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Report to the Secretary of Defense

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JOINT MILITARY OPERATIONS

DOD's Renewed Emphasis on Interoperability Is Important but Not Adequate

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National Security and
International Affairs Division

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The Honorable Les Aspin
The Secretary of Defense

Dear Mr. Secretary:

In a 1987 report,[1] we identified various problems and made recommendations associated with the Department of Defense's (DOD) efforts to achieve command, control, and communications (C3) systems interoperability—the ability of systems, units, or forces to exchange services, enabling them to operate effectively together. DOD concurred with our recommendations regarding certification, waiver, and funding matters and stated that it needed to improve interoperability in certain areas and had established mechanisms to do so.

This letter discusses DOD's efforts to overcome persisting interoperability problems. Our focus was on system (equipment) and operational (doctrine, tactics, procedures, and training) interoperability associated with command, control, communications, computers, and intelligence (C4I).

Background

DOD defines command and control as the exercise of authority and direction by a properly designated commander over assigned forces in the accomplishment of a mission. Communications is a method or means of conveying information of any kind from one person or place to another. Intelligence is the product of collecting, analyzing, and interpreting information concerning foreign countries or areas. Collectively, these functions are referred to as command, control, communications, and intelligence (C3I); however, the recognition of extensive computer use has made the term C4I more widely used within DOD.

The military services have had a history of interoperability problems during joint operations—a military action or mission by two or more services that are under the control of a single commander. The primary reason was that the services have tended to develop their own C4I systems independent of one another without consideration for joint requirements. Congressional committees have had a continuing interest, dating back to the Vietnam conflict, in seeing DOD make interoperability improvements.

[1]Interoperability: DOD's Efforts to Achieve Interoperability Among C3 Systems (GAO/NSIAD-87-124, Apr. 27, 1987).

Although DOD has worked over the years to achieve greater interoperability, it continued to experience interoperability problems during the most recent major joint military operations—the Persian Gulf War in 1991.

DOD is currently emphasizing joint military operations based on expectations that future threats will more likely be encountered on a regional basis, rather than a global basis, requiring a mix of land, sea, and air forces. This emphasis takes into consideration the (1) changes in the strategic environment relative to the former Soviet Union, (2) unpredictable nature and location of future conflicts, and (3) likelihood that forces may have to be promptly and precisely employed with little preparation time.

In 1992, the Chairman of the Joint Chiefs of Staff stated that the (1) need for interoperability among services and nations is well known and a generally accepted premise, (2) downsizing of military forces and shrinking defense budgets have resulted in increased reliance on C4I interoperability, and (3) time is ripe to set a course to resolve C4I interoperability issues. Accordingly, he announced a new initiative called "C4I for the Warrior," which is an effort to achieve global C4I joint interoperability. This initiative was based, in part, on his belief that C4I initiatives by the services were not unified because no common global vision existed to guide the future direction of C4I in support of the warrior during joint and combined operations.[2]

Results in Brief

DOD has been confronted with interoperability problems for at least 25 years, and achieving effective C4I interoperability continues to be a difficult matter for DOD to resolve. Although DOD placed special emphasis on addressing interoperability nearly a decade ago and has made some improvements, several recent DOD reports have identified C4I interoperability as a continuing concern.

Interoperability problems persisted to a point where DOD renewed its emphasis in 1992 to better ensure interoperability success. DOD issued more assertive interoperability policy guidance and strengthened some procedures associated with reviewing system requirements and making acquisition decisions. However, DOD's new C4I for the Warrior initiative faces several obstacles, including a prolonged schedule for achieving

[2]Combined operations involve forces of two or more allied nations.

interoperability that extends into the next century. The initiative also involves unknown costs and relies on presently unavailable technology.

DOD's success in achieving interoperability will be highly dependent on the availability of a comprehensive, integrated, and useful joint C4I architecture. Also, success may depend on whether mechanisms are established for effective enforcement at the highest DOD levels, including a joint program management office with directive authority and funding controls. Finally, interoperability effectiveness could be strengthened by assigning primary responsibility to the U.S. Atlantic Command for (1) assessing C4I requirements for the potential effect on joint task force operations, (2) providing guidance to the Defense Information Systems Agency on the development of a joint C4I architecture, and (3) ensuring continuous C4I interoperability assessments through joint training exercises.

Interoperability Problems Have Persisted

In 1984 and 1985, DOD placed a special emphasis on interoperability by issuing directives that (1) required the development and maintenance of a joint tactical C3 architecture and (2) revised policy and assigned responsibility for architecture implementation. DOD published the joint architecture from 1988 to 1992 as a basis for achieving compatibility and interoperability in joint and combined military operations, taking about 8 years to complete the project. This architecture has not been well-accepted within DOD as a planning document. Nevertheless, it did identify numerous system and operational interoperability deficiencies, impediments, or concerns that could prevent effective joint military operations.

Recent reports by the Joint Staff and DOD have disclosed the need for interoperability improvements. For example, a 1991 report,[3] which was issued by a panel formed by the Chairman of the Joint Chiefs of Staff to review DOD's command and control functions and processes, discussed several problems associated with both system and operational interoperability.

In its 1992 report to the Congress on the Persian Gulf War,[4] DOD described the challenge in establishing a coherent, interoperable network consisting of three generations of tactical communications systems. It stated that a

[3]Command and Control Functional Analysis and Consolidation Review Panel Report, Oct. 30, 1991.

[4]Conduct of the Persian Gulf War, Apr. 1992.

comprehensive joint architecture to help resolve interoperability issues was needed.

Also in 1992, a team organized by the Joint Staff reviewed interoperability aspects of command and control systems at the unified and specified commands, with an emphasis on how these commands would interface with joint task forces. The team reported[5] that interoperability was more a matter of chance than deliberate planning and that the commands were using funds to satisfy immediate needs without considering DOD-wide interoperability issues.

See appendix I for details.

New Initiative to Achieve Interoperability Faces Obstacles

The C4I for the Warrior initiative is intended to guide the services toward a global system to satisfy total information requirements when the services fight as a team with a common mission. The concept is to give battlefield commanders access to all information that is needed to win in war and provide the information when, where, and how the commanders want it. However, the new initiative faces several obstacles, and it will not be achieved soon or easily.

First, the tentative schedule shows a prolonged phased process for achieving interoperability that will extend at least 10 years into the next century. The concept assumes that the services cannot afford to discard their existing systems; thus, these systems will coexist with new systems while being phased out over a long period of time.

Second, the costs associated with the initiative are currently unknown, and some of the necessary technology is not available. According to DOD representatives, (1) a lot of economic analyses has to be done to implement the entire concept, (2) the competition for funds under increasing budget reductions may hamper interservice cooperation, and (3) certain technology that is ultimately needed does not currently exist.

Third, success will be highly dependent on developing a comprehensive, integrated, and useful joint C4I architecture. An architecture is intended to establish the logical link between operational requirements and system development. However, based on DOD's previous lengthy record in developing the joint tactical C3 architecture and the lack of user

[5]C4I For The Warrior Interoperability Tiger Team Final Report, May 26, 1992.

acceptance, developing such an architecture could present DOD with an arduous task.

Finally, effective enforcement of interoperability is an issue, based on recent DOD reports, and appears to be essential. It could also be a contentious issue, considering that joint program management authority and funding controls may be involved.

In his February 1993 report entitled Report on the Roles, Missions, and Functions of the Armed Forces of the United States, the Chairman of the Joint Chiefs of Staff recommended that the U.S. Atlantic Command assume a new mission as a joint headquarters for continental U.S.-based forces and be the major force provider to other unified commands. The Secretary of Defense directed that the recommendation be implemented. This action provides DOD an opportunity to strengthen C4I interoperability by assigning selected functional responsibilities to a single command for joint C4I requirements, the joint C4I architecture, and joint training exercises.

See appendix II for details.

Recommendations

Although DOD's renewed emphasis on C4I interoperability is crucial to achieving success, the actions taken thus far may not be adequate. We, therefore, recommend that you and the Chairman of the Joint Chiefs of Staff take additional actions to ensure that

- guidelines are established, including time-driven goals, for the development of a joint C4I architecture;
- a joint program management office be established with directive authority and funding controls for C4I system acquisitions; and
- consideration is given to assigning the U.S. Atlantic Command primary responsibility for (1) assessing C4I requirements for the potential effect on joint task force operations, (2) providing guidance to the Defense Information Systems Agency on the development of a joint C4I architecture, and (3) ensuring continuous C4I interoperability assessments through joint training exercises.

Agency Comments and Our Evaluation

DOD provided written comments on this report (see app. III), stating that it generally agreed with the report's findings and recommendations. However, DOD believed it had taken adequate measures to deal with C4I

system interoperability and saw no benefit in assigning additional responsibilities to the U.S. Atlantic Command. In addition, DOD stated that establishing joint program management offices was unnecessary because it would add layers of management with little return in solving interoperability problems. It also stated that current funding controls are best left with the services and agencies responsible for equipping and training forces, with oversight by the Office of the Secretary of Defense.

DOD stated that its new policy and procedures published in November 1992 (DOD Directive 4630.5 and Instruction 4630.8) have greatly enhanced the process of how compatibility, interoperability, and integration requirements for C4I systems are stated, coordinated, validated, and approved. DOD emphasized that under this new guidance (1) all new and modified C4I system needs and operational requirement documents must be certified by the Joint Staff for conformance to policy and doctrine, interoperability requirements, functional architectures, and joint potential before granting system production approval and (2) joint certification testing is now mandatory for all C4I systems. DOD stated that other efforts are underway to enhance C4I interoperability among the services and defense agencies, including the designation of the Defense Information Systems Agency as the executive agent for all C4I standards.

We believe these initiatives are noteworthy and recognize that a reasonable amount of time is required for new guidance to take effect. However, we must note that DOD responded in a similar manner to our 1987 report on interoperability when it stated that publication of the 1985 DOD Directive 4630.5 and a corresponding 1986 Joint Chiefs of Staff Memorandum of Policy 160 created mechanisms for institutionalizing interoperability. DOD's new guidance is undoubtedly necessary, but ensuring that greater C4I interoperability is achieved will likely require firmer measures than issuing new guidance.

Accordingly, we continue to believe that additional enforcement mechanisms such as a joint program management office with directive authority and funding controls would provide the basis for essential firm management oversight by the Office of the Secretary of Defense and the Joint Staff. We also believe that DOD has an opportunity to better achieve C4I interoperability by taking advantage of the U.S. Atlantic Command's new joint mission. The Command is ideally suited, as the primary force provider, for the additional responsibilities of (1) assessing C4I requirements for the potential effect on joint task force operations and providing the results to the Joint Staff for review; (2) providing guidance

to the Defense Information Systems Agency on developing a joint C4I architecture, which was not provided by DOD in the mid-1980s when the last joint tactical C3 architecture was developed; and (3) ensuring continuous C4I interoperability evaluations through joint training exercises.

Scope and Methodology

We reviewed DOD and Joint Staff C4I interoperability directives, architectures, plans, reports, and briefings. We discussed these documents and C4I interoperability issues with DOD representatives responsible for C4I architectures, programs, and systems at the offices of the Assistant Secretary of Defense for C3I; the Joint Staff C4 Directorate; the Defense Information Systems Agency's Joint Interoperability and Engineering Organization; DOD's Intelligence Communications Architecture Project Office; the Army's Directorate of Information Systems for C4; the Navy's Directorate of Space and C4 Systems Requirements and Space and Naval Warfare Systems Command; the Air Force's Deputy Chief of Staff for Plans and Operations; and the U.S. Pacific Command and its component commands.

We performed our review between April 1992 and June 1993 in accordance with generally accepted government auditing standards.

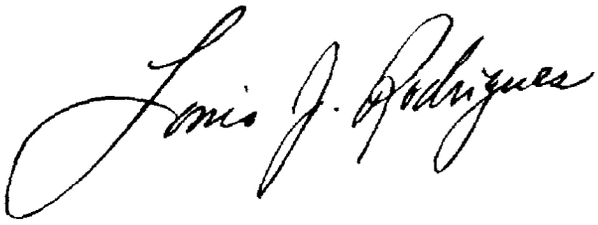
This report contains recommendations to you. The head of a federal agency is required by 31 U.S.C. 720 to submit a written statement on actions taken on these recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of this letter. A written statement also must be sent to the Senate and House Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of this letter.

We are sending copies of this report to the Director, Office of Management and Budget; the Secretaries of the Army, the Navy, and the Air Force; and interested congressional committees. We will also make copies available to others upon request.

This report was prepared under the direction of Thomas J. Schulz, Associate Director, Systems Development and Production Issues, who may be reached on (202) 512-4841 if you have any questions about this report. Other major contributors to this report were Homer H. Thomson,

Assistant Director; Charles R. Climpson, Evaluator-in-Charge; and Richard B. Kelley, Evaluator.

Sincerely yours,



Louis J. Rodrigues
Director, Systems Development and
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Abbreviations

C3	Command, control, and communications
C3I	Command, control, communications, and intelligence
C4I	Command, control, communications, computers, and intelligence
DOD	Department of Defense

Interoperability Is Still a Concern

The Department of Defense's (DOD) policy and procedures relative to interoperability of command, control, and communications (C3) equipment for joint military operations date back to 1967, when DOD issued Directive 4630.5. However, based on evidence provided in our 1987 report, the military departments and the Office of the Joint Chiefs of Staff did not carry out their responsibilities under this directive.

In 1984, DOD placed a special emphasis on interoperability by establishing the Joint Tactical Command, Control, and Communications Agency[1] under DOD Directive 5154.28. The Joint Agency's mission was to ensure interoperability of tactical C3 systems for joint and combined operations through the development and maintenance of a joint architecture and interface standards and definitions.[2]

In 1985, DOD reissued Directive 4630.5 in response to congressional criticism concerning interoperability. The revised directive established policy for DOD components to acquire and deploy tactical command, control, communications, and intelligence (C3I) systems and equipment that were compatible and interoperable, where required, with other similar systems and equipment. The directive required the Joint Agency to (1) develop and manage a tactical C3I system interoperability testing and certification program to verify proper implementation and maintenance of technical and procedural interface standards and (2) make recommendations to the Joint Chiefs of Staff on whether tested systems should be certified for use in joint and combined operations.

In our 1987 report, we concluded that although DOD had begun a number of initiatives to achieve interoperability among C3 systems, overall success of such efforts was disappointing. This was, in part, because of a failure to develop a joint tactical C3 architecture. We pointed out that the equivalent of such an architecture had been a requirement for 20 years. Although the Joint Agency was just beginning to develop the architecture, there was no general agreement within DOD on what the architecture should accomplish.

[1]Through reorganizations in 1988, 1991, and 1992, the Joint Agency is now known as the Joint Interoperability and Engineering Organization and is located within the Defense Information Systems Agency (formerly the Defense Communications Agency).

[2]A C3 architecture is a plan that describes the overall C3 concept by (1) defining command relationships (who talks to whom), information requirements (what information is exchanged), and characteristics of associated C3 systems and (2) documenting technical and procedural interface standards and procurement and fielding schedules. Such an architecture is intended to establish the logical link between operational requirements and system development. Interface standards refer to (1) the functional, electrical, and physical characteristics and (2) the form or format, language, syntax, vocabulary, and procedures necessary to allow for the exchange of information across a boundary between different C3 systems and equipment.

We concluded that it could be years before the architecture was completed and that past experience provided little assurance it would ever be effectively implemented. We recommended that (1) the service secretaries certify the interoperability of C3 equipment being acquired or seek waivers if the equipment would not provide interoperability and (2) the services be allowed to seek funding only for items that would provide interoperability or for which a waiver was approved.

DOD concurred with our recommendations and stated that it needed to improve interoperability in certain areas and had established mechanisms to do so. It cited the Joint Agency as the organization for assuring that new systems would provide the necessary degree of interoperability. It stated that (1) prior to 1984, no agency had ever been given the responsibility for developing an overall defensewide joint interoperability architecture and (2) the Office of the Secretary of Defense did not provide specific guidance to the Joint Agency in the development of architectures because rigid instructions would stultify imagination. DOD expressed caution, however, regarding the achievement of interoperability by stating that (1) there would be some interoperability problems as long as new and old systems coexist, (2) fiscal constraints conspire against interoperability, even when the services unanimously agree on common equipment, and (3) fielding equipment to general purpose forces that are simultaneously committed to the plans of up to six unified and specified commands adds another difficult dimension.

DOD Documents Identify Persisting Interoperability Problems

Since our 1987 report, several DOD documents have identified interoperability problems, citing needed improvements. They included the joint tactical C3 architecture, two reports sponsored by the Joint Staff, and the report on the Persian Gulf War.

Joint Tactical C3 Architecture

From 1988 to 1992, DOD published the joint tactical C3 architecture, which was divided into nine functional area documents. Eight of the documents were oriented toward military missions—air operations, air defense and airspace control, fire support, land combat operations, maritime and amphibious operations, combat service support, special operations, and intelligence operations—and one was a capstone document for a notional joint task force headquarters.

All nine documents were validated by the Joint Chiefs of Staff. All but one (intelligence) was approved by the Assistant Secretary of Defense for Command, Control, Communications and Intelligence for implementation by DOD components. Implementation meant that the architecture was to be used as authoritative guidance for preparation of program objective memorandums.[3]

The architecture identified service missions, roles, and responsibilities; command and control connectivity requirements; and supporting C3 systems and equipment. Although the architecture has not been well-accepted within DOD as a planning document (see app. II), it did identify numerous examples of system and operational interoperability deficiencies, impediments, or concerns that could prevent effective joint operations.

One of the system problems involved no formal statement of requirements for automated C3 support at joint task force headquarters. An automated capability to gather, process, store, display, and report information and to issue operational orders in a timely manner was considered to be essential for command and control purposes.

Another system problem involved no joint communications network management capability to support a joint task force during land combat operations and to ensure more effective use of communication assets. Various automated network management efforts responsive to intraservice requirements were underway, but they were uncoordinated and not keyed to the management of joint networks. Individual systems such as the Army's Mobile Subscriber Equipment were cited as incorporating well-defined communication control elements, but making no provision for integrating these elements into a joint network.

In addition, the lack of digital communications for joint information exchange needs during fire support operations was cited as a system problem. Voice communications was not considered to be entirely responsive to operational needs. An increasing variety of digital entry devices that used different message standards and protocols was being acquired by the services, disallowing their use for joint operations.

One of the operational problems involved too much time to prepare and disseminate tasking orders for joint air operations. Such tasking was

[3]Such memorandums are submitted to the Secretary of Defense biennially by DOD components recommending total resource requirements and programs for a 6-year period. The memorandums are based on fiscal guidance provided by the Secretary of Defense.

viewed as being too detailed, and requests for some types of air missions were viewed as having to be made unrealistically early. Some aspects of these problems reflected a conflict between the need for an orderly process in employing air assets and the demands for responsiveness in supporting forces on the battlefield. (During the Persian Gulf War, the air tasking order transmission process was slow and cumbersome. This was specifically demonstrated in the Navy due to the lack of necessary communications on aircraft carriers to permit on-line integration with the Air Force computer-aided force management system. Couriers were used, as substitutes, to deliver air tasking order diskettes.)

Another operational problem involved deficient joint C3 interfaces and operating procedures for adjacent Army and Marine Corps forces to coordinate joint use of airspace below the coordinating altitude in a timely manner. The architecture viewed this as inhibiting Army aircraft involved in land combat operations from passing into Marine Corps airspace and Marine Corps aircraft involved in maritime and amphibious operations from passing into the Army's area of operations.

A third operational problem involved the need for improved joint doctrine and procedures in fire support operations beyond the fire support coordination line as a result of introducing long-range fire support weapons (such as the Army Tactical Missile System) with long-range target acquisition capabilities (such as the Air Force-Army Joint Surveillance and Target Attack Radar System). Coordination of air, ground, and naval fire support was considered essential to avoid duplicate targeting, reduce fratricide, and increase efficiency in using the weapons.

In addition, command and control challenges in air operations that are expected from introducing large numbers of unmanned aerial vehicles to the battlefield having both joint and service component roles were also cited as an operational problem. These vehicles have multiple roles, including reconnaissance, surveillance, target acquisition, C3, electronic warfare, and lethal attack.

Joint Staff Reports

In a 1991 report from a panel formed by the Chairman of the Joint Chiefs of Staff, interoperability was a major topic in a review of DOD's command and control functions and processes. The panel's purpose was to review these matters based on the changing world environment and the evolving national military strategy. The report discussed several aspects of "technical" interoperability by stating that (1) DOD needs to strengthen its

emphasis on acquisition of interoperable command and control systems by the services; (2) reliance on an ad hoc assembly of service-unique command and control systems must be reduced; (3) service-developed information exchange standards may not be well implemented across service boundaries; and (4) in some cases, services do not recognize a requirement to use service-unique capabilities in joint operations and, therefore, do not recognize a need for joint interface standards.

The report also stated that there were other elements of interoperability, which were not system-oriented and which were even more difficult to achieve than technical interoperability. For example, substantial variations existed within the services regarding procedures, tactics, and rules governing actions (operational interoperability) that were considered to be at least as important as the technical (system interoperability) factors. The report stated that DOD would have to address this class of problems by emphasizing the need to test, evaluate, train, and exercise in a joint environment.

In 1992, a team organized by the Joint Staff reviewed interoperability aspects of command and control systems at the unified and specified commands. The team placed emphasis on how these commands would interface with a subordinate joint task force, with the purpose of developing short-term solutions under the new C4I for the Warrior initiative. Some of the team's conclusions were that (1) systems were being developed and fielded using commander in chief initiative funds to satisfy immediate needs, but without considering DOD-wide interoperability issues and (2) interoperability among different systems was more a matter of chance than deliberate planning. The team's report distinguished between what it called "technical" interoperability fixes and what it characterized as "other pillars of interoperability" such as requirements, doctrine, procedures, and training that needed to be addressed.

Persian Gulf War Report

In its 1992 report to the Congress on the Persian Gulf War, DOD described the challenge in establishing a coherent, interoperable network consisting of three generations of tactical communication systems. DOD stated that

> "Equipment not designed or intended to interoperate when procured originally was in use to support missions that became increasingly integrated as the theater developed. In many cases, as interoperation requirements emerged, the Services and agencies developed innovative modifications or upgrades to make interfaces possible . . . However, in some

cases, interoperability was lacking, and these problems were documented in numerous after-action reports."

DOD stated that (1) one of several shortcomings during the war included the need to construct a comprehensive C3 interoperability plan between services and other defense agencies with many workarounds in both hardware and software and (2) there was a need for a comprehensive joint architecture from which supporting communications architectures could be built and interoperability issues resolved.

C4I for the Warrior Is a New Interoperability Initiative

In June 1992, the Chairman of the Joint Chiefs of Staff stated that C4I initiatives by the services were not unified because no common global vision existed to guide the future direction of C4I in support of the warrior during joint and combined operations. Thus, C4I for the Warrior is intended to (1) address joint force C4I interoperability issues and (2) provide a means for unifying the many heterogeneous service C4I programs currently being pursued.

Despite these goals, the new initiative faces a prolonged process for achievement, and success will be highly dependent on a comprehensive, integrated, and useful joint C4I architecture that has yet to be developed and effective interoperability enforcement. DOD now has an opportunity to strengthen interoperability through the U.S. Atlantic Command.

Achieving the Initiative Will Be a Prolonged Process

Achieving the new initiative will be a prolonged process because the tentative schedule consists of an evolutionary effort in three concurrent phases. The first (quick-fix) phase extends through the ensuing 6 years and includes the development of translation devices[4] and information standards for existing systems. Although DOD policy discouraged the use of such translators for the last 25 years, the 1991 report by the Chairman's panel stated that the lack of joint interface standards resulted in a need for cumbersome and ineffective manual interfaces or expensive buffer-translator systems to establish necessary information interfaces within a joint force. DOD's current Directive 4630.5 no longer includes this long-standing policy of discouraging translators.

The Joint Staff's 1992 tiger team report on C4I for the Warrior identified four major existing command and control systems that were not interoperable, but that should be made interoperable through the use of translators, during the quick-fix phase. The systems involved (1) the Army's Standard Theater Army Command and Control System, which supports end-to-end force tracking, rear area theater operations, and theater sustainment functions; (2) the Navy's Joint Operational Tactical System, which provides a near real-time tactical picture for situation assessment purposes; (3) the Air Force's Air Situation Display System, which provides air picture information from airborne and land-based radar systems; and (4) DOD's Worldwide Military Command and Control System, which provides national military commanders with a means for planning, directing, and controlling U.S. military forces worldwide.

[4]Translators interpret nonstandard message and data formats and protocols and produce common outputs that can be readily exchanged via standard transmission paths.

The second (mid-term) phase is to run concurrently with the quick-fix phase but includes the next 10 years—extending into the next century. During this phase, (1) a common network operating environment is contemplated, (2) interoperability and jointness become the primary drivers and design features for all new C4I requirements, and (3) a transition from military-unique to commercial standards and systems is expected whenever feasible.

The final (objective) phase is to run concurrently with the quick-fix and mid-term phases but is to extend beyond the mid-term phase into the next century, and it is very dependent on advanced technology. A fully developed C4I network of fused information that is automatically updated is envisioned whereby the joint warfighter would have worldwide access to needed data in the performance of a mission. The Chairman expects the objective phase to be affordable and not technologically limited because it is to rely on maximum use of commercial off-the-shelf and nondevelopmental items.

Comprehensive Architecture Remains to Be Developed

DOD had difficulty developing its joint tactical C3 architecture, which was first required in the mid-1980s. Several DOD representatives expressed dissatisfaction with the architecture, which was eventually published from 1988 through 1992. According to these representatives, the architecture was inadequate for planning purposes, too abstract, and out of date, and it lacked detail, relevance, usefulness, or an operational perspective. Other comments were that the Joint Interoperability and Engineering Organization—the current organization responsible for the architecture—lacked the authority to enforce compliance with interoperability standards because it (1) was not part of the budget process, (2) did not have a clearly defined role, (3) did not help users, (4) did not plan to update the architecture, and (5) had produced products that lacked specificity, timeliness, accuracy, and quality.

Despite these negative comments, some type of architecture is necessary to establish the logical link between operational requirements and system development and to guide DOD components toward a common end. Under C4I for the Warrior, the objectives are to integrate the current disparate C4I architectures and systems that exist throughout the services and commands and to chart a road map to a fully interoperable, global C4I architecture and network.

The Defense Information Systems Agency established a joint program integration office in August 1992 to develop an implementation plan and coordinate the initiative's implementation by the services and commands. The office intends to complete the implementation plan in 1994. However, based on DOD's previous lengthy record in developing the joint tactical C3 architecture and the lack of user acceptance, developing a new joint C4I architecture could present DOD with an arduous task, requiring continuous management attention.

Effective Enforcement Is a Critical Issue

In our 1987 report, we cited the absence of an effective central enforcement authority to make the necessary interoperability decisions. This statement was based on findings from a number of earlier studies that suggested the need for clearer mechanisms to resolve conflicting service demands. DOD's 1987 response to our report was that (1) establishment of the Joint Tactical Command, Control, and Communications Agency in 1984 to ensure interoperability provided DOD with a much needed neutral expert on interoperability issues; (2) publication of the 1985 DOD Directive 4630.5 and a corresponding 1986 Joint Chiefs of Staff Memorandum of Policy 160 created mechanisms for institutionalizing the approach to interoperability; and (3) appointment of an Assistant Secretary of Defense for Command, Control, Communications, and Intelligence with a very broad and comprehensive charter had given the interoperability program a viable means of enforcement.

Despite this official DOD response, recent DOD documents show a continuing concern about interoperability enforcement. For example, the 1991 report by the Chairman's panel stated that mechanisms for specifying and enforcing interoperability needed to be strengthened. The report concluded that (1) the planning and acquisition approach for command and control was not oriented toward building a consolidated joint capability and (2) centralized planning and management oversight were needed from the initial stages where concepts and architectures are created to the final stages where systems are tested, evaluated, and deployed to the component forces. Related recommendations were that DOD should (1) enforce interoperability, (2) increase the degree of centralized management oversight of command and control acquisition, and (3) establish joint program management offices and command oversight for programs, as required.

In addition, the 1992 Joint Staff's tiger team report stated that although the C4I for the Warrior concept was well received at all unified and specified

commands during team visits, a common concern voiced at almost every briefing given by the team was how enforcement would work. The team's recommendations included (1) clearly identifying who is responsible for C4I interoperability and who can enforce compliance, with no waivers, and (2) designating a joint program management office to become an acquisition arm for the concept.

Changes Made, but More Emphasis May Be Needed

DOD recently made some changes to strengthen enforcement of C4I interoperability. For example, in November 1992, DOD reissued its 1985 Directive (4630.5) establishing policy for compatibility, interoperability, and integration of C3I systems and issued a new DOD Instruction (4630.8) to implement the policy. The revised policy established as a long-term objective, a DOD-wide, global C3I infrastructure and declared that all C3I systems developed for U.S. forces were considered to be for joint use. It also expanded and strengthened some procedures associated with reviewing requirements and making acquisition decisions. However, these publications apply only to new C3I systems and major changes to existing systems. According to a DOD representative, the effect of the revised directive and new instruction may not be noticeable for several years.

In addition, the corresponding 1986 Joint Chiefs of Staff Memorandum of Policy 160 is being revised, and the Joint Interoperability and Engineering Organization has formed a joint program integration office to coordinate various efforts under the initiative.

The question is whether these changes are adequate or whether other actions may be needed to better ensure success. For example, although the joint program integration office has the responsibility to coordinate interoperability efforts, it is not a management office with the authority to direct that they be achieved. We were informed by a Joint Interoperability and Engineering Organization representative that the Office of the Secretary of Defense did not intend to give the Joint Program Integration Office directive authority until a requirements analysis for a future global command and control system was completed—a task that could take about a year.

Equally important to directive authority for joint programs may be funding control. Considering that part of DOD's revised policy on interoperability is that "all C3I systems developed for use by U.S. forces are considered to be for joint use," it is reasonable to expect acquisition funds for such systems to be jointly controlled, possibly through defense agency accounts, rather

than service accounts, to strengthen this policy. Acceptance within DOD of this traditionally contentious issue relative to joint programs could be a major obstacle because of the military services' legal budget authority under 10 U.S.C. and propensity to give their own needs the highest priority when making budget decisions.

In addition, management emphasis at the highest DOD levels will be essential. Representatives from the Office of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence informed us that DOD review authorities for C4I requirements and acquisitions—the Joint Staff and the Office of the Secretary of Defense, respectively—had not invoked sufficient resolve to enforce interoperability when services identified systems as having service-unique requirements.

A Means Is Available to Strengthen Interoperability

In his February 1993 report entitled Report on the Roles, Missions, and Functions of the Armed Forces of the United States, the Chairman of the Joint Chiefs of Staff recommended that the U.S. Atlantic Command assume a new mission as a joint headquarters for U.S.-based forces. The impetus for this change involved the revised national military strategy that included the decline in a forward presence of forces overseas and the increased importance that U.S. forces be trained to operate jointly as a way of life. The Secretary of Defense directed in March 1993 that the recommendation be implemented.

The U.S. Atlantic Command's new mission provides a means for DOD to strengthen C4I interoperability. Given that in future conflicts or crises, joint forces may have to be promptly and precisely deployed from the United States with little preparation time, effective C4I interoperability will need to be in place. According to the Chairman's report, (1) units that are already accustomed to operating jointly will be easier to deploy and (2) overseas commands will be able to focus more on in-theater operations and less on deployment and readiness concerns.

Functional responsibilities that the Chairman suggested could be assigned to the U.S. Atlantic Command included (1) improving joint tactics, techniques, and procedures and (2) recommending and testing joint doctrine. He pointed out that while the services would retain their responsibilities under 10 U.S.C. to organize, train, and equip forces, the training and deploying of U.S.-based forces as a joint team would be the responsibility of the U.S. Atlantic Command.

In a March 1993 report to congressional committees on the progress of the initiative, the Chairman stated that great strides have been made in the interoperability arena as the services are thinking "joint," rather than service-unique, requirements. However, he stated that there is still a long way to go, requiring emphasis in (1) continuing several ongoing actions to achieve interoperability now and (2) addressing areas fundamental to institutionalizing the concept and laying a solid foundation for future efforts.

In consonance with the U.S. Atlantic Command's new mission as the primary force provider and the need to institutionalize interoperability, the Command would be ideally suited for additional responsibilities associated with C4I interoperability. Specifically, the Command could be assigned primary responsibility for assessing C4I requirements for the potential effect on joint task force operations. It could also provide guidance to the Defense Information Systems Agency on the development of a joint C4I architecture. In addition, it could ensure continuous C4I interoperability assessments through joint training exercises.

Comments From the Department of Defense

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

ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301-3040

COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE

September 2, 1993

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

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) Draft Report, "JOINT MILITARY OPERATIONS: DOD's Renewed Actions To Improve C4I Interoperability May Not Be Adequate," dated July 30, 1993 (GAO Code 395199), OSD Case 9484. The DoD partially concurs with the report.

While the Department generally agrees with the findings and recommendations, the DoD believes it has taken adequate measures to deal with Command, Control, Communications, Computers and Intelligence system interoperability. New DoD policy, published in November 1992, contained in DoD Directive 4630.5, "Compatibility, Interoperability, and Integration of Command, Control, Communications and Intelligence Systems" and the procedures established in DoD Instruction 4630.8, "Procedures for Compatibility, Interoperability, and Integration of Command, Control, Communications, and Intelligence Systems" have greatly enhanced the process of how compatibility, interoperability, and integration requirements are stated, coordinated, validated, and approved. The Department believes that the responsibilities currently assigned to the Joint Staff to review and validate requirements should remain as they are as opposed to the GAO recommendation to assign these responsibilities to the Atlantic Command. Joint architecture development and maintenance is the responsibility of the Defense Information Systems Agency. The Department sees no benefit in reassigning these responsibilities to the Atlantic Command.

The new DoD policy and procedures require that all new and modified Command, Control, Communications, Computers and Intelligence systems needs and operational requirements documents be certified by the Joint Staff for conformance to joint Command, Control, Communications, Computers and Intelligence policy and doctrine, interoperability requirements,

conformance to functional architectures, and joint potential before approval. Joint certification testing under the supervision of the Defense Information Systems Agency's Joint Interoperability Test Center is now mandatory for all Command, Control, Communications, Computers and Intelligence systems. Many other efforts are underway and others are planned to enhance joint interoperability among the Services and Defense Agencies. On September 21, 1992, in a memorandum from the Assistant Secretary of Defense for Command, Control, Communications and Intelligence, the Army was designated as Executive Agent for tactical switched systems with the Defense Information Systems Agency serving as the overall integration manager for tactical to strategic switched systems. This action was taken to strengthen control over the Service's fielding and configuration management of communication switches' hardware and software and to ensure that the tactical to strategic interfaces work. Similar efforts have been taken to standardize the Air Tasking Order preparation and dissemination procedures and to develop a joint task force communications network management system.

In another measure to strengthen interoperability the Department designated the Defense Information Systems Agency as the Executive Agent for all Command, Control, Communications, Computers and Intelligence standards. The Defense Information Systems Agency has established a Center for Standards and is taking the lead in coordinating and supporting the information technology standards requirements of the Services and Defense Agencies.

In summary, the DoD has new policy and procedures to implement Command, Control, Communications, Computers and Intelligence interoperability. They apply to all Command, Control, Communications, Computers and Intelligence systems in the DoD. The policy and procedures are being implemented DoD-wide. The policy requires that all Command, Control, Communications, Computers and Intelligence systems be certified for interoperability, which is a critical characteristic considered in granting system production approval.

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

Emmett Paige, Jr.

Enclosure

GAO DRAFT REPORT - DATED JULY 30, 1993
(GAO CODE 395199) OSD CASE 9484

"JOINT MILITARY OPERATIONS: DOD'S RENEWED ACTIONS TO IMPROVE INTEROPERABILITY MAY NOT BE ADEQUATE"

DEPARTMENT OF DEFENSE COMMENTS

* * * * *

FINDINGS

FINDING A: Interoperability Problems Have Persisted For Some Time. The GAO observed that DoD policy and procedures relative to interoperability of command, control, and communications equipment for joint military operations date back to 1967 when the DoD issued Directive 4630.5. The GAO concluded, however, that the Military Departments and the office of the Joint Chiefs of Staff did not carry out their responsibilities under that directive. The GAO also observed that, since the Vietnam conflict, congressional committees have had a continuing interest in seeing that the DoD initiate interoperability improvements. The GAO further concluded that, although the DoD worked over the years to achieve greater interoperability, it continued to experience interoperability problems during the most recent major joint military operations--the Persian Gulf War in 1991. The GAO noted that the DoD is currently emphasizing joint military operations based on expectations that future threats will more likely be encountered on a regional, rather than a global basis--requiring a mix of land, sea, and air forces.

The GAO pointed out that, in 1984 and 1985, the DoD placed special emphasis on interoperability by issuing directives that (1) required development and maintenance of a joint tactical command, control, and communications architecture and (2) revised policy and assigned responsibility for implementation. The GAO further pointed out that, from 1988 to 1992, the DoD published the joint architecture as a basis for achieving compatibility and interoperability in joint and combined military operations--taking about 8 years to complete the project. The GAO concluded that, although the architecture was not well-accepted within the DoD as a planning document, it nevertheless identified numerous system and operational interoperability deficiencies, impediments, or concerns that could prevent effective joint operations. The GAO noted that, in its 1992 report to the Congress on the Persian Gulf War, the DoD described the challenge in establishing a coherent, interoperable network consisting of three generations of tactical communications systems--stating that a comprehensive joint architecture to help resolve interoperability issues was needed.

Enclosure

The GAO found that, in addition, the Chairman of the Joint Chiefs of Staff recently announced a new initiative called "C4I for the Warrior," which is a concept for achieving global joint interoperability for command, control, communications, computers, and intelligence. The GAO concluded, however, that the initiative faces several obstacles--including a prolonged schedule for achieving interoperability that (1) extends into the next century, (2) involves unknown costs, and (3) relies on unavailable technology. (pp. 2-4, p. 9/GAO Draft Report)

Now on pp. 1-4 and 12-13.

DOD RESPONSE: Partially concur. Although the DoD concurs with most of the finding, the DOD disagrees with the statement that the Military Departments and the Office of the Joint Chiefs of Staff did not carry out their responsibilities under DOD Directive 4630.5. Ongoing interoperability efforts determined that DOD Directive 4630.5 required change. The Military Departments and the Office of the Joint Chiefs of Staff should not be accused of not following the Directive, without providing supporting rationale. It should also be recognized that "C4I for the Warrior" is more than a concept--it provides a roadmap, focus, and unity of effort.

See comment 1.

FINDING B: DoD Documents Continue to Identify Persisting Interoperability Problems. The GAO referenced its 1987 report (OSD Case 7291), in which it concluded that, although the DoD had begun a number of initiatives to achieve interoperability among command, control, and communications systems--the overall success of such efforts was disappointing, partially because of a failure to develop a joint tactical command, control, and communications architecture. The GAO pointed out that the equivalent of such an architecture had been a requirement for 20 years, but there was no general agreement within the DoD on what the architecture should include. In that previous report the GAO also concluded that it could be years before the architecture was completed--and that past experience provided little assurance it would ever be effectively implemented. In the 1987 report the GAO recommended that (1) the Service Secretaries certify as to the interoperability of command, control, and communications equipment being acquired, or seek waivers if the equipment will not provide interoperability, and (2) the Services be allowed to seek funding only for items that will provide interoperability or for which a waiver was approved.

The GAO noted that the DoD concurred with the GAO 1987 recommendations, but expressed caution regarding the achievement of interoperability and indicated that (1) there would be some interoperability problems as long as new and old systems coexist, (2) fiscal constraints conspire against interoperability, even when the Services unanimously agree on common equipment, and (3) fielding equipment to general purpose forces that are simultaneously committed to the plans of up to six unified and specified commands adds another difficult dimension.

The GAO found that, since its 1987 report, several DoD documents have identified interoperability problems, including (1) the joint tactical command, control and communications architecture, (2) two reports sponsored by the Joint Staff, and (3) the report on the Persian Gulf War. The GAO observed, for example, that in the Joint Tactical Command, Control, and Communications Architecture, one of the system problems involved the lack of a formal statement of requirements, or a provision made, for automated command, control, and communications support at joint task force headquarters, which was considered to be essential. The GAO also indicated that another system problem involved the lack of joint communications network management capability to support a joint task force during land combat operations to ensure more effective use of communication assets. The GAO found that, while various automated network management efforts responsive to intra-service requirements were underway, they were uncoordinated and not keyed to the management of joint networks. In addition, the GAO observed (1) that the lack of digital communications for joint information exchange needs during fire support operations was cited as a system problem, and (2) that voice communications was not considered to be responsive to operational needs.

The GAO also concluded that one of the operational problems involved the fact that too much time was needed to prepare and disseminate tasking orders for joint air operations. The GAO pointed out that requests for some types of air missions were viewed as having to be made unrealistically early. (The GAO indicated that during the Persian Gulf War, the air tasking order transmission process was slow and cumbersome--particularly in the Navy, due to the lack of necessary communications on aircraft carriers to permit on-line integration with the Air Force computer-aided force management system.) The GAO further concluded that another operational problem involved no joint command, control, and communications interfaces and operating procedures allowing adjacent Army and Marine forces to coordinate the joint use of airspace below the coordinating altitude in a timely manner by rotary wing aircraft. (pp. 11-13/GAO Draft Report)

Now on pp. 12-15.

DOD RESPONSE: Partially concur. The documents cited do point out interoperability problems, but do not reflect the current efforts being taken to improve interoperability. The Technical Architecture Framework for Information Management is being developed to provide guidance on architectures. Also, actions are being taken to provide an automated network management capability for joint task force use and resolve air tasking order problems. The Services are developing or implementing new concepts which incorporate the vision and concepts of Command, Control, Communications, Computers and Intelligence for the Warrior. The Military Communications-Electronics Board and the Joint Interoperability and Engineering Organization have been restructured to more effectively deal with interoperability

See comment 2.

issues. The Joint Staff (J6) has established an Architecture and Integration Council to review and harmonize the architecture efforts of the Services and Defense Agencies.

FINDING C: The Joint Staff And Persian Gulf War Reports Also Cited Problems. The GAO found that, in a 1991 report prepared by a panel formed by the Chairman of the Joint Chiefs of Staff, interoperability was a major topic in a review of the DoD command and control functions and processes. The GAO indicated that the report discussed several aspects of "technical" interoperability by stating the following:

- the DoD needs to strengthen its emphasis on acquisition of interoperable command and control systems by the Services;
- reliance on an ad hoc assembly of Service-unique command and control systems must be reduced;
- Service-developed information exchange standards may not be well implemented across Service boundaries; and
- in some cases, the Military Services do not recognize a requirement to use Service-unique capabilities in joint operations and, therefore, do not recognize a need or joint interface standards.

The GAO also observed the Joint Staff task force report indicated there were other elements of interoperability that were not system-oriented-elements that were even more difficult to achieve than technical interoperability, such as substantial variations existing within the Services regarding procedures, tactics, and rules governing actions (operational interoperability) that were considered to be at least as important as the technical (system interoperability) factors.

The GAO also found that, in its 1992 report to the Congress on the Persian Gulf War, the DoD described the challenge of establishing a coherent, interoperable network consisting of three generations of tactical communication systems. The GAO observed that the report indicated one of several shortcomings during the war included the need to construct a comprehensive command, control, and communications interoperability plan between the Services and other Defense agencies with many work-arounds in both hardware and software. The GAO further observed that the report to the Congress also indicated that, in addition, there was a need for a comprehensive joint architecture from which supporting communications architectures could be built and interoperability issues could be resolved. (pp. 13-14/GAO Draft Report)

Now on pp. 15-17.

DOD RESPONSE: Concur. The DoD has taken action to strengthen its emphasis on acquisition of interoperable command, control, communications, computer and intelligence systems by the

Services. Current DoD policy states that all command, control, communications, computer and intelligence systems are considered to be for joint use. Efforts to standardize data among the Services has been accelerated. The DoD will adopt a standard command, control, communications, computer and intelligence data element model for use by all DoD components during September 1993. The Department is also identifying legacy command, control, communications, computer and intelligence systems which should be retained and considered for joint use.

FINDING D: Achieving the Interoperability Initiative Will Be A Prolonged Process. The GAO reported that, in June 1992, the Chairman of the Joint Chiefs of Staff stated that command, control, communications, computers, and intelligence initiatives by the Services were not unified because no common global vision existed to guide the future direction in support of the warrior during joint and combined operations. The GAO concluded that, therefore, that the command, control, communications, computers, and intelligence for the Warrior is intended to (1) address joint force interoperability issues and (2) provide a means for unifying the many heterogeneous Service programs currently being pursued. The GAO concluded that, despite those goals, the new initiative faces a prolonged process for achievement, and success will be highly dependent on (1) a comprehensive, integrated, and useful joint architecture that has yet to be developed and (2) effective interoperability enforcement.

The GAO reported that the tentative initiative schedule consists of an evolutionary effort in three concurrent phases--i.e., quick-fix, midterm, and objective phases. The GAO indicated that the first phase extends through the ensuing 5 years and includes the development of translation devices and information standards or existing systems. The GAO further reported that the second phase is to run concurrently with the quick-fix phase, but includes the next 10 years-extending into the next century--during which (1) a common network operating environment is contemplated, (2) interoperability and jointness are to become the primary drivers and design features for all new command, control, communications, computers, and intelligence requirements, and (3) a transition from military-unique to commercial standards and systems is expected whenever feasible. The GAO also reported that the final (objective) phase is to run concurrently with the quick-fix and mid-term phases, but is to extend beyond the mid-term phase into the next century--and is very dependent on advanced technology. (pp. 15-16/GAO Draft Report)

Now on pp. 18-19.

DOD RESPONSE: Concur. However, the GAO statements regarding the importance of interoperability and jointness are misleading. As opposed to "becoming" primary drivers for command, control, communications, computer and intelligence requirements, interoperability and jointness are already in the forefront. As reflected in the DOD National Military Strategy and Joint

See comment 3.

Publication 1, jointness is no longer an after thought, but rather a point of departure.

FINDING E: Comprehensive Architecture Remains To Be Developed. The GAO reported that the DoD had difficulty developing its joint tactical command, control, and communications architecture, which was first required in the mid-1980s and was eventually published from 1988 through 1992. The GAO pointed out that several DoD representatives expressed dissatisfaction with the architecture. The GAO also reported that, according to those DoD representatives, the architecture is inadequate for planning purposes, too abstract, and out of date, and it lacked detail, relevance, usefulness, or an operational perspective. The GAO also noted that other DoD officials indicated the Joint Interoperability and Engineering organization--the current organization responsible for the architecture--lacked the authority to enforce compliance with interoperability standards because it (1) was not part of the budget process, (2) did not have a clearly defined role, (3) did not help users, (4) did not plan to update the architecture, and (5) had produced products that lacked specificity, timeliness, accuracy, and quality.

The GAO concluded that, despite the negative comments, some type of architecture is necessary to establish the logical link between operational requirements and system development and to guide the DoD components toward a common end. The GAO observed that the Defense Information System Agency established a joint program integration office in 1993 to develop an implementation plan, which is scheduled to be completed in 1994. The GAO further concluded, however, that developing a new joint command, control, communications, computers and intelligence architecture is likely to be a formidable task--requiring continuous management attention. (pp. 16-17/GAO Draft Report)

Now on pp. 19-20.

DOD RESPONSE: Concur. The DoD concurs with the finding, but disagrees with the statement indicating the Joint Interoperability and Engineering Organization ought to be able to enforce compliance. Enforcement should remain an Office of the Secretary of Defense and Office of the Joint Chiefs of Staff responsibility.

See comment 4.

FINDING F: Effective Enforcement Is A Critical Issue. In its 1987 report (OSD Case 7291), the GAO had concluded that there was an absence of an effective central enforcement authority to make the necessary interoperability decisions. The GAO based that conclusion on findings from a number of earlier studies, which suggested the need for clearer mechanisms to resolve conflicting Service demands. In its response to the 1987 report, the DoD indicated that (1) the establishment of the Joint Agency in 1984 to ensure interoperability provided the DoD with a much needed neutral expert on interoperability issues, (2) the publication of the 1985 DoD Directive 4630.5 and a

corresponding 1986 Joint Chiefs of Staff Memorandum of Policy 160 created mechanisms for institutionalizing the approach to interoperability, and (3) the appointment of an Assistant Secretary of Defense for Command, Control, Communications and Intelligence (with a very broad and comprehensive charter) had given the interoperability program a viable means of enforcement.

The GAO concluded, however, that despite the official DoD response in 1987, recent Department of Defense documents show a continuing concern about interoperability enforcement. For example, the GAO observed that the 1991 report by the Chairman's panel stated that the mechanisms for specifying and enforcing interoperability needed to be strengthened. The GAO further observed the report concluded that (1) the planning and acquisition approach for command and control was not oriented toward building a consolidated joint capability and (2) centralized planning and management oversight was needed from the initial stages where systems are tested, evaluated, and deployed to the component forces. In addition, the GAO pointed out that a common concern voiced in the 1992 Joint Staff tiger team report was how enforcement would work, and that the team recommendations included (1) clearly identifying who is responsible for interoperability and who can enforce compliance with no waivers, and (2) designating a joint program management office to become an acquisition arm for the concept. (pp. 17-18/GAO Draft Report)

Now on pp. 20-21.

DOD RESPONSE: Concur. The DoD has implemented procedures to review interoperability requirements and conduct an interoperability assessment on all Mission Need Statements and Operational Requirements Documents for all command, control, communications, computer and intelligence systems. The DoD policy now requires that all new or modified command, control, communications, computer and intelligence systems be certified for interoperability prior to production.

FINDING G: Administrative Changes Have Been Made, But More Emphasis May Be Needed. The GAO reported that the DoD had recently made some administrative change to strengthen enforcement of command, control, communications, computers, and intelligence interoperability. For example, the GAO noted that the DoD reissued its 1985 Directive (4630.5) in 1992, which establishes policy for compatibility, interoperability, and integration of command, control, communications, and intelligence systems--and issued a new DoD instruction (4630.8) to implement the policy. In addition, the GAO observed that the corresponding 1986 Joint Chiefs of Staff Memorandum of policy 160 is being revised--and that the Joint interoperability and Engineering Organization had formed a joint program integration office to coordinate various efforts under the initiative.

The GAO concluded that the question remains whether the cited changes are sufficient or whether other actions are needed to better ensure success. For example, the GAO found that, although the joint program integration office has the responsibility to coordinate, it is not a management office with the authority to direct. The GAO also concluded that funding control is equally important to directive authority for joint programs. The GAO indicated that, considering that part of the DoD revised policy on interoperability (which states that all Command, Control, Communications and Intelligence systems developed for use by U.S. forces are considered to be for joint use), it is reasonable to expect acquisition funds to be jointly controlled to strengthen that policy--possibly through Defense agency accounts, rather than Service accounts. However, the GAO concluded that acceptance within the DoD of that traditionally contentious issue relative to joint programs could be a major obstacle because of the Military Service legal budget authority and their desire to make their own spending decisions. (pp. 18-19/GAO Draft Report)

Now on pp. 21-22.

See comment 5.

DOD RESPONSE: Partially concur. The DoD disagrees that existing changes are only administrative. The changes to date have been in-depth and institutional in nature, revising both policy and organizational structures. In addition, as mentioned in the DOD response to Finding E, the Joint Interoperability and Engineering Organization does not need to be able to direct interoperability, and funding control changes are not required.

FINDING H: A Means Is Available To Strengthen Interoperability. The GAO reported that the Chairman of the Joint Chiefs of Staff recommended in his February 1993 report on roles and missions that the U.S. Atlantic Command assume a new mission as a joint headquarters for U.S. based forces. The GAO indicated that the impetus for the change involved the revised national military strategy that included the decline in a forward presence of forces overseas, and the increased importance that U.S. forces be trained to operate jointly as a way of life. The GAO also indicated that the new Atlantic Command mission will provide a means for the DoD to strengthen command, control, communications, computers, and intelligence interoperability. The GAO concluded that, because in future conflicts or crisis, joint forces may have to be deployed promptly and precisely from the United States with little preparation time, effective interoperability will need to be in place.

The GAO also observed that, in a DoD March 1993 report to congressional committees on the progress of the initiative, the Chairman indicated great strides have been made in the interoperability arena as the Services are thinking "joint," rather than Service-unique, requirements. The GAO pointed out, however, that the Chairman also indicated there is still along way to go, requiring emphasis in two different areas--(1) continuing several ongoing actions to achieve interoperability now

and (2) addressing areas fundamental to institutionalizing the concept. The GAO concluded that the Atlantic Command could take the lead in (1) establishing and/or reviewing joint command, control, communications, computers, and intelligence requirements, (2) developing and maintaining the needed joint architecture, and (3) ensuring continuous interoperability assessments through joint training exercises. (pp. 19-20/GAO Draft Report)

Now on pp. 22-23.

DOD RESPONSE: Partially concur. The DoD disagrees with using the Atlantic Command for all joint command, control, communications, computers and intelligence requirements and architectures. Moving the responsibility to the Atlantic Command will not solve the problem; in fact, it may compound the problem by separating the participating Service/Agency staffs from the joint planning personnel. The Atlantic Command should be assigned requirements and architecture responsibilities on a case-by-case basis consistent with established roles, missions, and functions. Identification and validation of joint requirements should remain the responsibility of the Joint Staff.

See comment 6.

* * * * *

RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommended that the Secretary of Defense and the Chairman of the Joint Chiefs of Staff take additional actions to ensure guidelines are established, including time-driven goals, for the development of a joint command, control, communications, computers, and intelligence architecture. (pp. 5-6/GAO Draft Report)

Now on p. 5.

DOD RESPONSE: Concur. Architecture guidelines are being established. The Department is in the process of developing the Technical Architecture Framework for Information Management. That architecture establishes the guidelines recommended by the GAO. Estimated completion is during January 1994. The Department is also in the process of developing a top level migration and implementation plan to integrate and harmonize the Services enterprise architectures. Estimated completion of that top level effort is during 2nd quarter of fiscal year 1994. The Department also has other efforts ongoing and planned to further refine technical and functional architectures within the DoD.

RECOMMENDATION 2: The GAO recommended that the Secretary of Defense and the Chairman of the Joint Chiefs of Staff take additional actions to ensure that effective command, control, communications, computer, and intelligence interoperability enforcement mechanisms are established--such as a joint program management office and Defense agency funding controls. (pp. 5-6/GAO Draft Report)

Now on p. 5.

See comment 7.

DOD RESPONSE: Partially concur. Additional action may be required to ensure effective command, control, communications, computers and intelligence interoperability enforcement. However, planned and recently implemented policy, procedural, and organizational changes need time to take effect. The Department will continually be assessing the policy and procedures and making changes when necessary. In addition, establishment of joint program management offices for various programs is unnecessary and adds additional layers of management with little return in solving interoperability problems. It is the DoD position that current funding controls are adequate. Funding control, with oversight by the Office of the Secretary of Defense, is best left with the Services and Agencies currently responsible for equipping and training the forces to support the various Combatant Commands.

Now on p. 5.

RECOMMENDATION 3: The GAO recommended that the Secretary of Defense and the Chairman of the Joint Chiefs of Staff take additional actions to institutionalize command, control, communications, computers, and intelligence interoperability--such as delegating the necessary authority and assigning the necessary responsibility to the U. S. Atlantic Command, so that it can take the lead in (1) establishing and/or reviewing all joint requirements, (2) developing and maintaining the needed joint architecture, and (3) ensuring continuous interoperability assessments through joint training exercises. (pp. 5-6/GAO Draft Report)

See comment 6.

DOD RESPONSE: Partially concur. Additional action may be required to institutionalize command, control, communications, computers and intelligence interoperability. However, planned and recently implemented policy, procedural, and organizational changes need time to take effect. In addition, as mentioned in the DOD response to Finding H, the Department disagrees with using the Atlantic Command for all command, control, communications, computers and intelligence requirements and architectures. The responsibility for reviewing and validating joint requirements and joint architecture currently rests with the Joint Staff. The Defense Information Systems Agency has been assigned responsibility to develop and maintain joint architectures for command, control, communications, and computer information systems. Current assignment of responsibility for requirements and architectures is adequate. Transferring those responsibilities to the Atlantic Command would not solve the problem. It would only shift the responsibility for solving the problems and result in further delays while the organizational structure is developed and resources are identified to work on the associated tasks and issues. The Atlantic Command should be assigned requirements and architecture responsibilities on a case-by-case basis consistent with established roles, missions, and functions.

GAO Comments

The following are GAO's comments on the Department of Defense letter dated September 2, 1993.

1. The statement referred to is the 1967 version of the directive before it was revised in 1985, not the 1985 directive before it was revised in 1992. The supporting rationale for the statement is that (1) the Office of the Joint Chiefs of Staff did not establish joint requirements or specify which systems had to interoperate and did not develop an overall C3 architecture and (2) the military departments continued to develop their own noncompatible communications equipment. DOD concurred with the finding in its response to our 1987 report (GAO/NSIAD-87-124, Apr. 27, 1987).

2. We acknowledge that the documents cited do not reflect current efforts DOD is taking to improve interoperability. The purpose of citing the documents was to establish credible examples of interoperability problems known to DOD.

3. We modified the statement in our report to be consistent with the Chairman of the Joint Chiefs of Staff's March 1993 progress report to congressional committees on C4I for the Warrior. The Chairman's report stated that in the mid-term phase, interoperability and jointness become the primary drivers and design features for all new C4I requirements. We nevertheless acknowledge the special emphasis DOD is now placing on interoperability and jointness.

4. The statement regarding the lack of authority to enforce compliance, which was obtained from DOD representatives, was not intended to imply that the Joint Interoperability and Engineering Organization should be able to enforce compliance. Instead, it was merely a statement of fact that the Organization had no such authority, and that it and its predecessor organization were responsible only for developing and maintaining the architecture. We agree that such enforcement should remain an Office of the Secretary of Defense and Office of the Joint Chiefs of Staff responsibility.

5. We deleted the word "administrative" to better recognize DOD's efforts toward making institutional changes.

6. We agree with DOD that all C4I requirements and architecture responsibilities should not be moved to the U.S. Atlantic Command. We recognize that under DOD Instruction 4630.8, the Chairman of the Joint Chiefs of Staff is responsible for reviewing C3I requirements for adherence

to interoperability policy and for validating the requirements. We also recognize that commanders of the unified and specified combatant commands are responsible for reviewing C3I requirements submitted by other commands and assessing their potential impact on joint task force operations.

However, in view of the U.S. Atlantic Command's new mission, we believe that assigning the Command primary responsibility for assessing C4I requirements submitted by other commands for their potential effect on joint task force operations would be consistent with (1) the Command's added responsibilities for joint training, force packaging, and facilitating deployments of continental U.S.-based forces during crises and (2) the Chairman's views that overseas commands could focus more on in-theater operations and less on deployment and readiness concerns. Final requirements review and validation should still rest with the Joint Staff. We have clarified the report to reflect this position.

Regarding a joint C4I architecture, we recognize that the Defense Information Systems Agency is responsible for developing and maintaining such an architecture. However, the U.S. Atlantic Command's new mission also supports an added responsibility to provide guidance and assess the adequacy of the architecture. The basic tasks could include describing a joint task force organizational structure, defining command relationships (who talks to whom), and identifying information requirements (what information is exchanged). Considering (1) DOD's difficulty, from 1967 to 1987, in developing an architecture, (2) DOD's acknowledgement that no specific guidance was provided in the mid-1980s for developing the joint tactical C3 architecture, and (3) the general user dissatisfaction with the architecture once it was developed, a new approach and more coordinated effort in developing a C4I architecture in support of joint military operations seem appropriate. We believe the U.S. Atlantic Command could provide a strengthened role in this area and have clarified our report accordingly.

7. DOD is relying on its newly implemented policy and procedures to better ensure C4I interoperability, stating that such changes need time to take effect. We agree that additional time is needed to measure the effectiveness of this new guidance. However, we must note that effective enforcement was also a subject of our 1987 report. In response to that report, DOD stated in 1987 that the (1) establishment of an agency—the Joint Tactical Command, Control, and Communications Agency—chartered to ensure interoperability provided DOD with a much

needed neutral expert on interoperability issues and (2) appointment of an assistant secretary of defense for command, control, communications, and intelligence with a very broad and comprehensive charter had given the interoperability program a viable means of enforcement. However, as found in our current report, DOD documents in 1991 and 1992 expressed the need to strengthen interoperability enforcement. To be effective, we believe that additional enforcement mechanisms such as a joint program management office with directive authority and funding controls are still needed.

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