army Data Distribution System, the Mobile Subscriber Equipment, and the Single Channel Ground and Airborne

[1]Battlefield Automation: Army Tactical Command and Control System's Schedule and Cost (GAO NSIAD-91-118BR, Apr. 15, 1991).

Radio System). These systems will provide (1) low- to high-rate data transmissions—Army Data Distribution System, (2) area-wide telephone-like communications—Mobile Subscriber Equipment, and (3) combat net radio—Single Channel Ground and Airborne Radio System. The Common Hardware and Software segment will support the Army Tactical Command and Control System by providing computer system commonality.

Results in Brief

The Army's current strategy for fielding All Source Analysis System equipment includes the development of three systems—a limited capability configuration system, a baseline system, and the objective system. The Army plans to develop a limited system that will have the minimum set of features the users need and then add features when other versions are developed. The reduced Warsaw Pact/Soviet threat and the availability of existing capabilities similar to the All Source Analysis System have eliminated the need for further procurement of the limited capability system. Current All Source Analysis System equipment can be used to help refine software and system requirements. Further, the Army's current test plan for the All Source Analysis System, which has not been approved, calls for testing the system with software that does not meet user requirements.

The Maneuver Control System has yet to be successfully developed. The Army has spent $155 million to acquire Maneuver Control System equipment that it now says does not meet its system requirements. The Army is compressing its current development and acquisition process to make a production decision so it can acquire equipment at the end of fiscal year 1992. Also, the Army is compressing the schedule, even though (1) the revised Maneuver Control System test and evaluation master plan has not been approved, (2) the operational test criteria have not been adequately defined, and (3) other obstacles to a successful operational test have not been resolved. In addition, further hardware and software changes are planned for the system, even though the Army has yet to define system requirements. The Army appears to be rushing the Maneuver Control System's development and acquisition process, which may result in additional procurement of equipment that may not meet user requirements.

The Army has cited several reasons for acquiring larger, transportable Common Hardware and Software computers and requiring many users that only need the less expensive, portable versions to buy the larger units. However, the disparity between the $340 million increase in

acquisition costs and the logistical and hardware savings, as well as other benefits to be derived, does not support the Army's position.

Details on the weaknesses in the Army's efforts to develop the All Source Analysis System, the Maneuver Control System, and the Common Hardware and Software computers are contained in appendix I.

Matters for Congressional Consideration

Because of the continuing weaknesses in the development of the All Source Analysis System, the Maneuver Control System, and the Common Hardware and Software computers, the Congress may wish to

- eliminate all funding for the development and acquisition of a limited capability All Source Analysis System;
- not approve any Maneuver Control System procurement funds until (1) specific requirements for the light divisions are defined, (2) a test plan that includes testing major software revisions prior to a production decision is developed and approved, and (3) the revised system successfully completes an operational test that demonstrates its military effectiveness; and
- not approve any procurement funds for the larger Common Hardware and Software computers until the Army completes needs and economic analyses that (1) demonstrate the need to have the same capability at each unit and (2) justify the additional investment.

Recommendations

We recommend that the Secretary of Defense direct the Secretary of the Army to

- stop further acquisition of the limited capability All Source Analysis System;
- develop and follow a test plan that will establish a baseline upon which to measure the merits of the All Source Analysis System and ensure user requirements are met before a production decision is made;
- ensure that (1) the Maneuver Control System's requirements for the light divisions are defined, (2) a Maneuver Control System test plan is developed and approved for light divisions and updated and approved for heavy divisions, and (3) the new Maneuver Control System successfully completes an operational test that demonstrates its military effectiveness using the software version that is to be fielded; and
- perform economic and needs analyses that justify the increase in Common Hardware and Software acquisition costs because units will

now be required to use the transportable Common Hardware and Software computers at many locations.

Agency Comments

The Department of Defense (DOD) partially concurred with the report. It agreed that all systems must have test plans and appropriate testing prior to decision reviews. DOD also stated that all systems within the Army Tactical Command and Control System have test plans that are in various stages of the approval process. We have changed the report to reflect this comment. However, our concern with testing plans, as stated in the report, is that the plans for the Maneuver Control System were approved by the Army but not by DOD as required. Now the plans are being revised. We are also concerned, as stated in the report, that the testing plans do not cover testing of a light division system.

DOD commented that some of the issues mentioned in this report would be examined during a July 1991 DOD review of the Army Tactical Command and Control System program. We believe this is a step in the right direction, and we will monitor the results of DOD's review.

DOD partially concurred with most of our recommendations on the All Source Analysis System and the Maneuver Control System, but believed they were not needed because DOD Directive 5000.1 on defense acquisition requires the steps we are recommending. Our findings do not offer a high level of confidence that DOD Directive 5000.1 has been fully applied to the All Source Analysis System and Maneuver Control System procurements. Therefore, we believe that specific direction is needed. The DOD review in July would be a good place to stress the need for the improvements we are recommending.

DOD concurred with the need to define Maneuver Control System requirements for the light divisions, and it plans to do so no later than the first quarter of fiscal year 1992. We will continue to monitor DOD's and the Army's implementation efforts.

DOD partially concurred with our recommendation to perform economic and needs analyses that justify the increase in Common Hardware and Software costs. The Army is currently doing a needs analysis that we will continue to monitor. However, DOD did not provide a specific plan for doing an economic analysis as required by DOD directives. We believe that the $340 million increase in Common Hardware and Software costs attributable to the decision to buy the larger Common Hardware and Software system has not been justified.

DOD's detailed comments and our rebuttal are included in appendix II.

Scope and Methodology

To determine weaknesses in the three Army Tactical Command and Control System segments, we reviewed acquisition plans, cost estimates, schedules, test plans, and other pertinent documents. We discussed each segment's estimated costs, schedule, and performance with officials at the

- Army Tactical Command and Control System program offices in McLean, Virginia, and Fort Monmouth, New Jersey;
- Office of the Secretary of Defense for Command, Control, Communications, and Intelligence; Army Offices of the Under Secretary of the Army and the Deputy Chief of Staff for Operations; Director, Information Systems Command, Control, Communications, and Computers in Washington, D.C.;
- Army test and evaluation agencies in Aberdeen, Maryland; Fort Monmouth, New Jersey; Alexandria, Virginia; and Washington, D.C.;
- *Combined Arms Center, Fort Leavenworth*, Kansas; and
- Army Tactical Command and Control System development contractor offices in Leavenworth, Kansas, and El Segundo, California.

We performed our review from January 1991 to May 1991 in accordance with generally accepted government auditing standards.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 10 days from the date of this letter. At that time, we will send copies to the Chairmen of the House and Senate Committees on Armed Services and the Senate Committee on Appropriations; the Secretaries of Defense and the Army; and other interested parties.

This report was prepared under the direction of Louis J. Rodrigues, Director, Command, Control, Communications, and Intelligence Issues, who may be reached on (202) 275-4841 if you or your staff have any questions concerning this report. Other major contributors to this report are listed in appendix III.

Sincerely yours,

Frank C. Conahan
Assistant Comptroller General

Contents

Abbreviations

ASAS	All Source Analysis System
CHS	Common Hardware and Software
DOD	Department of Defense
GAO	General Accounting Office
MCS	Maneuver Control System

Army Tactical Command and Control System Development Problems

All Source Analysis System Acquisition Strategy Is Outdated

In 1986, the Army developed a plan to field a limited capability All Source Analysis System (ASAS) because of an urgent need in Europe, and it purchased some parts of the system. The Army intends to buy additional system parts, despite a reduced threat in Europe and the subsequent development and availability of an alternative system with similar capabilities. A prior Army test has been unsuccessful in establishing the required performance baseline for ASAS, and a production decision will be based on a software version that lacks key features users need.

Description of ASAS

ASAS is intended to automate the fusion of intelligence and combat information on the types of enemy units, as well as to process information on these units' locations, movements, and projected capabilities and intentions. It is to automate data analysis and provide a coherent picture of the enemy situation. It will disseminate this information to commanders so that they can make timely, well-informed decisions.

The Army's current strategy for fielding ASAS equipment includes the development of three systems—a limited capability configuration system, a baseline system, and the objective system. The Army plans to develop a limited system that will have the minimum set of features the users need and then add features when other versions are developed. Additional purchases of equipment that will have the limited capability configuration are planned to provide enough equipment for two complete sets and training units. This equipment will be sent to Fort Hood, Texas, where the other limited capability configuration equipment continues to be used. According to the Army's current plans, the equipment will be used to develop another limited capability system it calls the baseline system.

The Army expects to make a production decision on the baseline system that will use version 2.0 software during fiscal year 1993. When fielding starts, the Army plans to implement version 2.1 software, which includes key features the primary user, the Army Intelligence Center and School, insists are needed in a fielded system, including the automatic sanitization of data and the integration of Defense Intelligence Agency data bases. In fiscal year 1992, the Army will begin the development of a more capable system referred to as the objective system that will use Ada software and common hardware. The Army, due to limited funding, has delayed its plans to begin production of the objective system from fiscal year 1993 to fiscal year 1998.

Further Procurement of the Limited Capability ASAS Is Not Needed

The ASAS acquisition strategy delays fielding a fully capable system to active forces while retaining early fielding of a limited capability system. The Army, under a limited procurement (urgent) designation, continued limited production by awarding a contract for the limited capability system in March 1990. For fiscal year 1990, the contract was valued at $70 million, and it has additional option years that have not been priced. Overall, the Army plans to spend $168.7 million to develop and acquire a system with hardware and software that it already intends to replace with another system. The Army's need for additional limited capability ASAS systems is questionable for the following reasons:

- The Army's acquisition plan for ASAS justified the urgency for a limited capability system based on the Warsaw Pact/Soviet threat in Europe. However, according to Department of Defense (DOD) officials, the North Atlantic Treaty Organization's pressing requirement to acquire and attack Warsaw Pact/Soviet ground targets has diminished. The change in East-West relations also raises questions about the need for the Army to continue acquiring a limited capability ASAS.
- An existing system that has capabilities similar to the limited capability ASAS may meet a significant part of the requirements that the objective ASAS is intended to satisfy. The Tactical Exploitation of National Capabilities Program has equipment that has demonstrated significant ASAS-like capabilities. This equipment, which is operational at the corps and echelon above corps levels, can (1) automate the fusion of intelligence and combat information; (2) process information on unit locations, movements, and projected capabilities and intentions; and (3) disseminate this information to commanders so they can make timely, well-informed decisions. Planned improvements to the equipment will further automate data analysis and provide an improved picture of the enemy situation.
- The limited capability configuration system previously tested at Fort Hood, Texas, along with the $70 million of equipment purchased in 1990, is planned to be used to conduct software verifications and testing leading to the baseline system production decision in fiscal year 1993. The planned buys of equipment in fiscal years 1992 and 1993 will be the second complete set of limited capability systems and additional training unit equipment. This second limited capability system will become the first system to be fielded as the baseline system.

The Army Does Not Have an Approved Test Plan for the Baseline ASAS

A test plan is generated to evaluate development efforts prior to a major procurement decision. The Army, however, has no approved test plan for the baseline ASAS. In addition, the Army's current strategy will not provide adequate performance information for the scheduled ASAS baseline production decision because the software lacks key features users need. These features are to be available in version 2.1 software scheduled for release in October 1992, 2 months after operational testing is to be completed. Therefore, the Army's production decision will be based on test results that do not include these features.

Army officials are concerned that if operational testing is deferred until the key features are available, they will not be able to make a production decision until fiscal year 1994. Such a delay, according to these officials, could result not only in the loss of the ASAS fiscal year 1993 funding commitment but also in the program's termination. To keep fiscal year 1993 funds, the developer has prevailed upon the primary user to agree to field the limited capability system without meeting its minimum requirements, with the expectation that these key features will be added later.

The Manuever Control System's Acquisition Schedule Is Unrealistic

The Army is unnecessarily rushing the Maneuver Control System's (MCS) development and acquisition process, which could result in more unnecessary procurement. Commanders believe that the current system has not successfully demonstrated its military usefulness. Prior efforts to field MCS resulted in the Army's spending $155 million in acquisition funds for MCS equipment that did not meet user requirements. Undefined MCS requirements and lack of an approved test plan could result in further unnecessary procurement of MCS equipment that may not meet user requirements.

Description of MCS

Currently, MCS is composed of two types of computers that are not Common Hardware and Software (CHS) configurations—nondevelopmental and militarized.[2] MCS is an automated corps-to-battalion system to help maneuver commanders and their battle staff control combat forces. It is being developed (1) to enable the command staff to collect, store, process, display, and disseminate critical battlefield information

[2]Nondevelopmental items are any items that are (1) commercially available, (2) in use by a U.S. agency or foreign government with which the United States has a mutual defense cooperation agreement, or (3) in (1) or (2) that require only minor modification. Militarized hardware has been specifically designed and custom built for military use to operate under adverse conditions.

and (2) to produce and communicate battle plans, orders, and enemy and friendly situation reports.

Prior Failures in MCS Equipment Acquisitions

The Army Operational Test and Evaluation Command has reported that MCS has not demonstrated its effectiveness in providing timely, accurate, and useful information in a battlefield environment. It noted that MCS's primary use during the latest validation was for facsimile transmissions. Also, commanders indicate that MCS provides little or no aid in controlling maneuver forces. The Army has invested $126 million in militarized MCS equipment that will be withdrawn from units due to (1) the limitations of its unique operating system, (2) the inability to convert to a common operating system, (3) the memory capacity restrictions, and (4) a limited mapping capability. Furthermore, the Army decided not to deploy nondevelopmental MCS equipment procured for the light divisions at a cost of about $29 million. Bulky size and excessive weight were the reasons given for the light divisions' refusal to accept the equipment.

Lack of an Approved Test Plan Could Result in More Unnecessary Procurement

The Army plans further MCS development and production that it estimates will cost about $1.3 billion. For fiscal year 1992, the Army has requested $45.9 million to initiate the MCS equipment acquisition. However, the Army has not developed a comprehensive, effective test plan for the new MCS equipment and software because the current test plan does not include light divisions. Without an effective plan that includes light divisions, the potential exists for further unnecessary procurement. In addition, by compressing the MCS test schedule leading up to the operational test, the Army may not adequately demonstrate MCS's battlefield effectiveness. In April 1990, when the current MCS equipment was rejected, the Army Vice Chief of Staff directed that a light division system with reduced capability be developed within 18 months. A light division system experiment conducted in phases is to take place during fiscal year 1991 to define user requirements and system capabilities. According to Army officials, as of March 1, 1991, limited progress had been made, and this effort remained unfunded.

The Army's plans for testing MCS are incomplete and not approved. Army officials said that the revised test and evaluation master plan had not been approved by DOD because MCS operational test criteria were not adequately defined to ensure MCS battlefield effectiveness. In addition, this plan only addresses heavy divisions and must be amended for light

division requirements. Also, test officials are concerned with the adequacy of test preparations and unit training in support of the MCS acquisition and fielding decisions.

We noted that the Army has compressed the test schedule for MCS so that it can meet a scheduled production decision milestone. The Army had planned for an 11-month period of software acceptance testing, verification, and implementation of fixes, which included 4 months of unit operational preparation and training, leading up to the operational test. This 11-month period has now been compressed to 3.5 months to keep to the scheduled operational test date and to not delay the production decision. According to Army officials, the Army is also considering eliminating a preliminary test that would aid in assessing system software and test units' readiness for the operational test.

The availability of units to conduct the operational test is questionable. In September 1990, the Army suspended support of planned test and evaluation activities due to Operation Desert Shield. According to Army officials, units not involved in Desert Shield had already made other commitments.

The Army's Decision to Acquire Larger CHS Computers Was Not Adequately Justified

Our evaluation showed that the Army's decision to acquire larger CHS computers increases the Army Tactical Command and Control System's acquisition costs by at least $340 million. The Army believes that every large CHS computer should have the capacity to provide enhanced mapping and graphics capabilities. However, the purchase of larger computers and the resultant cost increases are not justified by economic and needs analyses. These analyses should have been conducted prior to the Army's deciding to acquire the larger computers.

Description of CHS

The CHS acquisition strategy is to maximize the use of off-the-shelf commercial computer hardware and software products and acquire ruggedized,[3] rather than militarized, versions of computer hardware for the more stringent operating conditions encountered during military operations. When the CHS contract was awarded in August 1988, it provided for three types of computers—a portable computer unit, a transportable computer unit, and a hand-held computer unit—and peripheral equipment, such as printers and disk drives. The units were to have a variety

[3]Ruggedized hardware has been adapted to enhance its capabilities in a stressful environment but is often less tolerant of adverse operating conditions than militarized hardware.

of processing and memory capacities, as well as commercial and ruggedized versions. The Army decided in June 1990 that users would standardize on a larger, transportable unit with the maximum available main memory and secondary storage capacity.

A Larger, More Expensive Computer Was Selected Without Proper Justification

The Army's decision to use larger, transportable computers is expensive and unsupported. DOD regulations require that economic and needs analyses be performed to compare the relative merits of the alternatives' benefits and costs for achieving an objective in the most efficient and effective manner. However, according to Army officials, the Army did not perform these analyses before it decided to acquire the larger, transportable computer.

As of December 1990, CHS program cost estimates had nearly doubled to $1.4 billion. For example, the Army had originally planned to purchase one type of CHS computer system for combat service support costing about $36,000. The Army is now estimating the unit cost at $78,000 per larger, transportable system. The change to a larger, transportable system contributes at least $340 million to the $666 million CHS program cost increase. The additional $326 million in the CHS cost estimate is due to program stretch-out, ranging from 2 to 11 years, software expenses, 65 additional systems, and procurement of spare parts.

The Army believes the larger system is needed to (1) enhance performance, (2) improve interchangeability in the field, and (3) provide logistical savings. According to Army officials, in comparison to the smaller portable computer, the larger, transportable computer will have the main and secondary storage capacities needed to process maps faster and it will provide greater flexibility. For example, they told us that if a computer breaks down, field units can interchange the software. In supporting its decision, the Army estimated $130.9 million of cost avoidance resulting from commonality of logistics and hardware. However, the Army did not prepare an economic analysis that compared the logistics savings and other benefits to the $340 million net increase in equipment acquisition costs.

The Army has not done a thorough needs analysis to determine locations that need the additional capability of the larger, transportable system. By the fourth quarter of fiscal year 1991, the Army expects to complete an analysis of users' computer requirements for such

capabilities as mapping, graphics, and general computations. Its analysis will consider the users' overall ability to function with a smaller or larger system, both in terms of physical size and weight and processing capabilities.

Comments From the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE

ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301-3040

May 29, 1991

Mr. Frank C. Conahan
Assistant Comptroller General
National Security and International Affairs Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report--"Battlefield Automation: Army Tactical Command and Control System Development Problems," dated April 15, 1991 (GAO Code 395168) OSD Case 8664. The DoD partially concurs with the report.

See comment 1.

The DoD agrees that all systems must have test plans and appropriate testing prior to decision reviews. However, the initial reading of the report would lead the reader to assume that the programs mentioned herein had no such plans. All of the systems within the Army Tactical Command and Control System have test plans. These test plans are in various stages of the approval process and are being completed in accordance with DoD Directive 5000.1.

On July 31, the Command, Control, Communications, and Intelligence Systems Committee within the Office of the Secretary of Defense will review the Army Tactical Command and Control System to ensure the Army continues to manage the program properly. Some of the issues mentioned in the report will be examined during that review.

Detailed DoD comments on the report findings and recommendations are provided in the enclosure. The DoD appreciates the opportunity to comment on the GAO draft report.

Sincerely,

Duane P. Andrews

Enclosure

GAO DRAFT REPORT - DATED APRIL 15, 1991
(GAO CODE 395168) OSD CASE 8664

"BATTLEFIELD AUTOMATION: ARMY TACTICAL COMMAND AND CONTROL SYSTEM DEVELOPMENT PROBLEMS"

DEPARTMENT OF DEFENSE COMMENTS

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FINDINGS

o **FINDING A: All Source Analysis System Acquisition Strategy Is Outdated.** The GAO reported that the All Source Analysis System is a part of the Army Tactical Command and Control System--which, overall, is estimated to cost over $17 billion. Because of an urgent need in Europe, the GAO found that, in 1986, the Army developed a plan to field a limited capability All Source Analysis System. The GAO explained that the current Army strategy for fielding All Source Analysis System equipment includes the development of three systems--(1) a limited capability configuration system, (2) a baseline system, and (3) the objective system. The GAO further found that, although the Army will begin development of the objective system in FY 1991 (which will use Ada software and common hardware), fielding of that system will be delayed until FY 1998.

- Further Procurement of the Limited Capability All Source Analysis System Is Not Needed. The GAO found that additional purchases of equipment with the limited capability configuration are planned to provide enough equipment for two complete sets and training units--and will be used to develop the baseline system. The GAO observed that, overall, the Army intends to spend about $131 million to develop and acquire the limited capability system with hardware and software--which, in turn, it intends to replace with another system. The GAO concluded that the Army need for additional limited capability All Source Analysis Systems is questionable for the following reasons:

  -- the urgency for a limited capability All Source Analysis System was based on the Warsaw Pact/Soviet threat in Europe;

  -- an existing system developed by the Tactical Exploitation of National Capabilities Program

Enclosure

office has similar capabilities, and is operational at the Corps and echelon above Corps levels; and the limited capability configuration system previously tested at Fort Hood, along with $70 million of equipment purchased in FY 1990, can be used to conduct software verification and testing leading to the baseline system production decision in FY 1993.

- The Army Does Not Have a Test Plan for the Baseline All Source Analysis System. The GAO also found that the Army has no test plan for the baseline All Source Analysis System. In addition, the GAO found that the version 2.1 software--which contains features the users need--will not be released until October 1992, two months after operational testing is to be completed. The GAO concluded that, since the Army operational testing will be based on test results that do not include the additional software features, adequate information will not be available for the baseline system production decision. The GAO reported that Army officials are concerned that, if operational testing is deferred, FY 1993 funding could be lost. The GAO also observed that, for the same reason, the developer had prevailed upon the user to field the limited capability system without meeting minimum requirements.

In summary, the GAO concluded that the reduced Warsaw Pact/Soviet threat and the availability of existing capabilities similar to the All Source Analysis System have eliminated the need for further procurement of the limited capability All Source Analysis System. (pp. 3-9/GAO Draft Report)

Now on p. 2 and pp. 10-12

DOD RESPONSE: Partially concur. The current All Source Analysis System program is undergoing redirection to integrate increased functionality at an earlier date. The Commanding General, Intelligence Center, and the Program Executive Officer-Command and Control Systems have recommended an interim solution and milestone associated with program redirection. The interim solution integrates several existing hardware and software options or packages. On June 3, the Army System Acquisition Review Council is scheduled to review the recommended changes and provide formal approval of program redirection. After the Army System Acquisition Review Council has made a decision, an Office of the Secretary of Defense Acquisition Review will be held to provide a final decision.

See comment 2

- The All Source Analysis System is an evolutionary development acquisition program. Implicit within the

See comment 3

See comment 4

See comment 5

acquisition approach is the fact that the system capability improves over time in a pre-planned fashion. Accordingly, the All Source Analysis System limited capability was designed to be fielded with less than the final set of functional software capabilities. The hardware of the limited capability All Source Analysis System will support the limited capability software (version 2.0) and the baseline system software (version 2.1). There is sufficient functionality within version 2.0 software to ascertain through an Initial Operational Test and Evaluation that the hardware will meet both the limited and baseline requirements. The net result is a limited capability into the hands of soldiers at the earliest opportunity, followed with software upgrades to provide more functionality.

The requirement for the All Source Analysis System is not theater-dependent. It is based on automation required to support the tasking, collection management, analysis, fusion, and reporting of enemy actions, capabilities, and probability of intentions across the spectrum of possible conflict. The equipment used in the limited capability system can be and will be used for other than just European use.

The House Appropriations Committee has directed a comparison of the functionality of the Tactical Exploitation of National Capabilities Program versus the All Source Analysis System. That is a phased study being conducted by the MITRE Corporation. To date, only Phase I has been completed. The results indicate that, although there is some overlap in functionality, the Tactical Exploitation of National Capabilities Program is not designed to provide critical segments of the All Source Analysis System requirement. The Tactical Exploitation of National Capabilities Program does not provide an all source data base, situational analysis tools, or targeting support.

The DoD agrees that an approved test and evaluation master plan is needed for the All Source Analysis System. It should be noted, however, that the plan has been written and staffed at both the Army and the Office of the Secretary of Defense levels, and presently is being revised to obtain final approval. In any case, DoD Directive 5000.1 requires that test plans be in place and the appropriate testing be accomplished prior to any production decision.

- **FINDING B: The Maneuver Control System Acquisition Schedule Is Unrealistic.** The GAO reported that the Army is unnecessarily rushing the Maneuver Control System development and acquisition process.

- Prior Failures In Maneuver Control System Equipment Acquisitions. The GAO found the Army Operational Test and Evaluation Command concluded that the Maneuver Control System has not demonstrated its effectiveness in providing timely, accurate, and useful information in a battlefield environment. The GAO noted commanders indicated that the Maneuver Control System provides little or no aid in controlling maneuver forces. The GAO found that the Army has invested $127 million in militarized Maneuver Control System equipment that will be withdrawn from units due to its limitations. The GAO also found that, because of bulk and excessive weight, the Army decided not to deploy the non-developmental Maneuver Control System equipment, which had been procured for light divisions at a cost of $29 million.

- Lack of a Test Plan Could Result in More Unnecessary Procurement. The GAO reported that the Army plans further Maneuver Control System development and production estimated at $1.3 billion. The GAO pointed out that the Army has requested $45.9 million in FY 1992 to initiate Maneuver Control System equipment acquisition. The GAO also reported that, although in April 1990, the Vice Chief of Staff of the Army directed that a light division system with reduced capability be developed within 18 months, as of March 1, 1991, only limited progress had been made. The GAO found that the Army plans for testing the Maneuver Control System are incomplete and not approved, because operational test criteria were not defined adequately to ensure battlefield effectiveness. The GAO also observed that test officials were concerned with the adequacy of test preparations and unit training--in view of the Army decision to compress a seven month period for that activity to one month. In addition, the GAO found that the availability of units to conduct the operational test is questionable.

The GAO concluded that the Army is compressing the Maneuver Control System schedule, even though (1) the revised Test and Evaluation Master Plan has not been approved, (2) the operational test criteria have not been defined, and(3) other obstacles to a successful operational test have not been resolved. The GAO also concluded that the Army appears to be rushing the Maneuver Control System development and acquisition process--which may result in the additional procurement of equipment not meeting user requirements. (pp. 3-4, pp. 10-13/GAO Draft Report)

Now on p 2 and pp 12-14

DOD RESPONSE: Partially concur. The Maneuver Control System has been successfully developed and fielded with

See comment 6

See comment 7

See comment 8

the original software and military specification hardware (1986) and also with the present version 10.03.1 software and non-developmental hardware (1991). Through the evolutionary development process, the next phase is the movement of the Maneuver Control System to the common hardware and software, and development of the version 11 software. The version 11 software development schedule is ambitious, but is low to moderate risk. It is important to note that two decisions will be made based on the FY 1992 Maneuver Control System Initial Operational Test and Evaluation; (1) to field the version 11 software on the already fielded non-developmental item hardware and (2) to make a production decision for common hardware and software, using version 11 software.

- The Maneuver Control System hardware evolved along with the software. It started with the Maneuver Control System militarized equipment in 1980. For the first three years, the system was operated in Europe and provided valuable input to the software development process. In 1983, a production decision was made based upon a successful operational test and the Army started fielding the Militarized Tactical Computer Terminal in 1986. The Tactical Computer Terminal was built using Plasma display technology of the 1970s and micro-processor technology (M68000) of the early 1980s. That technology is however, outdated for the 1990s, especially when implementing an Electronic Map Capability. The Army decided to stop fielding and phase out the use of the Tactical Computer Terminal ($750,000 each), because (1) it could not meet the new users requirements, (2) processing speed was too slow, (3) it had no electronic map, (4) it had no color screen, (5) it was not user friendly, (6) it was heavy and bulky, and (7) it offered very limited growth potential. The Army determined that upgrading the Tactical Computer Terminals to meet current standards and the users new requirements would not be cost effective. All the non-developmental item computers will be fielded to the heavy divisions by the third quarter of FY 1992. The Army also made the decision that the non-developmental item computer was too heavy and bulky to be transported by light divisions. Therefore, the Army decided to wait until Common Hardware is procured (to include the lightweight computer unit), before fielding the Maneuver Control System to the light divisions. The initial common hardware procurements will be used to equip the contingency corps and light divisions. After they are equipped the Army will procure common hardware to replace the non-developmental items previously fielded to the heavy divisions and reissue the non-developmental items to the reserve components starting in FY 1995.

See comment 9.

- The Maneuver Control System, operating with the dramatically improved software version 10.03.1, has provided timely, accurate, and useful information to commanders. Prior to version 10.03.1, which is the period the GAO addressed, views of the Maneuver Control System usefulness were, at best, mixed. After the fielding of version 10.03.1 in January 1991, commanders unanimously have pursued and supported the need for the Maneuver Control System. During Operation Desert Storm, VII Corps requested an emergency delivery of the version 10.03.1 software for its use.

See comment 10.

- The Army has a service approved Test and Evaluation Master Plan. The lan was approved on July 2, 1990, and submitted to the Office of the Secretary of Defense. The Office of the Secretary of Defense returned the master plan to be reworked on October 25, 1990. Coordination and resolution with the Office of the Secretary of Defense continues, with the last meeting held on March 25. The Critical Operational Issues and Criteria for the Maneuver Control System were approved on April 23, by the Army. They will be incorporated into the Test and Evaluation Master Plan for submission to the Office of the Secretary of Defense for approval. The Army has not compressed its contractor/Government formal acceptance test plan. The schedule was revised to shift the "test-fix-test" function to precede formal testing. The software will complete final acceptance testing on January 31, 1992. The operational evaluation is scheduled for May 1992. That leaves 3 to 3-1/2 months for unit acceptance of the equipment and formal training prior to an operational test.

See comment 11.

o FINDING C: The Army's Decision to Acquire Larger Common Hardware and Software Computers Was Not Adequately Justified. The GAO pointed out that the Army decision to acquire larger Common Hardware and Software computers increases acquisition costs by $666 million. The GAO reported it is the Army position that every Common Hardware and Software computer should have the capacity to provide enhanced mapping and graphics capabilities. The GAO found that, in June 1990, the Army decided that users will standardize on a larger transportable unit with the maximum available main memory and secondary storage capacity. The GAO observed that, according to the Army, the larger system is needed to (1) enhance performance, (2) improve interchangeability in the field, and (3) provide logistical savings. The GAO further observed that, in supporting its decision the Army estimated $130.9 million of cost avoidance

resulting from commonality of logistics and hardware. The GAO found, however, the Army did not prepare an economic analysis that compared the savings and other benefits to the $666 million net increase in equipment acquisition costs. In addition, the GAO found the Army had not done a thorough needs analysis to determine locations needing the additional capability of the larger transportable system. The GAO concluded that the disparity between the increase in acquisition costs and the logistical and hardware savings, as well as other benefits to be derived, simply does not support the Army position. (p. 4, pp. 13-16/GAO Draft Report)

Now on pp. 2-3 and pp. 15-16

See comment 12

DOD RESPONSE: Nonconcur. The DoD does not agree that the Army standardization of computers for use throughout the Army Tactical Command and Control Systems resulted in an increase in cost of $666 million. The figure was arrived at by comparing two different Baseline Cost Estimates. The 1988 estimate covered 10 years of acquisition and did not include such costs as installation kits, cables, software licensing, printer and other peripheral devices; while the 1990 Baseline Cost Estimate did cover those costs and also covered 20 years of acquisition.

The GAO concluded that a larger more expensive computer was procured without a cost benefit analysis. The DoD disagrees. In an earlier report, (OSD Case 7532) "Battlefield Automation: Better Justification and Testing Needed for Command and Control Acquisition."), the GAO specifically recommended that the Army not procure large quantities of common hardware and software without first conducting development activities to verify the computer requirements. That is exactly what the Army did. It verified that the more capable computers would be required to meet current developmental requirements and the requirements of future evolutionary software. Because of the ability of technology insertion, which was in the common hardware and software contract, the Army was able to upgrade the hardware (at no developmental cost) to meet the current and future requirements. The upgrades were primarily providing computer memory and speed; and adding a video display with higher resolution for maps. The Army now has hardware that fully meets the needs of the developing contractors (saving development cost growths) and one that has capability for future upgrades.

See comment 13

See comment 13

The Army has completed several operational facilities studies to determine where on the battlefield computers are required by type. The materiel developers and developing contractors have verified their current and evolutionary computer requirements. The Army decided that the transportable computer unit is what is needed at those operational facilities where a common display of the battlefield is needed. The lightweight

computer unit which is currently being competed, will be used at the locations that do not require the more powerful transportable computer unit.

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RECOMMENDATIONS

Now on p. 3

- **RECOMMENDATION 1:** The GAO recommended the Secretary of Defense direct that the Secretary of the Army stop further acquisition of the limited capability All Source Analysis System. (pp. 16-17/GAO Draft Report)

See comment 14

DOD RESPONSE: Partially concur. The DoD understands the GAO concern over the further procurement of the All Source Analysis System limited capability configuration. However, the equipment used for limited capability will be used with the next evolution of software. The issue will be covered during the on-going review of the All Source Analysis System by the Army and the Office of the Secretary of Defense. There is no need for specific Secretary of Defense direction to the Secretary of the Army, except for the requirements already set forth in DoD Directive 5000.1.

Now on p. 3

- **RECOMMENDATION 2:** The GAO recommended the Secretary of Defense direct the Secretary of the Army to develop and follow a test plan that will establish a baseline upon which to measure the merits of the All Source Analysis System and ensure user requirements are met before a production decision is made. (p. 17/GAO Draft Report)

See comment 15

DOD RESPONSE: Partially concur. The DoD agrees that an approved test and evaluation master plan is needed for the All Source Analysis System. The Test and Evaluation Master Plan has been developed and staffed at both the Army and Office of the Secretary of Defense levels, but is not yet approved. It will be forwarded to the Office of the Secretary of Defense by the end of July for approval, if the redirection is not extensive. Final approval of the plan is anticipated by 1 Oct. There is no need for specific Secretary of Defense direction to the Secretary of the Army, except for the requirements already set forth in DoD Directive 5000.1.

Now on p. 3

- **RECOMMENDATION 3:** The GAO recommended the Secretary of Defense direct the Secretary of the Army to ensure that Maneuver Control System requirements for the light divisions are defined. (p. 17/GAO Draft Report)

DOD RESPONSE: Concur. The Army is in the process of redefining the requirements for the light divisions and

plans to complete that effort not later than the first quarter of FY 1992.

Now on p 3

- **RECOMMENDATION 4**: The GAO recommended the Secretary of Defense direct the Secretary of the Army to ensure that a Maneuver Control System test plan is developed and approved. (p. 17/GAO Draft Report)

See comment 16

DOD RESPONSE: Partially concur. The DoD agrees with the need for a Test and Evaluation Master Plan. The Maneuver Control System master plan has been approved by the Army and will be sent to Office of the Secretary of Defense for approval by the end of June 1991. The DoD Directive 5000.1 requires that test plans be in place and the appropriate testing be accomplished prior to specific decision reviews; therefore, there is no need for specific Secretary of Defense direction to the Secretary of the Army.

Now on p 3

- **RECOMMENDATION 5**: The GAO recommended the Secretary of Defense direct the Secretary of the Army to ensure that the revised Maneuver Control System successfully completes an operational test that demonstrates its military effectiveness using the software version that is to be fielded. (p. 17/GAO Draft Report)

See comment 17

DOD RESPONSE: Partially concur. The Maneuver Control System must complete operational testing successfully and demonstrate its military operational effectiveness and suitability, based on the criteria established in the Test and Evaluation Master Plan. There is no need for specific Secretary of Defense direction to the Secretary of the Army, except for the requirements already set forth in DoD 5000.1.

Now on pp 3-4

- **RECOMMENDATION 6**: The GAO recommended the Secretary of Defense direct the Secretary of the Army to perform economic and needs analyses that justify the increase in Common Hardware and Software acquisition costs because units will now be required to use the transportable computers at many locations. (p. 17/GAO Draft Report)

See comment 18

DOD RESPONSE: Partially concur. The Office of the Secretary of Defense will hold a review on the Army Tactical Command and Control System on July 31, 1991.

As directed by DoD Directive 5000.1, the Cost Analysis Improvement Group will asses the cost of the programs in the Army Tactical Command and Control System prior to the review. Upon completion of the review, if the Secretary of Defense deems it necessary to perform additional economic and needs analyses, the Secretary of the Army will be so directed.

GAO Comments

The following are GAO's comments on the Department of Defense's letter dated May 29, 1991.

1.We have changed the report by inserting approved plans where necessary.

2.We are aware that the ASAS program restructuring was reviewed by the Army on June 3, 1991, and will later be reviewed by DOD. So far, the Army and DOD have not released any data on their reviews. However, we believe that, at a minimum, the program restructuring and the reviews should address the concerns raised in this report.

3.When ASAS was restructured in 1990, the Army Chief of Staff directed that the limited capability system meet the users' minimum requirements. The primary user defined the system's minimum requirements to include the features to be implemented in version 2.1 software. Faced with criticism from Congress and the Army test community over not testing the software that was to be fielded and the possible termination of the program if it was delayed until the software to be fielded (version 2.1) was ready, the user agreed to reduce the system requirements, which would allow the use of 2.0 software.

4.Our point is that the Army acquisition plan for ASAS justified the acquisition of a limited capability ASAS based on an urgent need to counter the Soviet threat in the European theater. However, with the diminished Soviet threat, there is no longer an urgent need for this system. Furthermore, the Army currently has limited ASAS-like capabilities through the limited capability system, as well as the Tactical Exploitation of National Capabilities Program system. These systems' capabilities should provide the Army with the time needed to address the issues raised in our report.

5.The Tactical Exploitation of National Capabilities Program is an intelligence gathering capability that is in the field today and would provide some ASAS-like functions until the objective ASAS is available.

6.The Army Tactical Command and Control System's engineering and integration contractor considers the Army's compression of the software verification and fix process to be a high risk. Also, as DOD commented, the software schedule is ambitious. Since March 1987, the availability date for version 11 software has changed five times and slipped 43 months. This history of delays does not provide a high level of confidence that the system will be delivered on time.

According to DOD, the version 11 software is now to be delivered on January 31, 1992. This is 1 day before the start of the Force Development Test and Evaluation phase. The test's objective is to validate software performance, doctrine, and training development before operational testing. The delivery date leaves limited opportunity to train units on the software to be tested and is precisely the situation that the test community has objected to. Furthermore, the Army has proposed eliminating the phase that would assess the system's software and the test units' readiness for the operational test. The Army's proposal to eliminate this phase would take away an opportunity to have soldiers, who are less skilled on the system than contractor personnel, identify problems and to have corrections made before the operational test.

7.This comment illustrates our concern that the Army does not do a sufficient job of matching requirements and emerging capabilities. DOD's comments show that the Tactical Computer Terminal, at $750,000 per unit, took over a decade to develop and was purchased prior to successfully demonstrating military usefulness. About one-third of this equipment has never been fielded; rather, it has been stored in a warehouse.

8.This comment supports our recommendation that MCS requirements for the light divisions be developed and that a test plan be established that evaluates development efforts against these requirements. After buying $29 million of MCS equipment for the light divisions, it was discovered that the computer systems would be too difficult for the light divisions to transport. Thorough requirements development and testing could have avoided this wasteful procurement.

9.According to Army officials, during Operation Desert Storm, one division used MCS to display maps, but it was not used by commanders to help in aligning forces or otherwise direct forces during the battle. This is similar to results from the 1990 test report; during testing the system was used to send messages prior to and aid in reconstituting units after a military action. Army officials could not provide Operation Desert Storm after-action reports that described how MCS was used. They said that the Army was developing lessons learned from Operation Desert Storm for release sometime in the future. Because of this they were not able to release data to support their comments.

10.The MCS test plan currently awaiting approval is designed for heavy divisions only. The Test and Evaluation Master Plan and the Critical Operation Issues and Criteria will have to be amended to reflect light division requirements.

11.The current Army plan is to perform test-fix-test during the software development and integration process and then to conduct several formal acceptance tests within 1 month. The Army believes that early testing will eliminate problems and allow formal testing to be completed in a short period. Previously, a series of preliminary checkout tests and fixes, as well as unit training, was to occur over an 11-month period. Four of the checkout tests will now be done concurrently within 1 month. About 2 months will then remain to fix the software and train the units before operational testing.

12.Contrary to the Army's statement, the 1988 baseline cost estimate did include cables, software licensing, printers, and other peripheral device costs. Army officials could not provide a detailed breakout of the $666 million CHS program cost increase. In the 1990 baseline cost estimate, all program estimates were not stretched out 10 years, the estimates were extended from 2 to 11 years. Using additional Army cost data, we attribute at least $340 million of the $666 million cost increase to the use of larger, more expensive computer systems.

Our report has been changed to reflect the revised estimate. Even so, the lower estimate of $340 million would still be sufficient reason for conducting needs and economic analyses to support the decision to use larger, more expensive computer systems. The study currently being performed by the Army is a step in the right direction. The Army must determine the Army Tactical Command and Control System's requirements for computer memory, speed, map display capability, etc., for each location.

13.Prior requirements studies did not address the needs of the light divisions. Army officials stated that the prior studies are no longer relevant to the current MCS requirements because the studies were done for each functional area rather than the Army Tactical Command and Control System as a whole. The ongoing study is looking at all five control systems as a whole and not as separate systems. According to Army officials, the current study will identify where functional areas can share computer system resources and identify the correct mix of transportable and lightweight computer systems. It will also examine the sharing of peripheral and communication interface devices.

14.As stated in our report, sufficient quantities of equipment are already available for test and verification. Our recommendation reinforces the need for these reviews and for the Army to eliminate unnecessary procurement. We will continue to monitor the implementation of our recommendation.

15.DOD's planned actions are in concert with our recommendation. We will monitor the implementation of these reviews to ensure that corrective action is taken.

16.As stated in the report, our concerns are that there is no test plan for the light divisions and that the test plan for the heavy divisions was only approved at the Army level and is now being revised. We have changed our recommendation to focus on these concerns.

17.We believe that our recommendation has merit because, as stated by the Army test community, prior attempts at fielding MCS, presumably under the charter of DOD Directive 5000.1, did not demonstrate that MCS had military effectiveness, but rather was primarily used to relay messages and as a facsimile machine. We will continue to monitor DOD's and the Army's implementation efforts.

18.We believe that DOD's review of the Army Tactical Command and Control System on July 31, 1991, should help ensure that the Army has selected the most efficient and economical approach to meeting its requirements. We believe the Army's study follows the intent of our recommendation directed toward performing a needs analysis, and we will continue to monitor its progress. However, DOD did not provide a specific implementation plan for doing a required economic analysis. Given the additional costs for upgrading computer systems, we believe that a thorough economic analysis is needed. (Also see comments 12 and 13.)

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