

on and
NATIONAL DEFENSE SUBCOMMITTEE,
Committee on Government Operations,
House of Representatives

April 1987

INTEROPERABILITY

DOD's Efforts to Achieve Interoperability Among C3 Systems



Released

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538670

**National Security and
International Affairs Division****B-226593**

April 27, 1987

The Honorable Jack Brooks
Chairman, Legislation and
National Security Subcommittee
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

In your letter of February 19, 1986, you asked us to evaluate:

- the extent to which communications interoperability problems have been identified during exercises and past operations;
- the impediments preventing interoperability and how much they can be overcome; and
- the prognosis for the newly created Joint Tactical Command, Control, and Communications (C3) Agency to achieve significantly greater interoperability among the military services.

We discussed these issues at hearings on August 14, 1986, before your Subcommittee. A copy of our testimony is included as appendix I. This letter summarizes some of our testimony along with additional observations about the Department of Defense's (DOD's) efforts to attain a greater degree of interoperability among its C3 systems. Appendix II more fully discusses those observations.

Since the Vietnam War, the Congress has had a continuing interest in DOD's efforts to develop interoperable C3 systems. Although DOD, including the Office of the Joint Chiefs of Staff and the services, has begun a number of initiatives to achieve interoperability among C3 systems, overall success of such efforts has been disappointing. This disappointment is reflected in

- DOD's failure to develop an overall C3 architecture,
- the length of time DOD took to revise its interoperability directive, and
- DOD's limited success in fielding common and compatible C3 equipment

In our testimony, we discussed C3 interoperability problems experienced in Vietnam and Grenada and in joint exercises. We also noted that our recently completed audit in the Pacific theater showed the services still do not have compatible encryption equipment, antijam radios, and satellite terminals.

Past studies frequently cite, and DOD officials generally agree, that there are three causes for interoperability problems.

- DOD's decentralized management structure,
- the lack of clearly defined joint requirements, and
- the absence of an effective central enforcement authority to make the necessary interoperability decisions.

In our testimony, we concluded that it was too early to determine whether the Joint Tactical C3 Agency would succeed. Nonetheless, we believe the C3 architecture being developed by the Joint Tactical C3 Agency should help. Unfortunately, it could be years before the C3 architecture is completed, and past experience provides little assurance that it will ever be effectively implemented. Also, the changes anticipated from implementation of the Defense Reorganization Act of 1986 should help to achieve interoperability in the long run.

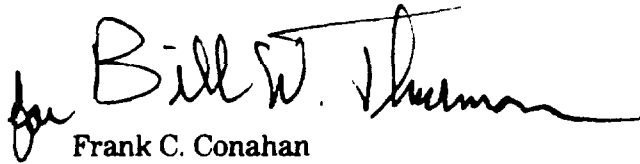
We believe that interoperability could be enhanced more immediately if the service secretaries certified to the Secretary of Defense that C3 equipment being developed and procured will interoperate with other C3 equipment when required to do so. Such a certification program could provide more visibility to decisions effecting interoperability and provide a basis to evaluate specific systems.

We recommend that the Secretary of Defense require that the service secretaries certify that the C3 equipment being developed and procured will provide the needed degree of interoperability with other C3 equipment in order to satisfy the operational plans of the unified commanders. If the C3 equipment will not provide the needed degree of interoperability, the service secretaries should seek a waiver from the Secretary of Defense or a designee. We also recommend that the Secretary of Defense allow the services to seek congressional funding only for items that will provide the needed degree of interoperability or for which a waiver has been approved.

We discussed key facts of this report with representatives of the Joint Chiefs of Staff and Joint Tactical C3 Agency. Officials of the Joint Chiefs of Staff emphasized the complexity of the interoperability tasks, and said that several programs had made progress in specific areas, such as standard message formats. As agreed, we did not obtain formal comments from DOD.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 10 days from the date of this letter. At that time we will send copies to interested parties and make copies available to others upon request.

Sincerely yours,

A handwritten signature in black ink, appearing to read "for Bill W. Thurman". The signature is written in a cursive style with a long horizontal flourish at the end.

Frank C. Conahan
Assistant Comptroller General

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Abbreviations

C3	command, control, and communications
DOD	Department of Defense
GAMO	Ground and Amphibious Military Operations
JINTACCS	Joint Interoperability of Tactical Command and Control Systems
JTIDS	Joint Tactical Information Distribution System
TRI-TAC	Tri-Service Tactical Communications Program

Testimony on DOD's Efforts to Achieve a Greater Degree of Interoperability

FOR RELEASE ON DELIVERY
EXPECTED AT 10:00 AM
THURSDAY AUGUST 14, 1986

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON D.C.
STATEMENT OF
RICHARD A. DAVIS
ASSOCIATE DIRECTOR, NATIONAL SECURITY
AND INTERNATIONAL AFFAIRS DIVISION
BEFORE THE
SUBCOMMITTEE ON LEGISLATION AND NATIONAL SECURITY
COMMITTEE ON GOVERNMENT OPERATIONS
HOUSE OF REPRESENTATIVES
ON
THE DEPARTMENT OF DEFENSE'S EFFORTS TO ACHIEVE A
GREATER DEGREE OF INTEROPERABILITY

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE:

I AM PLEASED TO APPEAR BEFORE THE SUBCOMMITTEE TODAY TO TESTIFY ON OUR REVIEW OF THE DEPARTMENT OF DEFENSE'S (DOD'S) EFFORTS TO ACHIEVE A GREATER DEGREE OF INTEROPERABILITY FOR COMMAND, CONTROL, AND COMMUNICATION SYSTEMS. DURING THIS REVIEW YOU ASKED US TO PAY PARTICULAR ATTENTION TO

- THE EXTENT TO WHICH INTEROPERABILITY PROBLEMS HAVE BEEN IDENTIFIED DURING RECENT TRAINING EXERCISES AND PAST OPERATIONS SUCH AS GRENADA;
- THE NATURE OF THE IMPEDIMENTS PREVENTING THE ACHIEVEMENT OF INTEROPERABILITY AND THE EXTENT TO WHICH THESE IMPEDIMENTS CAN BE OVERCOME; AND
- THE PROGNOSIS FOR THE JOINT TACTICAL COMMAND, CONTROL, AND COMMUNICATIONS AGENCY ACHIEVING A SIGNIFICANTLY GREATER DEGREE OF INTEROPERABILITY AMONG THE MILITARY SERVICES.

BACKGROUND

INTEROPERABILITY, ACCORDING TO THE JOINT CHIEFS OF STAFF (JCS), IS ACHIEVED AMONG COMMAND, CONTROL, AND COMMUNICATIONS (C3) SYSTEMS WHEN INFORMATION IS EXCHANGED AMONG THE SERVICES DIRECTLY AND SATISFACTORILY. TO ACHIEVE INTEROPERABILITY, THE SERVICES NEED COMPATIBLE EQUIPMENT AS WELL AS COMPATIBLE OPERATIONAL PROCEDURES SUCH AS CODES, FORMATS, AND AUTHORIZATIONS. THE OVERALL PLAN, OR DESIGN, TO DEVELOP AND ASSURE THIS COMPATIBILITY IS REFERRED TO AS THE C3 ARCHITECTURE WHICH IS ESSENTIAL TO THE ACHIEVEMENT OF INTEROPERABILITY.

ARMY, NAVY, AIR FORCE, AND MARINE CORPS FORCES, WHEN ENGAGED IN JOINT OPERATIONS, MUST BE ABLE TO USE THEIR COMBINED POWER TO ACHIEVE MAXIMUM EFFECTIVENESS. THIS COMBINED USE IS ACCOMPLISHED THROUGH THE CONTINUOUS EXCHANGE OF INFORMATION USING THE VARIOUS ELEMENTS OF THE COMMAND AND CONTROL SYSTEMS WHICH SUPPORT AND LINK THE TACTICAL COMMANDER WITH OTHER COMMANDS AND ELEMENTS. EVERY ASPECT OF THE OPERATION DEPENDS HEAVILY ON THIS VITAL FLOW OF INFORMATION.

INTEROPERABILITY--A LONGSTANDING PROBLEM

THE SERVICES HISTORICALLY HAVE BEEN UNABLE TO COMMUNICATE EFFECTIVELY AMONG THEMSELVES DURING JOINT OPERATIONS AND EXERCISES. THIS WAS THE CASE IN KOREA, THE DOMINICAN REPUBLIC LANDING, VIETNAM AND, ALMOST 20 YEARS LATER, DURING THE GRENADA INTERVENTION IN 1983. TODAY, THERE ARE STILL INSTANCES IN WHICH THE SERVICES CANNOT EFFECTIVELY TALK OR EXCHANGE INFORMATION.

THE INABILITY OF AIR AND GROUND UNITS TO EFFECTIVELY COMMUNICATE CAN LEAD TO SERIOUS CONSEQUENCES. FOR EXAMPLE, SURFACE-TO-AIR MISSILES COULD SHOOT U.S. AIRCRAFT OR U.S.

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AIRCRAFT COULD BOMB OR FIRE UPON AMERICAN FORCES, AS OCCURRED IN GRENADA.

DURING THE VIETNAM WAR, THE SCARCITY OF INTEROPERABLE COMMUNICATION EQUIPMENT SEVERELY HAMPERED OPERATIONS, ESPECIALLY IN CLOSE AIR SUPPORT OPERATIONS. CLOSE AIR SUPPORT IS DEFINED AS THE AIR ACTION AGAINST HOSTILE TARGETS WHICH ARE NEAR FRIENDLY FORCES. WHEN CLOSE AIR SUPPORT OPERATIONS ARE REQUIRED, THE ABILITY OF AIR AND GROUND UNITS TO EFFECTIVELY COMMUNICATE CAN GREATLY ENHANCE OPERATIONS. ACCORDING TO A FORMER DEPUTY DIRECTOR OF DOD'S TACTICAL WARFARE PROGRAM, CLOSE AIR SUPPORT DELIVERED AS NEEDED, QUICKLY, AND IN THE RIGHT AMOUNT AND KIND IS THE PRINCIPLE MEANS OF REDUCING LOSSES ON THE GROUND. IN VIETNAM, THE AIR FORCE COULD NOT PROVIDE ADEQUATE AND RESPONSIVE AIR SUPPORT TO ARMY GROUND FORCES BECAUSE THEIR RADIOS WERE NOT COMPATIBLE. THE AIR FORCE USED UHF/AM RADIOS WHILE THE ARMY USED VHF/FM RADIOS.

IN GRENADA, AIR SUPPORT OPERATIONS WERE AGAIN HAMPERED. ARMY GROUND FORCES AND THE MARINES COULD NOT TALK DIRECTLY TO EACH OTHER BECAUSE EACH SERVICE HAD INCOMPATIBLE RADIOS. FURTHERMORE, ARMY GROUND FORCES COULD NOT TALK TO NAVY SHIPS BECAUSE THE SERVICES HAD DIFFERENT PROCEDURES FOR REQUESTING AIR SUPPORT AND ARMY UNITS COULD NOT AUTHENTICATE AIR AND FIRE SUPPORT REQUESTS BECAUSE THEY DID NOT HAVE NAVY CODES.

THE ABSENCE OF SECURE COMMUNICATIONS IN VIETNAM SEVERELY IMPAIRED OPERATIONS. FOR EXAMPLE, A 1972 HOUSE ARMED SERVICES SUBCOMMITTEE THAT REVIEWED DOD'S WORLDWIDE COMMUNICATIONS FOUND THAT

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". . . ENEMY INTERCEPTION OF UNENCRYPTED VOICE COMMUNICATIONS GAVE NOTICE OF PLANNED ASSAULTS, AMBUSHES, AIR STRIKES, AND ARTILLERY BARRAGES, AND PERMITTED THE ENEMY TO TAKE COUNTERMEASURES TO EVADE OR DEFEAT THOSE ACTIONS."

IN THE YEARS FOLLOWING VIETNAM, EACH SERVICE MADE SIGNIFICANT PROGRESS IN DEVELOPING AND ACQUIRING SECURE VOICE COMMUNICATION SYSTEMS. HOWEVER, DURING GRENADA, THE SERVICES WERE UNABLE TO COMMUNICATE WITH EACH OTHER IN A SECURE MANNER BECAUSE EACH SERVICE ARRIVED IN GRENADA WITH A VARIETY OF DIFFERENT RADIOS, SATELLITE COMMUNICATIONS AND ENCRYPTION DEVICES, ALL OF WHICH WERE INCOMPATIBLE.

INTEROPERABILITY PROBLEMS HAVE BEEN CONSISTENTLY IDENTIFIED IN JOINT EXERCISES. WE REVIEWED INFORMATION PERTAINING TO 24 JOINT EXERCISES CONDUCTED FROM 1979 TO 1985. THIS INFORMATION SHOWED 80 EXAMPLES OF INTEROPERABILITY PROBLEMS RELATING TO EQUIPMENT, PROCEDURES, DOCTRINE, AND TRAINING. FOR EXAMPLE, TWO EXERCISES CONDUCTED IN THE EARLY 1980S SHOWED THAT AIR DEFENSE OPERATIONS WERE NOT EFFECTIVE BECAUSE THE SERVICES USED INCOMPATIBLE ENCRYPTION DEVICES.

CURRENT COMMUNICATION INTEROPERABILITY PROBLEMS

WE RECENTLY COMPLETED AN AUDIT IN THE PACIFIC THEATER WHICH INDICATES THAT THE SERVICES STILL DO NOT HAVE INTEROPERABLE COMMUNICATIONS.

ENCRYPTION EQUIPMENT

WE FOUND THE INCONSISTENT AVAILABILITY OF ENCRYPTION EQUIPMENT THAT EXISTS IN THE PACIFIC THEATER IS SIMILAR TO THAT WHICH EXISTED IN GRENADA AND PAST EXERCISES.

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CRYPTOGRAPHIC EQUIPMENT "SCRAMBLES" RADIO TRANSMISSIONS TO ACHIEVE COMMUNICATIONS SECURITY. THE TWO PRINCIPAL TACTICAL VOICE ENCRYPTION DEVICES USED BY THE MILITARY SERVICES DO NOT INTEROPERATE. ALTHOUGH EACH SERVICE IS MOVING TO A NEWER ENCRYPTION DEVICE, U.S. FORCES IN THE PACIFIC THEATER ARE AT DIFFERENT STAGES OF CONVERTING TO THE NEWER DEVICE. BECAUSE EACH SERVICE HAS DIFFERENT FUNDING PRIORITIES, THE AMOUNTS OF EQUIPMENT PURCHASED AND THE FIELDING SCHEDULES VARY BY SERVICE AND EVEN WITHIN A SERVICE. UNCOORDINATED FIELDING OF THE NEWER DEVICE HAS LED TO JOINT AND INTRASERVICE INTEROPERABILITY PROBLEMS.

IN THE PACIFIC THEATER, THE ARMY HAS COMPLETED MOST OF ITS PLANNED CONVERSION TO THE NEWER ENCRYPTION DEVICE BUT HAS HAD TO RETAIN SOME OF THE OLDER EQUIPMENT TO INTEROPERATE WITH THE OTHER SERVICES.

ALTHOUGH THE NAVY IS CONVERTING ITS AIRCRAFT AND SHIPS, THE CONVERSION MAY TAKE 5 YEARS TO COMPLETE BECAUSE IT INSTALLS THE NEWER ENCRYPTION EQUIPMENT WHILE SHIPS ARE IN DRYDOCK FOR MAINTENANCE.

PACIFIC AIR FORCE CONVERSION TO THE NEWER EQUIPMENT IS PROCEEDING SLOWLY BECAUSE THE AIR FORCE PREFERS TO CONVERT A SQUADRON AT A TIME AND WILL NOT USE THE NEW EQUIPMENT UNTIL ALL PACIFIC AIRCRAFT AND GROUND FACILITIES ARE CONVERTED. AS A RESULT, F-16S, WHICH COME OFF THE ASSEMBLY LINE DESIGNED FOR THE NEW EQUIPMENT, HAVE HAD TO BE MODIFIED TO ACCOMMODATE THE OLD EQUIPMENT. PACIFIC AIR FORCE OFFICIALS WERE UNCERTAIN WHEN THE NEW EQUIPMENT WOULD BE INSTALLED IN FIXED FACILITIES.

HAVE QUICK RADIOS

HAVE QUICK IS AN AIR FORCE RADIO SYSTEM THAT WAS RECOMMENDED BY THE JCS AND DOD FOR JOINT PROCUREMENT BY EACH SERVICE TO COUNTER A SOVIET JAMMING THREAT. MOST PACIFIC AIR FORCE AIRCRAFT ARE EQUIPPED WITH THESE RADIOS. HOWEVER, BECAUSE OF TECHNICAL PROBLEMS THE GROUND VERSION IS NOT EXPECTED TO BE FIELDIED UNTIL AFTER FISCAL YEAR 1988. UNTIL GROUND HAVE QUICK RADIOS ARE FIELDIED, AIR FORCE GROUND UNITS' COMMUNICATIONS WITH AIRCRAFT WILL NOT BE JAM RESISTANT. AS AN INTERIM MEASURE, HOWEVER, SOME GROUND UNITS ARE USING AIRBORNE HAVE QUICK RADIOS TO GET JAM RESISTANT COMMUNICATIONS.

U.S. ARMY COMMANDS IN HAWAII AND KOREA DO NOT HAVE HAVE QUICK RADIOS ALTHOUGH THEY BELIEVE THEY ARE NEEDED FOR JAM RESISTANT GROUND-TO-AIR COMMUNICATIONS WITH THE AIR FORCE. ARMY OFFICIALS HAVE NOT ACQUIRED HAVE QUICK RADIOS BECAUSE THEY INTENDED TO ACHIEVE JAM RESISTANT GROUND-TO-AIR COMMUNICATIONS WITH THE SINGLE CHANNEL GROUND-TO-AIR RADIO SYSTEM (SINGARS) BETWEEN FISCAL YEARS 1987 AND 1988. THE ARMY HAS EXPERIENCED SOME DEVELOPMENT PROBLEMS WITH SINGARS AND ORIGINAL FIELDING SCHEDULES ARE LIKELY TO SLIP.

THE NAVY PLANS TO ACQUIRE ONLY ENOUGH HAVE QUICK RADIOS TO MEET MINIMUM INTEROPERABILITY REQUIREMENTS. CURRENTLY, THE NAVY HAS A FEW IT USES DURING EXERCISES FOR INTEROPERABILITY WITH THE AIR FORCE. THE NAVY DELAYED ACQUIRING THE RADIOS BECAUSE IT WAS DEVELOPING ITS OWN SYSTEM. WHEN DEVELOPMENTAL PROBLEMS AROSE WITH ITS SYSTEM, THE NAVY DECIDED TO BUY SOME HAVE QUICK RADIOS AS AN INTERIM CAPABILITY.

SATELLITE TERMINALS

THE ARMY AND AIR FORCE CANNOT COMMUNICATE VIA SATELLITES IN ONE PACIFIC THEATER COUNTRY BECAUSE THEIR SATELLITE TERMINALS USE DIFFERENT MULTIPLEXERS. THE ARMY AND AIR FORCE ARE AWARE OF THE PROBLEM AND PLAN TO ACHIEVE INTEROPERABILITY BY 1989 BY INSTALLING SIMILAR MULTIPLEXERS.

IMPEDIMENTS TO ACHIEVING INTEROPERABILITY

A NUMBER OF REASONS HAVE BEEN CITED FOR CONTRIBUTING TO INTEROPERABILITY PROBLEMS. THREE REASONS FREQUENTLY CITED BY PAST STUDIES AND BY AGENCY OFFICIALS INCLUDE DOD'S DECENTRALIZED MANAGEMENT STRUCTURE, LACK OF CLEARLY DEFINED JOINT REQUIREMENTS, AND THE ABSENCE OF AN EFFECTIVE CENTRAL ENFORCEMENT AUTHORITY.

MANAGEMENT STRUCTURE

AS IN A NUMBER OF PRIOR STUDIES, A NAVY ADVISORY PANEL ON C3 INTEROPERABILITY REPORTED IN 1985 THAT DOD'S INABILITY TO ACHIEVE INTEROPERABILITY IS PRIMARILY RELATED TO ITS DECENTRALIZED MANAGEMENT STRUCTURE WHICH PERMITS EACH SERVICE A LARGE DEGREE OF AUTONOMY OVER ITS PROGRAMS. ACCORDING TO THE PANEL, THE ASSIGNMENT OF RESPONSIBILITIES IS DIFFUSE, PERMITTING THE SERVICES TO "REINTERPRET" ORDERS TO FURTHER SERVICE PAROCHIAL INTERESTS BY DELAYING OR PREVENTING INTERSERVICE AGREEMENTS.

THE FIELDING OF THE REGENCY NET SYSTEM IN THE PACIFIC THEATER ILLUSTRATES HOW PAROCHIAL INTEREST CAN IMPEDE INTEROPERABILITY GOALS. REGENCY NET IS INTENDED TO BE A SECURE, JAM RESISTANT, HIGH FREQUENCY RADIO SYSTEM FOR CRITICAL THEATER COMMUNICATIONS. ALTHOUGH BOTH JCS AND THE OFFICE OF THE SECRETARY OF DEFENSE (OSD) VALIDATED THE NEED FOR THE SYSTEM TO OVERCOME EXISTING OPERATIONAL DEFICIENCIES, THE NAVY, RATHER THAN

USE THE REGENCY NET RADIO FOR ITS FORCES AFLOAT, WANTS TO DEVELOP AND USE ITS OWN HIGH FREQUENCY RADIO. ALTHOUGH THE NAVY'S HIGH FREQUENCY RADIO IS PLANNED TO BE INTEROPERABLE WITH REGENCY NET, USING IT IN LIEU OF THE APPROVED SYSTEM COULD MEAN A DELAY OF ABOUT 5 YEARS BEFORE THE SYSTEM IS FULLY OPERATIONAL.

REQUIREMENTS

IN A STUDY OF TACTICAL COMMUNICATIONS COMPLETED IN MARCH 1983, THE INSTITUTE FOR DEFENSE ANALYSIS (IDA) CONCLUDED THAT A "MAJOR PROBLEM IS A LACK OF ADEQUATE JOINT USER NEEDS AND REQUIREMENTS . . ."

THE NAVAL ADVISORY PANEL, IN A 1985 STUDY, FOUND THAT NEITHER THE ASSISTANT SECRETARY OF DEFENSE FOR C3 NOR THE JCS HAS ESTABLISHED MINIMUM ESSENTIAL INTEROPERABILITY REQUIREMENTS. THE LACK OF THESE REQUIREMENTS ALLOWS EACH SERVICE TO DETERMINE ITS OWN REQUIREMENTS, OFTEN WITH LITTLE, IF ANY, CONCERN FOR INTERSERVICE NEEDS. CONSEQUENTLY, MANY SYSTEMS ARE FIELDED WHICH ARE NOT INTEROPERABLE.

JOINT REQUIREMENTS WERE NOT AGREED TO WHEN THE AIR FORCE AND NAVY BEGAN TO DEVELOP THE JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM (JTIDS). AS A RESULT, THE TWO SERVICES, WHEN DEVELOPING THE SYSTEM, ADOPTED DIFFERENT TECHNOLOGIES THAT WERE NOT INTEROPERABLE. IN 1982 WE REPORTED THAT, "THE USE OF TWO DIFFERENT TECHNOLOGIES WITH THE ASSOCIATED INCREASED COSTS AND INTEROPERABILITY PROBLEMS MAY NOT BE APPROPRIATE." FINALLY, IN 1985 THE CONGRESS TOLD DOD THAT IT WOULD FUND ONE PROGRAM ONLY BECAUSE IT WAS CONCERNED ABOUT THE ABILITY OF THE TWO SERVICES TO INTEROPERATE. THE SECRETARY OF THE NAVY SUBSEQUENTLY CANCELED THE PROGRAM ON WHICH THE NAVY HAD SPENT OVER \$100 MILLION.

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A NUMBER OF STUDIES HAVE CONCLUDED THAT IT IS NOT ONLY IMPORTANT TO ESTABLISH JOINT REQUIREMENTS BUT THERE IS A NEED TO ESTABLISH THEM EARLY IN THE ACQUISITION CYCLE. THIS IS BECAUSE IT IS USUALLY TOO DIFFICULT AND COSTLY TO MODIFY SYSTEMS ONCE THEY HAVE BEEN DEVELOPED AND FIELDDED.

DOD ENFORCEMENT AUTHORITY
FOR INTEROPERABILITY

A COMMON THEME IN A NUMBER OF PAST STUDIES WAS THAT NO DOD ORGANIZATION HAS OR IS WILLING TO EXERCISE ITS AUTHORITY TO ENFORCE INTEROPERABILITY STANDARDS ESPECIALLY FOR EXISTING SYSTEMS. THESE STUDIES HAVE SUGGESTED THAT CLEARER MECHANISMS ARE NEEDED TO RESOLVE CONFLICTING SERVICE DEMANDS.

ONE EXAMPLE THAT ILLUSTRATES THIS POINT PERTAINS TO DOD'S ATTEMPT TO REVISE ITS BASIC DIRECTIVE (DOD DIRECTIVE 4630.5) DEALING WITH INTEROPERABILITY. THE ASSISTANT SECRETARY OF DEFENSE FOR COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE TESTIFIED BEFORE THE SENATE ARMED SERVICES COMMITTEE IN MARCH 1985 ON THE DIFFICULTIES HE ENCOUNTERED AS FOLLOWS.

" . . . STARTING IN THE SEVENTIES AND AGAIN IN 1980 AND AGAIN IN 1983 WE TRIED TO GET A NEW DIRECTIVE THROUGH THE PENTAGON BUREAUCRACY . . . FRANKLY, WE HAVE NOT BEEN SUCCESSFUL IN DOING THAT BECAUSE OF THE DIFFERENT VIEWS ON WHAT SHOULD BE SAID IN SUCH A DOCUMENT."

PACIFIC COMMAND C3 OFFICIALS RECENTLY TOLD US THAT THE LACK OF A SINGLE ENTITY IN DOD WITH THE RESPONSIBILITY AND AUTHORITY TO SET AND ENFORCE INTEROPERABILITY STANDARDS IS ONE REASON FOR INTEROPERABILITY PROBLEMS IN THEATER.

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THE INSTITUTE FOR DEFENSE ANALYSIS, IN ITS 1983 STUDY,
CONCLUDED THAT

"SECURE, JAM RESISTANT NET RADIOS AND DATA DISTRIBUTION
SYSTEMS . . . ENCOMPASS SUCH DIVERSE REQUIREMENTS AND
APPROACHES AMONG THE THREE SERVICES THAT DUPLICATION AND
LACK OF INTEROPERABILITY ARE ALMOST INEVITABLE UNLESS SOME
CENTRAL CONTROL AUTHORITY CAN OVERSEE THE DEVELOPMENTS
TAKING PLACE IN THE INDIVIDUAL SERVICES."

IN OUR 1983 REPORT ON JOINT SYSTEM ACQUISITIONS, WE REPORTED
THAT NO ORGANIZATION OR MANAGEMENT LEVEL HAS THE FINAL WORD OR
THE SUSTAINED CLOUT TO GAIN ACCEPTANCE AND IMPLEMENTATION OF ITS
DECISIONS. THE SECRETARY OF DEFENSE HAS NO SUBSTANTIAL MILITARY
STAFF. THE OFFICE OF THE JOINT CHIEFS OF STAFF COULD FILL THIS
VACUUM, BUT AS MANY OBSERVERS HAVE POINTED OUT, THE JCS IS NOT
SET UP OR IS SO DETACHED FROM THE SERVICES AS TO BE ABLE TO
RESOLVE SUCH CONFLICTS, OR TO CHOOSE THE SYSTEM OF ONE SERVICE
OVER THE SYSTEM OF ANOTHER. ALTHOUGH BOTH THE SECRETARY OF
DEFENSE AND THE JCS HAVE THE AUTHORITY TO MAKE SUCH CHOICES,
NEITHER HAS EXERCISED IT TO ANY GREAT DEGREE.

THE JOINT TACTICAL COMMAND,
CONTROL, AND COMMUNICATIONS AGENCY

OVER THE YEARS, DOD HAS TAKEN STEPS TO IMPROVE
INTEROPERABILITY AMONG THE SERVICES. THESE EFFORTS WERE PARTIAL
STEPS AIMED AT SELECTED EQUIPMENT AND STANDARD FORMATS. THE
JOINT TACTICAL COMMAND, CONTROL, AND COMMUNICATIONS AGENCY, WHICH
WAS ESTABLISHED IN 1984, WAS GIVEN MUCH BROADER RESPONSIBILITIES.
THE AGENCY IS RESPONSIBLE FOR FINDING AND PREVENTING PROBLEMS IN
THE JOINT AND COMBINED C3 INTEROPERABILITY ARENA. SIMPLY PUT,
THE AGENCY WAS ESTABLISHED TO BE THE INTEROPERABILITY ADVOCATE IN
DOD, TO ADDRESS JOINT INTEROPERABILITY NEEDS, TO DEVELOP

INTEROPERABILITY STANDARDS, AND TO ACT AS THE "HONEST BROKER" FOR INTEROPERABILITY.

MORE SPECIFICALLY, A JULY 5, 1984, DOD DIRECTIVE 5154.28, WHICH ESTABLISHED THE AGENCY, CHARGED IT WITH ENSURING INTEROPERABILITY OF TACTICAL C3 SYSTEMS BY DEVELOPING AND MAINTAINING THE REQUIRED C3 ARCHITECTURE AND SPECIFICATIONS, AND BY DEVELOPING AND CONDUCTING AN INTEROPERABILITY TESTING AND CERTIFICATION PROGRAM TO ENSURE PROPER IMPLEMENTATION AND MAINTENANCE OF APPROPRIATE STANDARDS FOR USE IN JOINT AND COMBINED OPERATIONS.

FURTHERMORE, THE REVISED 1985 DOD DIRECTIVE 4630.5 ALSO CHARGED THE AGENCY TO REVIEW FOR INTEROPERABILITY IMPLICATIONS, ALL APPROVED SERVICE AND UNIFIED COMMAND REQUIREMENTS DOCUMENTS AND TO VERIFY THAT THESE REQUIREMENTS ARE IN ACCORDANCE WITH ESTABLISHED PLANS.

THE AGENCY VIEWS THE DEVELOPMENT OF THE TACTICAL C3 ARCHITECTURE AS ONE OF ITS PRIMARY RESPONSIBILITIES. WHILE THE AGENCY HAS DEFINED AN APPROACH FOR DEVELOPING THE ARCHITECTURE, THE DIRECTOR BELIEVES THAT THIS WILL BE A LONG TERM PROJECT THAT COULD TAKE YEARS TO COMPLETE.

THE AGENCY'S AUTHORITY

THE AGENCY'S ROLE IN ASSURING INTEROPERABILITY IS PRIMARILY AN ADVISORY ONE. THE AGENCY DOES NOT HAVE AUTHORITY TO ALTER A PROGRAM REGARDLESS OF THE INTEROPERABILITY PROBLEM IT MAY IDENTIFY. WHEN THE AGENCY IDENTIFIES AN INTEROPERABILITY PROBLEM, THE DIRECTOR TRIES TO RESOLVE IT BY CONSULTING WITH THE AFFECTED SERVICE OR UNIFIED COMMAND. IF THIS APPROACH FAILS, THE DIRECTOR REPORTS THE PROBLEM TO JCS AND/OR OSD, ALONG WITH HIS RECOMMENDATION. OSD RETAINS THE AUTHORITY TO APPROVE OR

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DISAPPROVE SERVICE PROGRAMS, AND IT MAY SUSPEND A PROGRAM OR TAKE OTHER APPROPRIATE ACTION IF THERE ARE UNRESOLVED QUESTIONS WARRANTING SUCH ACTION.

SINCE ITS FORMATION, THE AGENCY HAS ISSUED 30 REPORTS TOUCHING ON VARIOUS C3 INTEROPERABILITY AREAS SUCH AS THE PROGRESS OF THE WORK IN ARCHITECTURE, PROCEDURAL AND TECHNICAL STANDARDS, AND THE ASSISTANCE IT PROVIDES TO THE UNIFIED COMMANDS ON INTEROPERABILITY ISSUES, CONFIGURATION MANAGEMENT, JOINT TESTING, AND INTEROPERABILITY DATA BASES.

ALTHOUGH THE MERE EXISTENCE OF A JOINT TACTICAL C3 AGENCY CANNOT GUARANTEE INTEROPERABILITY, IT SHOULD HELP TO ALLEVIATE SOME INTEROPERABILITY PROBLEMS IN THE SHORT TERM AND RAISE THE AWARENESS OF DOD COMPONENTS ON THE IMPORTANCE OF CONSIDERING INTEROPERABILITY IN THEIR C3 DECISIONS. SOME OF THE AGENCY'S EARLY EFFORTS, SUCH AS ITS ASSESSMENT OF A UNIFIED COMMAND'S OPERATIONS PLAN AND RECOMMENDATIONS FOR IMPROVEMENTS, COULD IMPROVE INTEROPERABILITY. IT IS TOO EARLY, HOWEVER, TO TELL TO WHAT EXTENT THE AGENCY WILL BE SUCCESSFUL IN ACHIEVING ITS OBJECTIVES.

SUMMARY

IN SUMMARY, THE SERVICES HAVE HAD PROBLEMS EFFECTIVELY COMMUNICATING IN PAST JOINT OPERATIONS AND IN SOME INSTANCES THEY CANNOT EFFECTIVELY COMMUNICATE TODAY. SOLVING THIS PROBLEM IS NO EASY TASK. IT REQUIRES THAT JOINT REQUIREMENTS BE CLEARLY STATED AND ACCEPTED BY THE SERVICES AT THE OUTSET. IT WILL REQUIRE A GREAT DEAL OF COOPERATION AMONG THE SERVICES AND A GENUINE WILLINGNESS ON THE PART OF EACH SERVICE TO ACCEPT INTEROPERABILITY EVEN WHEN IT CONFLICTS WITH SOME TRADITIONAL SERVICE PRACTICES. IN ADDITION, INTEROPERABILITY NEEDS A STRONG

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CENTRAL AUTHORITY THAT WILL BE WILLING TO MAKE THE VERY DIFFICULT DECISIONS THAT MUST BE MADE.

MR. CHAIRMAN, THIS CONCLUDES MY PREPARED STATEMENT. I WOULD BE PLEASED TO RESPOND TO ANY QUESTIONS YOU OR MEMBERS OF THE SUBCOMMITTEE MAY HAVE.

DOD's Efforts to Achieve Interoperability Among Tactical C3 Systems

This appendix discusses congressional expectations for interoperability of military communications systems, and the results of some of DOD's interoperability efforts.

Objectives, Scope, and Methodology

The objectives of our review were to (1) determine the extent of interoperability problems in DOD, (2) identify the impediments to achieving interoperability, and (3) comment on the prospects of the Joint Tactical C3 Agency achieving a greater degree of interoperability among the military services.

In performing our review we examined

- after-action reports of actual operations and exercises performed by the U.S. Readiness Command and other unified commands;
- congressional hearings held from 1965 to the present that dealt with interoperability of command and control systems; and
- efforts of the Joint Tactical C3 Agency.

Our review, which was completed in March 1987, was performed in accordance with generally accepted government auditing standards.

The Congress Has Encouraged DOD and the Services to Achieve Greater Interoperability

Since at least the mid-1960s, the Congress has had a continuing interest in DOD developing interoperable C3 systems. In 1965, for example, the Special Subcommittee on Tactical Air Support of the House Armed Services Committee held extensive hearings on close air support provided to U.S. ground forces in Vietnam. A large part of the hearing addressed the incompatibility of Army and Air Force radios. The Subcommittee concluded that perhaps the most "appalling" fact that came to its attention was that the Air Force, which had responsibility for providing close air support to the Army, could not talk to the Army because their radios were not compatible. The Subcommittee labeled this situation a "communications fiasco."

According to DOD officials, in 1970 the Congress refused to fund the Mallard¹ program because the Army was the only U.S. participant. Some Members of Congress were concerned that the communications equipment would not interoperate with other services' equipment. Subsequently, DOD asked the Congress to fund a revised Mallard program—

¹The Mallard program was to provide new digital communications equipment for the battlefield Armies of the United States, United Kingdom, Canada, and Australia participated in the program.

the Tri-Service Tactical Communications (TRI-TAC) program—to provide for joint interoperability.

Congressional direction for achieving interoperability was cogently stated in the conference report on the 1986 DOD Authorization Act

“No equipment should be developed to meet the peculiar needs of any one service if that equipment ultimately diminishes the ability of all the services to interoperate. Furthermore, wherever the operational requirements of the services are substantially similar every reasonable effort should be made to achieve commonality in the development and procurement of system components.”

DOD Initiatives to Achieve a Greater Degree of Interoperability

Following the interoperability problems it experienced in Vietnam and in response to congressional concern, DOD established policy and procedures to ensure that C3 equipment has the compatibility and commonality essential for joint military operations. The policy was not adequately implemented, however, nor was it revised in a timely manner to provide necessary authority. As a result, a C3 plan or architecture needed to guide system acquisitions is still in its infancy. Furthermore, three major programs established to foster interoperability fell short of their goals, and the services continued to develop their own noncompatible communications equipment.

DOD's Interoperability Directive

DOD's interoperability directive (Directive 4630.5, January 28, 1967) established policy and procedures to ensure that C3 equipment interoperate. As a matter of policy, the military departments were to develop and procure equipment that was either compatible or common when fulfilling similar operational requirements. A further objective of the policy was to minimize the addition of buffering, translative, or similar devices for the purpose of achieving workable connections.

The directive assigned specific responsibilities to the Office of the Secretary of Defense, the Office of the Joint Chiefs of Staff, and the military services. Among other things, the principal staff assistants to the Secretary of Defense were required to implement the policy during budget and funding reviews. The service secretaries were directed to assure that a copy of each operational requirement was provided to, and coordinated with, the other services, the commanders of unified and specified commands, and the Office of the Joint Chiefs of Staff. The Office of the Joint Chiefs was to describe the criteria and standards necessary to

achieve compatibility among automated tactical communications and control systems and equipment employed in joint operations

Although the 1967 interoperability directive provided a reasonable policy for achieving interoperability, the military departments and the Office of the Joint Chiefs did not carry out their responsibilities. The Office of the Joint Chiefs, for instance, did not fulfill its role of establishing joint requirements or specifying which systems had to interoperate, nor did it develop an overall C3 architecture.

In 1977 the Secretary of Defense informed the Congress that the directive would be revised to address congressional criticism. The Secretary of Defense told the Congress that he was going to revise DOD's interoperability directive to ensure that a C3 architecture was developed and that the manager for the Ground and Amphibious Military Operations (GAMO) program had sufficient authority to make decisions which were binding on the services.

In 1985 the directive still had not been revised. During hearings, the Assistant Secretary of Defense for Command, Control, and Communications, and Intelligence told the Senate Armed Services Committee that although there were several attempts to revise the directive, the services could not agree what should be said in the directive. Subsequently the Committee's Chairman, frustrated by DOD's inability to revise the directive, warned the Secretary of Defense that:

"If necessary, the Senate Armed Services Committee is willing to consider a legislative restriction on the expenditure of any funds for communications equipment until meaningful progress is made toward resolving these bureaucratic problems."

Following the Chairman's warning, DOD revised its interoperability directive on October 9, 1985.

Development of a C3 Architecture Has Been a Longstanding Requirement

The concept of a C3 architecture is extremely complex, and there is no general agreement within the C3 community on its precise definition. In this report the term "C3 architecture" refers to an overall communications plan or design which identifies the equipment, units, and activities that a commander uses to communicate. Representatives of the Joint Tactical C3 Agency told us that when this architecture is completed, it will consist of numerous documents that will serve as a road map for the acquisition and fielding of new C3 equipment.

Over the years, several organizations were assigned responsibilities to develop a C3 architecture. Although it was not then called an architecture, the 1967 interoperability directive assigned to the Office of the Joint Chiefs the responsibility of developing such a plan. In 1971, the TRI-TAC program, and in 1977, the Joint Interoperability of Tactical Command and Control Systems (JINTACCS) program were required to develop parts of architectures. Finally, in 1984, the Joint Chiefs of Staff delegated the task of developing an architecture to the newly created Joint Tactical C3 Agency.

Despite the efforts of these several agencies, architectural development is still in its infancy. In fact, some representatives of the Joint Tactical C3 Agency are still uncertain about what an architecture is and what it is to do. The first director of the Joint Tactical C3 Agency told us an architecture could not be completed for another 5 years, even if the present rate of development is accelerated. Nevertheless, the Joint Tactical C3 Agency has developed an analytical concept of a C3 architecture, and has completed analyses of the communications plans of two unified commanders. Recently, the Joint Tactical C3 Agency's new director called for completion of its first architecture in 3 months.

Joint Programs to Achieve Interoperability Have Been Disappointing

Despite some successes within individual programs, DOD has had limited success in satisfying interoperability requirements for tactical warfare. Partial architectures have been developed under the JINTACCS and TRI-TAC programs; message formats have been developed under the JINTACCS program; some TRI-TAC equipment has been fielded; and equipment from the Joint Tactical Information Distribution System (JTIDS) is to be fielded soon. Still, 20 years after Directive 4630.5 was issued, all of these efforts have not provided the means for the services to communicate effectively while fighting as a unified force.

The GAMO and JINTACCS Programs

The GAMO program was established in 1971 to ensure the interoperability of command and control systems used in ground and amphibious operations. The program was to: (1) identify command and control systems and force configurations which require exchange of information, (2) identify joint interface points, (3) identify information to be exchanged, (4) provide interface system descriptions and specifications, and (5) develop data link standards.

According to the Secretary of Defense, in 1977 the House and Senate Armed Services Committees were concerned that the program had not

developed the C3 systems' architecture necessary to ensure interoperability. They further expressed concern that program management lacked the authority to allocate program resources towards achieving both the architecture and interoperability. The program manager reported to the Joint Chiefs of Staff in 1976 that

"After five years of GAMO program development, it is apparent that the Joint Chiefs of Staff arena is not conducive to achieving success in tactical command and control interoperability. GAMO is a program which requires executive management probably at the Office of the Secretary of Defense level. As long as every aspect of the program is subject to Service/Agency veto or endless coordination and review, the achievement of interoperability among tactical command and control facilities and systems will be extremely difficult."

As a result of congressional concern, the GAMO program was terminated and the JINTACCS program was established to develop and test the interoperability of command and control systems for tactical operations, such as air defense, air control, and ground and amphibious operations. Although the JINTACCS program director was expected to develop automated interfaces and a command and control system architecture, the director was never given the authority to make decisions that would be binding on the services. This is because, as discussed earlier, DOD did not revise the interoperability directive to provide the needed authority.

The difficulties experienced with JINTACCS became evident when the program did not meet its timetable for developing some of its interfaces. In 1977 the Chairman of the House Appropriations Committee emphasized the need to complete the JINTACCS program before 1985. But in 1982 the Defense Audit Service reported that JINTACCS would not achieve its interoperability objectives by 1985. According to the report,

"Specific interface and subsequent information exchange requirements (except two systems) necessary to achieve interoperability among automated systems were never identified."

The report also concluded that, contrary to its original intent, the program emphasized manual instead of automated interfaces. In 1986 a consultant's study reported that an additional 41 interfaces between automated systems (or 39 percent of the total) had not yet been defined.

While the JINTACCS program has not met its objectives, it nevertheless has developed message standards which will be useful in the next few years as new automated command and control systems are fielded. Representatives of the Joint Chiefs and the Joint Tactical C3 Agency told

that the JINTACCS is an ongoing program that will continue to provide and maintain the principles and standards for the transfer of command and control information

The TRI-TAC Program

During House Appropriations Committee hearings in 1971, the Assistant Secretary of Defense for Telecommunications and the Director of the TRI-TAC program reported that the program would, among other things,

- provide digital communications needed for battlefield computers to talk to each other,
- review all tactical communications (except service unique) systems and equipments for interoperability, and
- develop a communications architecture for TRI-TAC equipment and systems.

The program's "jointness" was supposed to be ensured by the provision that the TRI-TAC director report directly to the Assistant Secretary of Defense. But in a 1983 report on tactical communications, the Institute for Defense Analysis concluded that although the Congress mandated that tactical systems be centrally managed, the TRI-TAC charter excluded many programs that should have been under TRI-TAC's management.

An official of the Joint Tactical C3 Agency who was previously with the Mallard and TRI-TAC programs said the original intent was for DOD to address the broader issue of interservice communication needs. The services opposed this because they each had their own satellite communications, net radios, and other C3 programs which they did not want to give up. Other individuals associated with the program have said that the inability of the services to identify and agree on minimum essential requirements resulted in equipment that was too late, too big, and too expensive.

Like JINTACCS, the TRI-TAC program did not meet its objectives in the time frame envisioned. However, it so far has developed some common equipment, such as telephone switches and radios, that the services have begun to field.

The JTIDS Program

In 1974 DOD established a joint program, with the Air Force as the lead service, to develop the JTIDS. Even though, the purpose of JTIDS was to develop a single system for distributing computer data across the battlefield, until recently the Navy and Air Force pursued separate solutions

From the very beginning of the program, the Navy decided that JTIDS could not meet its needs. It eventually began developing its own tactical information distribution system.

According to a DOD study, each year during budget deliberations, the Congress questioned the need for separate Air Force and Navy programs, but continued to fund both based on DOD assurances that both systems would interoperate.

In 1982 we reported that the two different technical approaches used by the Air Force and Navy could limit interoperability. A 1983 study² reported that the most pressing issue was the divergent Navy and Air Force technical solutions. The study concluded that the interfaces planned for the JTIDS terminals " . . . will have such a limited capability as to be almost useless." A Joint Tactical C3 Agency officer who reviewed both programs expressed doubt that interoperability between the two systems could be achieved to any meaningful degree.

In 1985 the Congress told DOD that it would not support separate JTIDS programs unless the Secretary of Defense reported that a single Air Force and Navy system was not feasible. As a result of the congressional direction, the Navy terminated its program and joined the Air Force effort.

Unified Commanders Want More Interoperability

During our review of documents and discussions with unified command representatives, the need for more C3 interoperability surfaced as a serious concern. A U.S. Atlantic Command report, for example, stated that the lack of equipment and procedural incompatibility severely constrains the command and control of combat forces. A Command official told us in March 1987 that although there has been some improvement since the Grenada experience, he is still concerned with equipment and procedural incompatibilities. During the August 1986 interoperability hearings before the House Government Operations Committee, we discussed the problems the U.S. Pacific Command had with incompatible encryption equipment, HAVE QUICK radios, and satellite terminals.

Senior U.S. European Command officers reported that interoperability problems occur both within and among the services as well as among North Atlantic Treaty Organization members. In one instance, because equipment was incompatible, important information which was received

²JTIDS—The Early Years, Tactical Air Forces Interoperability Group, 1983

by satellite had to be driven by vehicle to another service's location and transmitted to yet another location.

During hearings on the need to reorganize DOD, the Commander of the U.S. European Command recommended that the services should be required to organize, train, and maintain forces to satisfy unified commanders' operational plans. Although the final legislation did not incorporate this feature, the Commander's recommendation highlighted an underlying problem in the achievement of both jointness and interoperability; that is, the services have acquired equipment which has not been consistent with unified commanders' needs.

Defense Reorganization Act

The Congress passed the Defense Reorganization Act of 1986 to help overcome many of the interservice rivalries and bureaucratic difficulties that have impeded the effective integration of combat resources. Although the act's provisions may help resolve interoperability problems in the long term, it will probably have limited impact in correcting deficiencies in the short term.

The Reorganization Act (Public Law 99-433) attempts to mitigate service parochialism by providing more authority to the Chairman of the Joint Chiefs of Staff and to the unified and specified commanders. For example, the act transferred some responsibilities performed by the corporate Joint Chiefs of Staff to the Chairman and provided new statutory duties for the Chairman such as advising the Secretary of Defense on the priorities of the unified commanders. In addition, the act requires the Secretary of Defense to stress jointness through career development, joint training, and changes in the military educational system. The legislation emphasizes cultivating changes in the attitudes, orientations, and culture in the military environment.

The act has features that are aimed at resolving the difficulties that have caused interoperability deficiencies addressed in this report. The emphasis on jointness, for example, may cause service members and program managers to think more about equipment needs for combined operations rather than unique service solutions. However, since many things need to be done to fully implement the act's provisions, the immediate deficiencies in C3 systems interoperability will likely continue to exist.

Conclusions

Although the Congress has had a continuing interest in achieving interoperability among C3 systems, DOD's efforts have been hindered by bureaucratic disagreements and have generally accomplished less than originally planned. The goals established for JINTACCS and TRI-TAC were not achieved. Similarly, because the Office of the Secretary of Defense has not defined what is expected from an architecture, it is difficult to know whether it should be the result of 5 years or 90 days of work or how it is going to differ from the architecture that DOD told the Congress it was developing 10 years earlier.

While the Reorganization Act and the C3 architecture could over time enhance interoperability, we believe that actions can be taken now which could provide for more immediate improvements and thus give DOD decisionmakers, as well as, the Congress more assurance that C3 programs are satisfying interoperability requirements. Interoperability could be enhanced if the service secretaries certified to the Secretary of Defense that C3 equipment being developed and procured will interoperate with other C3 equipment when required to do so.

Recommendations

We recommend that the Secretary of Defense require that the service secretaries certify that the C3 equipment being developed and procured will provide the needed degree of interoperability with other C3 equipment in order to satisfy the operational plans of the unified commanders. If the C3 equipment will not provide the needed degree of interoperability, the service secretaries should seek a waiver from the Secretary of Defense or a designee. We also recommend that the Secretary of Defense allow the services to seek congressional funding only for items that will provide the needed degree of interoperability or for which a waiver has been approved.

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