

November 1995

BATTLEFIELD AUTOMATION

Army's Digital Battlefield Plan Lacks Specific Measurable Goals



**National Security and
International Affairs Division**

B-261753

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Congressional Committees

One of the Army's top priorities is a program to digitize the battlefield by creating a vast network of computers, sensors, and communications systems that would provide a common picture of the battlefield from soldier to commander simultaneously. Because of the importance and estimated \$4 billion cost of this program, we reviewed the "Army Digitization Master Plan" to evaluate the Army's efforts to digitize the battlefield, including the Marine Corps' participation. We conducted this review under our basic legislative responsibilities and are addressing this report to you because we believe it will be of interest to your committees.

Results in Brief

The Army's plan to digitize the battlefield is expensive, contains many risks, and lacks specific, measurable goals for the series of large-scale experiments that are to be conducted. The Army is planning to conduct a series of experiments from 1995 to 1997, including a brigade-level experiment in 1997 at a cost of \$258 million,¹ without having had a successful battalion-level experiment. In fact, a battalion-level experiment in 1994 failed to meet Army expectations. Specific, measurable goals are needed to evaluate the achievements of each experiment, and they should be met before proceeding to the next experiment. Otherwise, the Army is unnecessarily risking additional investments amounting to \$397 million for digital systems needed to conduct increasingly larger scale experiments to fiscal year 1999. Based on Army estimates, the investment required to digitize a 10 division Army could be as high as \$4 billion. Also, because Congress has directed the Army to include the Marine Corps in its plan, the Department of Defense (DOD) funding for the Marine Corps needs to be identified and assured to solidify its participation and success.

Background

Automation of the battlefield has been a long-term goal of the Army because of its promise as a force multiplier: it produces greater fighting effectiveness through better use of battlefield resources. Digitization of the battlefield is the Army's latest effort to bring it closer to its long-term goal. Prior Army efforts focused on automating command and control at the corps and division levels whereas digitization extends this automation to the brigade and lower echelons, including individual weapons platforms.

¹This includes 1,230 appliques, new software, a new digital radio, message protocols and standards, simulations and experiments, and evaluation of the results of the experiments from fiscal years 1995 through 1997.

Digitization of the battlefield is part of a major effort to reshape the Army and, thus, it is one of the Army's highest priorities. The Army hopes to identify how digitization will improve combat power and how to change its organizational structure, doctrine, and tactics to take advantage of digitization.

Army battlefield digitization started in the 1980s with the development of five corps- and division-level command and control systems collectively known as the Army Tactical Command and Control System. Their development and fielding have been a struggle. Two systems were fielded in 1993 and 1994, with limited capabilities. Two other systems are scheduled to undergo operational testing in 1995 and in 1996. The fifth system is scheduled to undergo its second operational test in 1996.

The Army's strategy for digitizing the battlefield uses a bottom-up approach that experiments echelon by echelon with several digital systems simultaneously. It is a massive effort involving brigade-, division-, and corps-level experiments over the next 5 years. Advanced warfighting experiments were performed in 1993 at the company level, and in 1994 at the battalion level. Current plans call for a brigade experiment in February 1997, a division experiment in February 1998, and a corps experiment in April 1999.

There are many digital systems to evaluate. For example, 25 unique digital systems and more than 120 items of equipment were evaluated in the battalion experiment. More than 40 digital systems, including potentially 1,200 appliques,² may be evaluated during the brigade experiment. The applique, which began its development when a contract was awarded on January 6, 1995, will provide digital capability to weapon systems that do not have any.

The major feature of the applique will be the situational awareness that it provides to its users. A digital map will display the locations of friendly and enemy forces and update their movement in near real time. This common picture will be provided simultaneously to all units in the brigade, from the command staff to the individual M1 tanks and other weapons platforms.

²"Applique" is the name in general use for what is formally known as the Force XXI Battle Command Brigade and Below (FBCB2) System. It consists basically of a laptop computer, FBCB2 applications software, a Global Positioning System receiver, and a communications interface.

Digitization Plan Requires High Investment in Early Phases

The investment required for what the Army describes as the equivalent of the concept exploration and definition phase is \$272 million through fiscal year 1997. For fiscal years 1998 and 1999, the equivalent of the demonstration and validation phase and the engineering and manufacturing development phase, the cost is expected to be \$125 million, bringing the total development effort to \$397 million. The cost primarily covers the development and acquisition of the applique and its integration onto many different vehicles, helicopters, and other platforms. It also covers the development of a digital radio and other related products. These research and development costs are relatively high because it is expensive to equip a battalion, a brigade, a division, and a corps with appliques for experiments. In the conventional concept exploration and definition phase, only a few prototypes of a system would be bought for experiments. The Army's position is that, although these costs are relatively high, the resources are needed to demonstrate the utility of a digitized force.

Through 2005, the Army estimates that \$2.1 billion is needed to field and sustain Force Package I.³ About 77 percent of this amount is to equip the force with appliques. The cost to equip the rest of the Army with appliques is not known, but according to Army officials, it could be \$2 billion through 2011. This is in addition to funds already programmed for other digital battlefield efforts such as the five systems that comprise the Army Tactical Command and Control System and the embedded systems whose costs are born by the weapon systems themselves.

Digitization Plan Has Numerous Risks

The Army faces numerous technical, program, cost, and schedule risks in implementing its master plan for battlefield digitization. These risks are integration, software development, hardware costs, unknown quantity requirements, communications, and interoperability with other command and control systems.

Integration

The integration of the applique onto different platforms represents a technical risk. The underlying cause of this risk is that each platform is different and requires a separate solution in terms of installation kits. For example, the installation kit that works for a tank may not necessarily work for an infantry fighting vehicle or a helicopter.

³Force Package I units are the highest priority combat units in the Army since these units deploy first and require the highest level of equipment support and training. The term Force Package I includes five divisions along with their corps headquarters and combat service support elements.

Software Development

Software development is an additional technical, cost, and schedule risk in our view because no appliques have been delivered and tested. More will be known after a critical design review in August 1995, and evaluations of interim software currently scheduled for July, September, and December 1995 and January and May 1996 have occurred. During this period, soldiers from Fort Knox will evaluate each version of software.

Implementing all software functions and requirements will require additional engineering; in fact, 30 percent of applique software, which is needed for the brigade experiment, is estimated to be new code. The rest of the software is existing Brigade and Below Command and Control (B2C2) software⁴ and elements of the Forward Area Air Defense Command and Control, the Combat Service Support Control System, and the Enhanced Position Location Reporting System software, which have only been demonstrated separately and not as an integrated system.

Hardware Costs

Applique hardware costs may be understated, depending on (1) how frequently hardware will be replaced, (2) what mix of computers will be used in future experiments and fieldings, and (3) whether higher end machines with more memory and speed will be needed. The Army may be required to upgrade applique computers every 2 to 3 years or sooner to take advantage of industry's technology advancements. The Army is still deciding on the proper mix of militarized, ruggedized, and commercial computers to be used for the brigade experiment. Currently, it is moving away from militarized toward ruggedized computers, which are less costly. However, the commercial computers, which are the least costly of the three variants,⁵ may not be rugged enough for the job. If the brigade experiment shows that more militarized and ruggedized computers are needed, that would drive up the costs of future experiments and deployment. The brigade experiment may also show that the appliques cannot do the job in terms of memory and speed. If so, higher end machines would be required, which will also increase costs.

Quantity Requirements

Cost risk is further aggravated by unknown quantity requirements for the applique. Because total quantity requirements are unknown, the total cost

⁴An earlier version of this software was used during the battalion experiment at the National Training Center in April 1994.

⁵The militarized computer costs about \$93,000, the ruggedized computer over \$14,000, and the commercial computer about \$11,000 based on program unit costs. Militarized hardware has been specifically designed for military use under adverse conditions. Ruggedized hardware is more robust than commercial computers but less stringent than militarized hardware.

of the applique and the FBCB2 program is unknown. The 1997 brigade experiment may show that installing an applique in every tank, helicopter, and weapon system is useful but not affordable.

Communications

Army officials have told us that having adequate communications is key to the 1997 brigade experiment; otherwise, it may have to be postponed. The Army is developing a tactical internet that increases the digital capacity and connectivity of three existing radio based communications systems.⁶ However, the tactical internet is not expected to be delivered to the Army until May 1996, only 1 month before the start of training for the experiment. Consequently, it represents a significant schedule risk.

If successful, the tactical internet will provide a short-term solution to meeting the Army's data distribution needs. However, long-term needs will increase as the Army becomes dependent on automation and adds new digital systems to its inventory. Because of this, Army officials told us that they will require two new data distribution systems, one in the interim to be potentially more capable but less costly than the current system, EPLRS, and another one in the future to meet long-term needs. Developing an interim digital communications system for a 10 division Army could cost at least as much as EPLRS, or more than \$900 million, and could take years to field.⁷ In our view, the data distribution issue is the weak link in the Army's plan because a new, interim system will be needed to meet the increasing communications demands imposed by the digital battlefield in the next century. Until it is resolved, we do not believe the full potential of battlefield digitization or automation will be realized.

Interoperability

A schedule risk is posed because a number of systems must interoperate with the applique and be available for integration and testing prior to the 1997 brigade experiment. An example would be the five division- and corps-level systems that comprise the Army Tactical Command and Control System. Interoperability has been demonstrated through a very limited number of messages being exchanged between these systems. However, database to database exchange, which is critical to providing

⁶These three systems are the Enhanced Position Location Reporting System (EPLRS)—a dedicated data distribution system at division and below, the Mobile Subscriber Equipment—a voice and data communications system with telephone-like service in the corps and division areas, and the Single Channel Ground and Airborne Radio System—a new generation of combat radios used primarily for voice communications in all Army units down to the platoon level.

⁷Cost would depend on the technology, capacity, speed and grade of service, and the number of subscribers in the network.

commanders with an accurate, near real-time common picture of the battlefield, has not been achieved.

Army Risk Reduction Efforts

In commenting on our report, the Army recognizes the risks that we discuss and believes that it has taken steps to mitigate them. These include (1) the establishment of the Army Digitization Office, which provides high-level oversight by reporting to the Chief of Staff of the Army; (2) the establishment of the Digital Integrated Laboratory to assess interoperability issues; (3) the establishment of a “user jury” to provide early assessments of applique performance; and (4) the development of a Risk Management Master Plan. While these efforts are commendable, we still believe that the risks are substantial in number and formidable obstacles to the success of the digitization of the battlefield and we will continue to monitor the program to determine whether these risk reduction efforts really work.

Experimentation Approach Is Inadequate

The Army’s experimentation master plan states what experiments are to be performed through 1999, but it does not provide specific goals and clear criteria to support decisions to proceed with the experiments and buy additional appliques and other equipment. Thus, there is no criteria for measuring whether the experiments will be successful. As a result, the Army could continue to conduct large-scale, costly experiments at the brigade, division, and corps level, no matter what the results would be. For example, the 1994 battalion-level experiment lacked specific goals and exit criteria. Despite poor results in that experiment, the Army is moving on to a larger scale, brigade-level experiment in 1997, at a cost of \$258 million. In addition, the Army’s experimentation approach lacks adequate instrumentation and data collection.

Experimentation Approach Lacks Specific Goals

Specific, measurable, and quantifiable goals are needed to evaluate program achievements and assure program success. The Army’s Operational Test and Evaluation Command (OPTEC) stated this requirement in its report on the 1994 experiment. Its recommendation was to “establish entrance criteria for hardware and software to ensure equipment used by the units is reliable and interoperable, and insights and data generated on force effectiveness meet established goals and expectations.”

Although the experimentation plan identifies numerous goals, such as increased lethality, it does not say how much lethality is to be achieved from the battalion experiment to the brigade and division-level experiments. Increased lethality is measured by many factors, such as the number of enemy troops, artillery pieces, and helicopters lost in battle. However, neither numeric criteria nor a baseline is given for these factors. The Army intends to determine effectiveness based on increasing trends in a series of simulations, technical tests, and field and subfield experiments over the next 5 years.

The Army does not believe that either pass/fail criteria or a baseline are necessary at this stage since it is only experimenting. However, given that the experiment is expensive and important to its future, the Army should have measurable goals that it is expecting to achieve. Attainment or nonattainment of these goals, rather than subjective assessments alone, can best show the Army where it must direct its resources and whether it is appropriate to proceed to the next experiment.

1994 Digitized Battalion Experiment Did Not Meet Expectations

From April 10 to April 23, 1994, a battalion-level experiment was conducted at the National Training Center, Fort Irwin, California. It was the first experiment to use a digitized battalion task force. The experiment did not have (1) specific goals, (2) a specific way to measure success, or (3) a baseline to compare the digitized battalion's performance to. However, some Army leaders expected that the digitized "blue" force would defeat its nondigitized opponent called the "red" force. This did not happen.

In the absence of specific goals, thresholds for performance, and a baseline, the Army compared the outcomes of seven nondigitized units that participated in four training rotations against the same well-trained red force at about the same time. Four units were at the National Training Center prior to April 1994, one at the same time as the digitized battalion, and two were there after the digitized unit's exercise. The comparison showed that the blue force generally performed no better than the seven other nondigitized blue forces against the red force. For example, the loss exchange ratio (the ratio of enemy losses to friendly losses) of the digitized blue force was about the same as the seven nondigitized blue forces in offensive and defensive engagements. The main reasons for these poor results were the immaturity of the B2C2 software, its lack of

interoperability with the M1A2 tank's command and control software,⁸ and a lack of hands-on training with the digital systems. Despite these poor results, the Army decided to proceed to the brigade-level experiment instead of redoing the battalion experiment because it would have slowed the digitization effort by a year and cost several million dollars.

Adequate Instrumentation and Data Collection Are Lacking

Instead of using a more controlled test environment like an operational test where empirical data can be collected by instruments, the Army used a warfighting experiment environment and less instrumentation and data collection. As a result, OPTEC could not collect enough data to assess the performance of digitization in the 1994 battalion experiment. It reported that

“ . . . additional instrumentation at critical nodes would allow increased confidence in experiment outcomes. It would permit a determination of when systems are operational, when they are used, how much they are used, who is communicating with whom . . . and if the systems are down, is the cause hardware, software, radio propagation, or human error. . . . The lack of instrumentation does not provide system developers the kind of information they need to troubleshoot problems identified during the exercise and make needed fixes.”

Objective data is vital in decisions to proceed to the next experiment and finally to full-rate production and deployment. The Army is planning to provide a more controlled environment for data collection of 100 instrumented vehicles during a 9-month training period prior to the February 1997 brigade experiment. However, it is unclear whether this will be enough in the context of numbers and critical nodes. The Army, in conjunction with an independent test agency, needs to decide specifically what instrumentation is needed to provide sufficient objective data to support moving the experiment forward.

Marine Corps Funding Issues

Last year, Congress directed the Army to include the Marine Corps in its plans for the digital battlefield. This has been done. Also, in fiscal year 1995, the Army provided the Marine Corps with \$429,000 to help it launch its digitization program. The Army will also provide the Marines—at a cost of about \$2.3 million to the Army—with enough appliques and installation kits to equip a light-armored reconnaissance company to participate in the 1997 brigade experiment.

⁸This software is part of the Intervehicular Information System, which is embedded in the Army's newest tanks and infantry fighting vehicles.

Despite these efforts, the Marines will have a \$4.8 million shortfall in fiscal year 1996 research and development funds for equipment, engineering support, and operational demonstrations, which will affect its preparation for the Army's 1997 brigade experiment. The Army says it cannot provide additional assistance to the Marines because it has no more resources. Thus, the Marines' participation in the Army's 1997 experiment appears to be unknown.

This situation illustrates that the Marine Corps needs assured funding to solidify its participation and success in all of the Army's digital battlefield experiments. These experiments may show that the Marines need additional appliques and communications systems to assure its interoperability with the Army in future joint combat operations. Thus, the Army; the Navy, which oversees Marine Corps funding; and DOD need to work together to produce a specific plan to create and assure Marine Corps funding.

Recommendations

To help ensure that resources are directed appropriately and the Army has the data it needs to determine whether it should (1) buy additional appliques and (2) proceed to the next level of experiments, we recommend that the Secretary of Defense require the Secretary of the Army to develop specific, measurable goals and exit criteria for each phase of digital battlefield experimentation. Further, the Secretary of Defense should independently verify the goals' attainments.

To carry out congressional direction, we also recommend the Secretary of Defense insure that the Secretary of the Navy and the Commandant of the Marine Corps identify resources to support the Marine Corps' participation and success in the Army's battlefield digitization effort.

Agency Comments and Our Evaluation

DOD partially concurred with the recommendations in our draft report. While the steps it plans to take on eventually establishing measurable goals substantially complies with our recommendation, we still have differences on the timing and specificity of the goals and the independent verification of the attainment of those goals.

DOD believes that while it is necessary to have some means to judge the outcome of these large-scale experiments, it is too early in the program to have specific goals and measurable standards that have a pass or fail criteria associated with them. We disagree and continue to maintain that

specific, measurable goals are needed, even at this early stage because of the expenses involved, the scale and progressive nature of the experiments, and their importance to the Army. By not establishing specific goals now at this level of experimentation, DOD and the Army are escalating risk as each advanced warfighting experiment progresses from the brigade to the division and finally to the corps levels. The DOD-supported Army approach continues the risk associated with acquiring millions of dollars of appliques and other related developments without knowing whether previous experiments were successful. Without some limits and controls, the Army could spend hundreds of millions of dollars on these experiments without having an adequate basis to judge whether it should continue them.

DOD partially concurred with our recommendation that the attainment of these yet to be established measurable goals needs to be independently verified by DOD and points to the involvement of the Director, Operational Test and Evaluation (DOT&E). We acknowledge that DOT&E involvement is a very positive step in the direction we recommend. However, it is still unclear whether DOT&E will actually (1) approve of specific, measurable goals early on as we recommend instead of the general ones that DOD and the Army advocate and (2) verify the attainment of those goals in each advanced warfighting experiment.

DOD's recognition of the Marine Corps' funding issue and its statement that it is working with the services to resolve it, essentially complies with the intent of our recommendation. We intend to monitor DOD's implementation efforts.

DOD's comments are addressed in the body of this report where appropriate and are reprinted in their entirety in appendix I, along with our evaluation.

Scope and Methodology

We performed our review primarily at the Army Digitization Office in Washington, D.C., and the Program Executive Office for Command and Control Systems, and the Program Executive Office for Communications Systems at Fort Monmouth, New Jersey. We also visited the Army's Training and Doctrine Command at Fort Monroe, Virginia; the Armor Center at Fort Knox, Kentucky; the Combined Arms Center at Fort Leavenworth, Kansas; OPTEC, Arlington, Virginia; and the Program Executive Office for Aviation, St. Louis, Missouri. In addition, we

contacted DOD's DOT&E, Washington, D.C.; and the U.S. Marine Corps Systems Command, Quantico, Virginia.

We conducted our review between October 1994 and June 1995 in accordance with generally accepted government auditing standards.

We are sending copies of this report to other appropriate congressional committees; the Director, Office of Management and Budget; the Secretaries of Defense, the Army, the Navy, and the Air Force; and the Commandant of the Marine Corps. Copies will also be made available to others upon request.

Please contact me at (202)512-6548 if you or your staff have any questions concerning this report. The major contributors to this report were William L. Wright, Donald F. Lopes, and Edwin B. Griffin.

A handwritten signature in black ink that reads "Louis J. Rodrigues". The signature is written in a cursive style with a large, looping initial "L".

Louis J. Rodrigues
Director, Systems Development
and Production Issues

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Comments From the Department of Defense

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



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August 25, 1995

COMMAND, CONTROL,
COMMUNICATIONS, AND
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Mr. Louis J. Rodriques
Director, Systems Development and
Production Issues
National Security and International
Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Rodriques:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "Battlefield Automation: Army's Digital Battlefield Plan Lacks Specific Measurable Goals," dated July 28, 1995 (GAO Code 707078), OSD Case 9984. The DoD partially concurs with the draft report recommendations. The DoD is actively addressing all the issues discussed in the GAO report.

The DoD has a high level of interest in the Army's digitization effort and is intensively managing the program to minimize the risks identified in the report. Although the Army's Battlefield Digitization Program is not a Joint Program, we want to insure the interoperability with the other Services. The Army's Digitization Office has established a Joint Battlefield Digitization General Officers Working Group and a Joint Battlefield Digitization Council of Colonels and Captains (JBDCOC/C). The JBDCOC/C has already taken on a number of the issues addressed in the report. The current issues include Service participation in Task Force XXI, communication/data link architecture, training, architecture, and evaluation and assessment.

The detailed DoD comments on the draft report recommendations are provided in the enclosure. The DoD appreciates the opportunity to comment on the draft report.

Sincerely,


Emmett Paige, Jr.

Enclosure



See comment 1.

Appendix I
Comments From the Department of Defense

GAO DRAFT REPORT - DATED JULY 28, 1995
(GAO CODE 707078) OSD CASE 9984

**"BATTLEFIELD AUTOMATION: ARMY'S DIGITAL BATTLEFIELD PLAN LACKS
SPECIFIC MEASURABLE GOALS"**

DEPARTMENT OF DEFENSE COMMENTS ON THE GAO RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommended that the Secretary of Defense require the Secretary of the Army to develop specific, measurable goals and exit criteria for each phase of digital battlefield experimentation.

DOD RESPONSE: Partially Concur. The Army and the Department do not intend to undertake an experimental effort of this scale without some means to judge and make use of the outcomes. At the same time, establishing measurables which are too specific, such as pass/fail, is likely to inhibit the range and usefulness of the experiments. The brigade level experiment at the National Training Center will have measurable standards. These standards will be refined during multiple sub-unit experimentation. The overall objectives for the 1997 exercise are being revisited to insure all Services provide objectives, force levels and scenario inputs. The Army has set goals for the appliqué program. Those goals are outlined in the Experimentation Master Plan (EXMP) as Operational Performance Objectives (OPOs) and Technical Performance Objectives (TPOs). Also, the EXMP identifies measures of effectiveness and qualitative exit criteria. At this point in time, no hard and fast numerical criteria have been established for these objectives due to the early stages of the program (Concept Exploration) and the unknowns far outweigh the knowns. What the Army is trying to establish prior to moving forward into a formal acquisition process is the degree of the benefit to digitization, and where it occurs within the force structure and how does it manifest itself. For example: 1) is the major benefit in increased lethality of direct fire weapons; 2) does it only increase efficiency of logistics support; or 3) do we see no direct benefit?

RECOMMENDATION 2: The GAO also recommended that the Secretary of Defense should independently verify the goals' attainment.

DOD RESPONSE: Partially Concur. The DoD has a high level of interest in the Army's Digitization effort. The results of the TF-97 exercise are a building block for the overall vision of full inter-operable environments across air, sea, space, and ground. The program was placed under DOT&E oversight on March 20, 1995. The DOT&E agreed that the program is largely experimental and that the traditional oversight process may not be compatible. The cornerstone of their oversight process for digitization is OPTEC active involvement and participation during the upcoming AWEs to ensure credible,

See comment 2.

See comment 3.

Appendix I
Comments From the Department of Defense

objective and timely results are obtained. This involvement by OPTEC includes all major experiment planning and execution functions, and in the conduct of operational assessments/evaluations of major events. The DOT&E involvement will include review of experimentation strategies and analytical plans and observation of all battlefield events in an effort to provide feedback from a joint perspective and to minimize replication of data collection events during operational testing. Between milestones II and III those digitization systems on the DOT&E oversight list will enter the formal acquisition process subject to IOT&E to support a MSIII decision. Continuous coordination and exchange between the Army and DOT&E throughout the experimentation phase using an IPT-like process will greatly contribute to making the Army's digitization of the battlefield a success.

RECOMMENDATION 3: The GAO also recommended that the Secretary of Defense assure the Marine Corps' participation and success in the Army's digitization effort by identifying and supporting funding.

DOD RESPONSE: Partially Concur. We recognize that there is a funding issue that must be addressed and are working with each of the Services to resolve this shortfall. It must be made clear that the Army's Battlefield Digitization effort is not a Joint Program and funding for other services is not included. We will make every effort to identify near term funding to assure the level of participation desired by the Marine Corps.

See comment 4.

The following are GAO's comments on the Department of Defense's (DOD) letter dated August 25, 1995.

GAO Comments

1. We have identified these efforts in the body of our report. We believe that the Army's intentions are encouraging. However, we will continue to monitor the program to determine whether these risk reduction efforts really work. We still believe that the risks are substantial in number and formidable obstacles to the success of the digitization of the battlefield.

2. The steps the Army plans to take on eventually establishing measurable goals substantially complies with our recommendation. We still have differences on the timing and specificity of the goals and the independent verification of the attainment of those goals. DOD believes that while it is necessary to have some means to judge the outcome of these large scale experiments, it is too early in the program to have specific goals and measurable standards that have a pass or fail criteria associated with them. We disagree and continue to maintain that specific, measurable goals are needed, even at this early stage because of the expenses involved, the scale and progressive nature of the experiments, and their importance to the Army. By not establishing specific goals now at this level of experimentation, DOD and the Army are escalating risk at higher levels as each advanced warfighting experiment progresses from the brigade to the division and finally to the corps levels. DOD supported Army approach continues the risk associated with acquiring millions of dollars of appliques and other related developments without knowing whether previous experiments were successful. Without some limits and controls, the Army could spend hundreds of millions of dollars on these experiments without having an adequate basis to judge whether it should continue with them.

3. We acknowledge that the Director, Operational Test and Evaluation (DOT&E) involvement is a very positive step in the direction we recommend. However, it is still unclear whether DOT&E will actually (1) approve of specific, measurable goals early on as we recommend instead of the general ones as DOD and the Army advocate and (2) verify the attainment of those goals in each advanced warfighting experiment.

4. DOD's recognition of the Marine Corps' funding issue and its statement that it is working with the services to resolve it, essentially complies with the intent of our recommendation. We will continue to monitor DOD's implementation efforts.

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