LEVEL II

(1)

REPORT OF THE DEFENSE SCIENCE BOARD TASK FORCE ON COMMAND AND CONTROL SYSTEMS MANAGEMENT

JULY 1978

OFFICE OF THE UNDER SECRETARY OF DEFENSE
RESEARCH & ENGINEERING
WASHINGTON, D.C. 20301

Report of the

DEFENSE SCIENCE BOARD TASK FORCE

on

COMMAND AND CONTROL SYSTEMS MANAGEMENT

July 1978

Office of the Under Secretary of Defense Research & Engineering
Washington, D.C. 20301

OFFICE OF THE UNDER SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

RESEARCH AND
ENGINEERING

2 August 1978

TO: Secretary of Defense

THRU: Under Secretary of Defense for Research and Engineering

SUBJ: Report of Defense Science Board Task Force on Command and Control Systems Management

The final report of the DSB Task Force on Command and Control Systems Management is hereby transmitted.

The Task Force has determined that:

a) our command and control systems have not kept up ~~wither~~ with the changes in the type of warfare or the changes in weapons and available command and control technology;

b) it is important to have procurement procedures for command and control systems that reflect the special nature of such systems. The Task Force recommends that a new procurement directive be issued (Appendix E) that:

1) makes 5000.1 and 5000.2 not applicable to command and control systems; 1/

2) brings the using Commands very deeply and continuously into the development of the command and control systems;

3) emphasizes the evolutionary character of command and control systems. 2/

1/ It is obvious to me that one of the causes of (a) was the misguided attempt to apply directives 5000.1 and 5000.2 to C^3 systems.

2/ I believe that the proposed directive makes insufficient provisions for the continuous changes in software and architecture required by the evolution process during the operational life of the system. However, this need is recognized in the list of findings (p, 10 and 13 of the report) and recommendations (No. 4, p. 17).

c) there is strong need for a central organization which would essentially:

1) oversee the design and testing of all command and control systems that cut across Service lines;

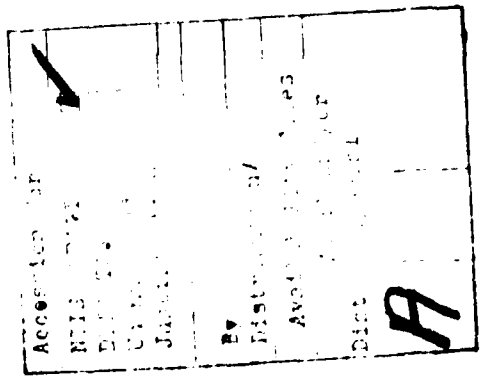
2) insure that means are available whereby the commands can take the initiative in the evolution of the systems; and

3) insure commonality and interoperability among US and Allied systems.

The Task Force feels strongly that the best course would be to establish a new agency (Defense Command & Control Systems Support Agency - DCCSSA) to fulfill these functions; they have prepared a draft directive (Appendix D) establishing the new agency. However, the Task Force also states that if the establishment of DCCSSA "is not now propitious, the next best approach would be to combine the functions we have identified (for the DCCSSA) with the present DCA to create a new Defense Command, Control & Communication Agency."3/

I recommend this second course and urge that we do expand the DCA by broadening its charter, using Appendix D as a basis, to fulfill the desired functions.

I also recommend the adoption of the other recommendations of the Task Force.



Chairman
Defense Science Board

3/ It is my belief that the Task Force members prefer the DCCSSA to the DC^{3}A because most of them believe that the military communicators (a) have shown historically a serious lack of understanding of command and control; (b) would not permit DC^{3}A to properly fulfill the DCCSSA role; and (c) they further believe that DCA performance in WWMCCS supports their fears. I do not share their concerns.

OFFICE OF THE UNDER SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

RESEARCH AND
ENGINEERING

19 July 1978

Memorandum for the Chairman, Defense Science Board

Subject: Report of the Task Force on Command and Control Systems Management

I transmit herewith the report of the DSB Task Force on Command and Control Systems Management. The Task Force concludes that the nation is failing to deploy command and control systems commensurate with the nature of likely future warfare, with modern weapons systems, or with our available technological and industrial base. A stronger focus on command and control is needed.

To this end we make just five broad recommendations listed in the Executive Summary. These deal with

- The need for a central organization to manage the design and acquisition of command and control systems that cut across Service boundaries and to assure the compatibility and operational effectiveness of all systems for the support of command and control.
- The need of each major military command to be able to adapt, modernize and maintain its command and control system to fit the needs of the command.
- The need to strengthen the capabilities of the Services and of the Unified and Specified Commands for evaluating, operating and specifying functions for command and control systems.
- The need for new directives for the acquisition of command and control systems tailored to the special characteristics of these systems.

The need for research on all aspects of command and control.

Two new DoD directives are drafted to help implement the recommendations and are included as Appendices D and E.

I urge that you take steps to implement these recommendations.

S. J. Buchsbaum
Chairman
DSB Task Force on
Command and Control
Systems Management

Att.

CONTENTS

I. EXECUTIVE SUMMARY

The nation is failing to deploy command and control systems commensurate with the natur of likely future warfare, with modern weapon systems, or with our available technological and industrial base. Consequently, a much stronger focus on command and control within DoD is needed to assure that improved command and control systems will evolve in a timely fashion to meet our national needs. Some centralization of responsibility for the management command and control systems will help achieve this goal. The role of the Unified and Specified Command in establishing requirements and adapting their command and control systems to their particular circumstances must be strengthened as well.

Command and control systems typically are very complex in their design and behavior, presenting special characteristics that distinguish them from weapons systems and that must, therefore, be reflected in the acquisition process. The most important of these characteristics is the need for adaptability to user needs and for their evolutionary change over time. Significantly, there is almost no commonly understood vocabulary or conceptual framework for analyzing, designing, or evaluating command and control systems.

These considerations take on especial importance in view of the likely future constraints on U. S. defense budgets, putting a great premium on gaining the most effective utilization of our military forces.

To correct these failings, the Department of Defense should revise its organization and procedures for the acquisition and management of command and control systems in the following ways:

1. There should be within the Department of Defense a strong central organization to manage the design and acquisition of command and control systems, designated by the Secretary of Defense, which cut across Service boundaries or are of major concern to OSD, JCS, or the National Command Authority and to assure the compatability and operational effectiveness of all systems for the support of of command and control.

2. Each major military command should have funding and manpower resources organic to that command to adapt, modernize and maintain its command and control systems, within established standards and specifications, to fit the needs of the command.

3. The capabilities of the Services and Unified and Specified Commands for exercising and evaluating, operating, and specifying functions to be performed by command and control systems should be strengthened.

4. The DoD should issue new regulations for the acquisition of command and control systems which would provide flexibility and which are specifically tailored to the special properties of these systems.

5. The DoD should develop a coordinated program of research and testing on command and control concepts, design, and system performance to provide the intellectual base to guide the evolution of improved Command and Control systems.

II. *INTRODUCTION*

The Defense Science Board Task Force on the Management of Command and Control Systems was commissioned by the Under Secretary, Defense Research and Engineering, during December 1977 to determine if the nation is acquiring command and control capabilities commensurate with the weapons systems that we are deploying or with the technology that is available.* The Task Force was urged to develop recommendations that, if implemented, would help improve the design, acquisition, operation, and evolution of command and control systems. This Report is in response to this charter.

*Command and control is defined in JCS Pub 1 as "the exercise of authority and direction by properly designated commander over assigned forces in the accomplishment of his mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities and procedures which are employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of his mission."

The Under Secretary's direction to the Task Force is reproduced in Appendix A. The Task Force membership is listed in Appendix B.

The Task Force held discussions with numerous managers and operators of command and control systems in the OSD and in the Services (listed in Appendix C) and has examined several command and control systems presently in development. We are grateful for the cooperation we have received.

It is clear that the nation needs command and control systems which would provide substantially better service to our national leaders and our military commanders than the ones we have in place. Our opponents in many circumstances are likely to have forces larger than ours over which we can prevail only with superior coordination and battle management, and the potential damage and rapid pace of likely future warfare make command and control even more essential than ever before.

It is also clear that we could have the improved command and control systems needed. The United States has a strong lead in the technologies of computers and communications upon which modern command and control systems must be built, and we have better knowledge of how to manage complex man-machine organizations than any of our potential adversaries.

There are, of course, real difficulties in achieving the needed and possible command and control system improvements. Some of the problems are technical; the design, installation and utilization of command and

control systems present one of the most complex challenges of modern technology. Some of the problems are managerial and organizational; it is difficult to reach agreement on who should do what in command and control systems design and acquisition and how to work around the constraints of acquisition directives designed for weapon systems that do not allow for the special characteristics of command and control systems. Some of the problems are conceptual: there is little explicit and shared understanding within the Defense community as to what command and control concepts are most important and how these concepts should be reflected in the design of command and control systems.

The Task Force has focused on management and organizational issues because we feel that changes in these areas are possible and are necessary antecedents to improvement of our national capability to field workable command and control systems. We confirm the view, widely held in DoD, that new procedures and new institutions are needed for the design and acquisition of command and control systems, for both our strategic and tactical forces. This report sets forth our findings, conclusions, and recommendations.

III. FINDINGS AND CONCLUSIONS

One of our most important findings is that there is an important need for fundamental change and improvement in our military command and control capability. This need arises primarily from significant changes over the last decade in the technology of American military

forces and in the nature of the control needed in likely future applications of those forces. The awareness of this need is widespread within DoD, albeit from different perspectives and with differing priorities.

Probably the most basic reason for new and better command and control capability is the changing nature of circumstances in which American military power may need to be applied. Our political and security interests around the world are likely to mandate carefully controlled use of force with precise understanding at all levels of command as to what is and is not happening, and what is -- or is not -- to be done. Especially in a major NATO-Warsaw Pact war or in general nuclear war with the Soviet Union, it will be important for commanders and national leaders to have a kind of control over the forces they command that is appropriate to the situations they will face.

A second reason for needing better command and control capability is that our ability to deter military aggression is dependent upon our ability to respond appropriately. Command and control systems that deny important options, are too complex to be used effectively, or are too slow, can cause aggressors to discount our will or ability to respond. They also can force us into excessive retaliation which may cause a military situation to escalate unnecessarily.

Third, U.S. intelligence collection and reporting systems have become highly rich in the information they provide. It is important

that this information be available to the appropriate level of command in the proper context and that the command and control systems permit commanders to utilize that information in controlling their forces. This information-rich character of the modern strategic and tactical battlefield is compounded by the advent of "smart" weapons which depend critically on timing and placement for their effectiveness.

Finally, the likelihood of future constraints on U.S. defense spending puts a great premium on gaining the most effective use of our limited forces. Although quantitative measures are lacking, it seems clear that improved command and control systems can multiply the effectiveness of U.S. forces in many of the possible confrontations we may face with the Soviet Union and other adversaries. (History provides some striking examples of such leverage - Midway, Pearl Harbor, Battle of Bulge, Gallipoli, etc.)

Fortunately, these reasons for more emphasis on improving our command and control capability are matched by the availability of technology and systems expertise to make such improvement a real, not futuristic, possibility. Early on in our study it became clear that the major difficulties in developing, acquiring, and deploying command and control systems are not primarily technical, but conceptual (What should the system do?) or administrative (How do we organize the required resources?).

Therefore, we have focused our effort and this report principally on the special charactristics and problems of command and control systems, as distinct from weapons systems or communications systems, and the adequacy of existing organizational and administrative arrangements for the acquisition and management of command and control systems.

The Special Problems of Command and Control

We have found a number of characteristics of command and control systems that distinguish them from other types of systems developed and procured by the DoD. Broadly, those characteristics can be categorized as technical, managerial, organizational, and conceptual. In the following discussion of these characteristics, we do not intend to imply that each is totally unique to command and control; we recognize that some are differences in degree and some are shared with certain other kinds of systems. Rather, we have attempted to describe an overall pattern that has led us to conclude that special arrangements are required for the management and acquisition of command and control systems.

Technical:

The most basic technical characteristic of command and control systems is that they are highly "information rich." That is to say, the behavior of the system is highly dependent in a very complex way on the information in it and the demands put upon it. Most weapon

systems by contrast have relatively simple behavior and control characteristics (although they may be highly sophisticated engineering accomplishments).

Also, command and control systems must be highly adaptable to meet the many demands a commander may place upon them in the myriad of circumstances that can arise in a battle. They must perform acceptably with imperfect information, and their performance should degrade gradually, rather than fail catastrophically under damage and stress. These kinds of requirements make it very difficult to specify performance criteria to guide technical developments that are much related to actual system usefulness. This is compounded by the fact that the range of technical choices, together with often subjective performance criteria, presents a complexity that is unique to command and control system development.

Then too, command and control systems differ from other defense systems in that a very large fraction of the development cost is in software rather than hardware and considerable hardware already is available commercially, at least for R&D use. Therefore, acquisition procedures based on hardware have little a priori applicability to command and control systems.

Managerial:

Each of the technical characteristics just described affects the management of command and control system development and acquisition.

This management is further complicated by the need to integrate the command user's diverse needs and perspectives with the wide range of technical options presented by system engineering designers. Since neither of these groups is likely to share a common vocabulary, expertise, experience, or priorities, the management problem of achieving the required capability at reasonable cost is yet more difficult.

Organizational:

Organizational factors add another layer of unique characteristics. Most command and control systems cut across Service lines, at their interface, if not in actual deployment. Key users may be Service unit commanders, CINCs, or the National Command Authority. Systems typically must be interoperable with many other systems designed at different times with different emphases. Researchers, designers, and users are likely to be in different organizations and in different locations. Commands, Service staffs, OSD and JCS all have important roles in generating command and control system specifications.

Command and control systems require easy adaptation to the changing and often unique situation facing each command and its personnel. They must be maintained and modified on a regular basis and yet remain interoperable and reasonably standardized so that military operations and manpower training programs can be operated across unit lines.

Conceptual:

As already mentioned, one of the biggest problems in designing, developing, and acquiring command and control systems is the problem of deciding what the system performance criteria should be -- i.e., what the system should and should not do. The absence of commonly understood concepts of command and control system performance and the existence of language barriers among technologists, policy analysts, planners, and commanders all underlie the fact that we lack in DoD any very useful conceptual framework for evaluating or specifying command and control systems. Terms like fail-soft, adaptability, robustness, and so forth are hard to translate into specific indices for the system designer.

The performance of command and control systems depends on factors such as damage, staff degradation, commander stress, weapon capabilities, intelligence inputs, and so forth, most of which involve considerations of organizational psychology, combat experience, decision theory, and the like, which typically are not in the realm of system designers and yet must be part of any sound command and control system design concept. Similarly, we have yet to learn how to separate the operational function of command and control from the design of command and control concepts and systems. It is significant that we found considerable system development within DoD, but almost no research in the command and control field is underway within or funded by DoD. Neither the Services, ASD/PA&E, nor ASD/C^3I have any significant capability to study the effects of

alternative command and control capabilities and vulnerabilities on military effectiveness or overall force posture, even though it is widely recognized that command and control is a major determinant of the strength and usefulness of our military forces.

Conclusions:

Our conclusions as a result of our study are simple. First, there are important long-term reasons for establishing a strong focus in DoD for command and control matters. DoD budget constraints seem likely to put a growing premium on enhancing the effectiveness of those weapon systems we can afford to include in our force structure. The lead of the U.S. over the Soviet Union in command and control technology is an area that should be exploited to gain the leverage of a superior command and control. Growing interdependence of political and military considerations in applications of U.S. force put a premium on precise and timely command and control capabilities at all levels, and the growth of real-time intelligence reporting systems has created an information-rich environment for both tactical and strategic military encounters which requires new command and control systems and procedures to sort out and utilize that information for application in the command and control function. A centralized focus within DoD on the management of command and control systems design, development, and acquisition can help foster research, assure proper funding, facilitate interoperability of systems and compatability of systems planning with overall force posture and doctrine development -- all of which will contribute to the growth of a

stable interface environment within which improved command and control systems will take root and grow.

Second, the need for standardization and central control must be balanced with the need for adaptability and evolutionary change in deployed systems. Using commands must have the primary responsibility for deploying, operating, and exercising their command and control systems. They also should have capability and freedom to modify those systems within specified limits. This is necessary to permit each military command to tailor its command and control systems to its own mission, geography, and commander's style. It also would help bridge the language barrier between users and designers.

Third, the command and control system acquisition process needs to reflect the special characteristics of those systems. Most importantly, it must recognize that command and control systems must be designed from the outset to facilitate future evolution and that most systems developments will, in fact, be evolutionary adaptations of existing systems, unlike weapon system development where change is usually highly discrete. It also must assure that the user's contribution is present from the very beginning of system design through acquisition and deployment.

Fourth, the capabilities and the roles of the Services and Unified and Specified Commands should be strengthened to accommmodate a DoD-wide effort to upgrade command and control capabilities and proficiency.

Fifth, a new long-term DoD-wide emphasis on research on command and control system technology and concepts should be formulated and funded to provide the broad professional and intellectual base necessary for improving our command and control capabilities.

IV Recommendations

Based on our review and analysis, as described above, we have identified five recommendations for change that we believe will strengthen the ability of the Department of Defense to devise and implement command and control systems that will enhance the effectiveness of our military forces.

1. The Department of Defense should charter an agency that will:

   - o assist the Unified and Specified Commands and JCS in the development of command and control system requirements and specifications;

   - o establish technical standards for interfacing specifications;

   - o perform development planning including alternative concept, trade-off studies;

   - o develop master plans for programming and budgeting of various command and control developments and procurements;

- and act as system architect and integrator on command and control systems, designated by the Secretary of Defense, which cut across Service boundaries or are of major concern to OSD, JCS or the National Command Authority.*

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*The organization should be responsible for the following functions:

- Assuring the integrity, compatibility, evolutionary capability, and technical efficiency of all communications, data, and information systems employed in support of command and control requirements designated by the Secretary.
- Coordinating with the Chairman, JCS and OSD elements to assure that all validated command and control requirements are considered in planning of systems and that systems constraints and opportunities are fully considered in the formulation and validation of requirements.
- Establishing standards and requirements for interface specifications, systems interoperability, evolutionary constraints, and system architecture for command and control systems, including both hardware and software.
- Developing, coordinating and, as appropriate, executing, a cohesive DoD program of research, analysis and other studies on command and control system design and operation.
- Assisting the ASD/C^3I in review, analysis, and comment on all DoD budgets pertaining to command and control systems.
- Assuring appropriate tests of command and control systems in realistic operational exercises, including vulnerability to damage and disruption.
- Assuring the adequacy of developmental and operational testing to provide compatibility, interoperability, and evolutionary growth capability in command and control systems, and, where appropriate, administering such testing.
- Participating in the development and validation of command and control concepts and requirements.

By contrast, this organization should not be responsible for the operation or maintenance of command and control systems, or the validation of command and control requirements.

This central command and control organization should report to the Secretary of Defense through the appropriate Under Secretary or Assistant Secretary. With regard to military command and control doctrine operational requirements and operating policies and procedures, it should be responsible to the Chairman, JCS.

We feel that it would be best to establish this central command and control organization as a new separate entity, which might be called the Defense Command and Control Systems Support Agency (DCCSSA). Reporting to the Secretary of Defense, the DCCSSA would have reporting and coordinating relationships within DoD much like DCA and NSA. Our reasons for preferring this arrangement are principally that the functions and professions of command and control systems design, development, and acquisition require high level support and visibility in DoD. We have included in Appendix D a draft of a DoD directive which would implement this recommendation. (This draft is provided as a "strawman"; it should be recognized that it must be reviewed by the OSD staff for consistency and completeness.)

If it is determined that establishment of a new DoD agency is not propitious, we feel that the next best option would be to combine the functions we have identified with the present DCA to create a new Defense Command, Control and Communications Agency (DC^3A). In this event, the present responsibilities of the Director, DCA, would have to be realigned to encompass the new command and control functions. Moreover, care would have to be taken to assure that sufficient funds,

manpower and management capability are assigned to the DC^3A so that command and control would not be lost or dominated by the communications professionals in the combined agency.

2. Each major military command should have funds and manpower sufficient to operate, maintain, modernize, and adapt its command and control systems within the architectural guidelines and constraints established by DCCSSA. The funding for maintenance, modernization and adaptation should be a significant fraction perhaps 10%, per annum of the invested value of systems.

We expect that there would be considerable assignment of people back and forth between the commands and the DCCSSA so that command and control professionals will acquire both perspectives and provide an important communication mechanism between the commands and the DCCSSA.

3. The very considerable capability for acquiring and operating command and control systems which currently resides in the Services and the Unified and Specified Commands should be reinforced to work with the new DCCSSA so as to strengthen the overall DoD command and control capability.

4. The Department of Defense should issue new directives to govern the acquisition of command and control systems that recognize the special characteristics of those systems. These directives should recognize that the various stages of the development of command and control systems

overlap; recognize that user participation in the conception, testing and development of command and control systems is a strong requirement; and provide flexibility and adaptability to meet the wide variations in the needs of commanders. A draft of such a directive is attached as Appendix E. (This draft is provided as a "strawman"; it should be recognized that it must be reviewed by the OSD staff for consistency and completeness.)

5. The DCCSSA (or DC^3A) should be directed to develop a broad research program on command and control encompassing technological, economic, organizational, cognitive, and other aspects of command and control system design and performance. This research program should be coordinated with DARPA and the Services and should include support for research by DARPA, the Services and contractors.

In making its recommendations, the Task Force has not studied the training and career pattern problems that may arise. We do believe, however, that the Services should play the major role in training command and control professionals and should have significant funding for command and control research. Innovative training programs, like the new command and control program at the Naval Postgraduate School, should be strongly supported.

APPENDIX A

TERMS OF REFERENCE

DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D C. 20301

20 SEP 1977

MEMORANDUM FOR THE CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Command and Control System Management

Please establish a task force to reexamine the process by which OSD and the Services specify, plan and procure C^3I systems.

I would like to have the DSB examine:

1. To what extent procurement of C^3I systems should require multi-Service cooperation as contrasted with the present procedure of separate procurement in each Service (accompanied by a distinct set of actions to insure interoperability).

2. To what extent have existing procedures and organizations proven their effectiveness in the procurement of joint systems for combined operations such as close Air Support Systems, Battlefield interdiction and the like.

3. To what extent the existing procedures and directives designed to regulate weapon system procurement are applicable to C^3I systems.

4. To what extent the existing management organizations deal satisfactorily with C^3I systems and, if changes are desirable, what alternatives exist.

5. In view of the existence of DCA, the WWMCCS Council, and the joint interoperability Council for Tactical C^2 systems, what type of relation should be established among these entities.

I would like to have your final report by 15 May 1978, and it would be most useful to have an interim report by 1 February 1978 to provide a preliminary view of the approaches being considered.

William J. Perry

William J. Perry

APPENDIX B

TASK FORCE MEMBERS

Dr. Solomon J. Buchsbaum, Chairman
Vice President, Bell Laboratories

Dr. Harold W. Lewis, Co-Chairman
University of California

General John R. Deane, Jr. (Ret.)
Consultant

General Russell Dougherty, USAF (Ret.)
Consultant

Dr. Richard D. DeLauer
Executive Vice President, TRW

Mr. Bob O. Evans, Vice President,
IBM

Dr. Ivan E. Sutherland
California Institute of Technology

Dr. Clay T. Whitehead
Allison Technical Services

VADM Levering Smith (Ret.)
Consultant

Mr. Charles A. Zraket, Executive Vice President
MITRE Corp.

Dr. Robert J. Hermann, Cognizant
Deputy Under Secretary of Defense
for Research & Engineering (C^3I)

Mr. Everett D. Greinke,
Cognizant Director

Mr. John C. Cittadino
Executive Secretary

APPENDIX C

PARTICIPANTS IN TASK FORCE MEETINGS ON COMMAND AND CONTROL SYSTEMS MANAGEMENT

PARTICIPANT	DATE	SUBJECT AREA
Dr. W. Perry, USDRE	12/8/77	Under Secretary's overview
Dr. R. Hermann, DUSDRE(C^3I)	12/8/77	Deputy Under Secretary's (C^3I) overview
LTG L. M. Paschall, Director, DCA	12/8/77	Defense Communications Agency
MG J. Hoover, Director, Joint Tactical Communications Office	12/8/77	TRI-TAC Program
COL F. Maffett, Systems Engineer, JINTACCS	12/8/77	Joint Interoperability of Tactical C^2 Systems
Dr. E. Fubini, Chairman, DSB	1/11/78	Chairman's perspective
LTG C. J. LeVan, Director, Operations, OJCS	1/11/78	JCS perspective and the Joint Tactical C^3 System Council
ADM D. J. Murphy (Ret), DUSD(P)	1/11/78	Policy/Requirements viewpoint
VADM R. V. Kaufman, USN	1/11/78	Navy Command and Control
MG C. R. Myer, Director, Army Telecommunications and MG H. Dickinson, Commander, CORADCOM	1/11/78	Army Command and Control
BG J. S. Creedon, USAF and COL T. Thompson, Tactical Air Command	1/12/78	Air Force Tactical Command and Control
COL Fred Clark, Dep. Dir. C^4, USMC	1/12/78	Marine Corps Command and Control
COL B. Parkinson	1/12/78	NAVSTAR/GPS Program
Dr. P. Dickinson	1/12/78	BETA Program

PARTICIPANT	DATE	SUBJECT AREA
Mr. A. Marshall, Director, Net Assessment	2/7/78	Net Assessment views
CDR J. Dunn, OD, Net Assessment	2/7/78	Counter-C^3
Mr. M. Lockerd, Texas Instrument Corp.	2/7/78	Army Scientific Advisory Panel views of Army C^2
MG R. Edge, USAF (Ret)	2/8/78	C^2 Management
Dr. A. Babbitt, WWMCCS, Systems Engineer	2/8/78	WWMCCS program and lessons learned
Dr. D. Signori, IDA	2/8/78	Tactical C^3I Framework Study
RADM Myers, Deputy Chief of Staff, CINCLANT	3/23/78	CINCLANT C^2 organization and operations
Mr. Vince Cook, IBM	3/23/78	Experiences in working WWMCCS architecture

APPENDIX D

DEPARTMENT OF DEFENSE DIRECTIVE

SUBJECT: Defense Command and Control Systems Support Agency (DCCSSA)

References: (a) Title 10, United States Code, Section 125

(b) DoD Directive 5000.XX, "Acquisition of Support Systems for Command and Control Systems"

A. PURPOSE

This directives establishes and defines the mission, responsibilities and command relationships of the Defense Command and Control Systems Support Agency (DCCSSA).

B. GENERAL

Pursuant to the authority vested in the Secretary of Defense and the provisions of reference (a), the DCCSSA is established as an Agency of the DoD reporting to the Secretary of Defense through the _____ (Appropriate Staff level to be added).

With regard to military command and control doctrine, operational requirement and operating policies and procedures, he shall be responsible to the Chairman, Joint Chiefs of Staff. Additional guidance with regard to operational doctrine and procedures shall be furnished to the Director, DCCSSA, by the JCS, the Unified and Specified Commands and the Military Departments. The purpose of the DCCSSA is to assist the Unified and Specified Commands and the JCS in the development of command and control system requirements and specifications; to establish technical standards for interfacing specifications; to perform development planning including alternative concept trade-off studies; to develop master plans for programming and budgeting of various command and control developments and procurements; and to act as system architect and integrator for command and control systems designated by the Secretary of Defense, which cut across Service boundries or are of major concern to OSD, JCS or the National Command Authority. Management policy for command and control systems acquisition is established in reference (b).

C. DEFINITIONS

Terms used in this Directive are defined in enclosure 1.[1]

D. MISSION

The mission of the DCCSSA is to:

1. Perform studies and system engineering analyses, establish standards, conduct other technical activities on a continuing basis and establish an overall command and control support systems plan which will ensure the technical adequacy, systems compatibility, and operational eifectiveness of all US and allied communications data and sensor systems required to support the validated command and control requirements for unilateral, joint or combined operations of US forces in peace, contingency or war.

2. Provide for orderly evolution and interoperability of future command and control support systems through continuing analysis of long range operational needs and management of the system configuration.

3. Provide programming and budgeting for and direction of developments and procurements of designated command and control systems.

4. Provide to the Secretary of Defense a consolidated program and budget for the Command and Control Systems of the Services and Commands.

E. ORGANIZATION

The DCCSSA shall consist of a Director, a headquarters establishment and such subordinate units and facilities as established by the Director to accomplish his mission of other activities assigned to the agency by the Secretary of Defense or by the Chairman, Joint Chiefs of Staff, acting by authority and direction of the Secretary of Defense.

F. RESPONSIBILITIES

1. Director of DCCSSA shall:

a. Command, organize, direct, and manage the DCCSSA and its field organizations in accordance with assigned missions and within the resources to be made available.

b. Participate with the Organization of the Joint Chiefs of Staff, the Unified and Specified Commands, and the Military Departments and applicable allied agencies in the development and formulation of operational concepts and requirements for the employment of US forces in order to understand the scope of command and control systems support needed to implement such concepts.

c. Establish standards and interface specifications and serve as the DoD intersystems architect/engineer/integrator for both hardware and software of US command and control systems.

d. Provide programming and budgeting data for, and manage all programs for which he is assigned responsibility and funded.

e. Establish technical specifications, interface standards and configuration control procedures of US systems and interfacing allied systems which provide command and control support in the employment of US forces.

f. Manage the technical and interface standards and the configuration of the DoD command and control systems throughout their service life.

g. Serve as the US representative in international/allied negotiations concerning cooperative research development, acquisition, interoperability and international configuration management of command and control support systems.

h. Develop, maintain, and update an overall technical and budgetary plan for research, development, acquisition, and integration of command and control systems to meet identified needs.

i. Make recommendations to the Office of the Secretary of Defense concerning research and development program approval, service funding, and acquisition of intra-service command and control systems; and the service assignment of program management, acquisition, and logistics support of inter-service command and control systems.

j. Provide for the conduct of intersystem developmental and operational testing (DT&E/IOT&E) to develop and demonstrate the compatibility, interoperability, and effectiveness required by employment concepts.

2. The Director, DCCSSA is not responsible for but will maintain an awareness of:

a. The operation, maintenance, and logistic support for command and control support systems.

b. The requirements for or management and acquisition of intra-service command and control support systems.

3. The Director, DCCSSA is assigned responsibilities for and, in conjunction with other DoD components and Agencies, will plan for the orderly incorporation into DCCSSA of the following programs/organizations:

a. Joint Tactical Communications Program (TRITAC).

b. Joint Interoperability of Tactical Command and Control Systems (JINTACCS).

c. Joint Tactical Information Distribution System (JTIDS).

d. WWMCCS System Engineering Office (WSEO).

e. Military Satellite Office (MSO).

f. Defense Communications Engineering Center (DCEC).

g. Command and Control Technical Center (CCTC).

4. The Deputy Under Secretary of Defense for Policy shall provide policy guidance to the ASD (C3I) with regard to the prioritization and confirmation of command and control requirements, as required.

5. The Chairman, Joint Chiefs of Staff shall:

a. Provide guidance, to the Director, DCCSSA on military and command and control doctrine and operational policies and procedures with regard to the development of command and control support systems.

b. Review and provide recommendations to the ASD (C3I) or the Director, DCCSSA, as appropriate, on the overall command and control support systems plan, other project and programming plans prepared by DCCSSA and on the allocation of military and civilian manpower to DCCSSA.

c. Provide advice to the ASD (C3I) regarding changes and modifications in the functions and responsibilities of the Director, DCCSSA.

d. Provide guidance concerning the relationships between the commanders of the Unified and Specified Commands and the DCCSSA.

e. Provide direction and guidance to the Director, DCCSSA on matters related to the development of improved command and control support to the NCA.

6. The Secretaries of the Military Department shall:

a. Provide, within the limitation of available resources, full support and assistance to the Director, DCCSSA in accomplishing his mission.

b. Accept tasking from the Director, DCCSSA to conduct acquisition programs for command and control support systems with funds provided by DCCSSA.

c. Accomplish related functions in support of planning, programing, budgeting, detailed engineering, training of operating and support personnel and other functions as may be required.

d. Consult with and obtain coordination of DCCSSA on the development of intraservice command and control support systems to ensure that potential interface requirements are not overlooked. Request DCCSSA representation on source selection advisory councils and evaluation boards for interservice command and control support systems.

e. Insure compliance with the technical specifications, interface standards and configuration control procedures established by Director, DCCSSA for command and control systems under his cognizance.

7. The Commanders of the Unified and Specified Commands shall:

a. Develop, with the participation of DCCSSA, the JCS, the Military Departments, and other DoD agencies, as appropriate, requirements for command and control support appropriate to their theatre, function, and threat.

b. Conduct, with the participation of the JCS, DCCSSA, and the Military Departments, field exercises/tests to aid in validating of command and control requirements and in the development of effective and efficient command and control support systems.

c. In conjunction with the Military Departments, provide for logistics and maintenance support of command and control support systems employed in exercises and military operations conducted within their Commands. This provision shall include employment of assigned personnel qualified to maintain, modify, and upgrade command and control systems to adapt to the specific operational needs of the Command, within established standards and specifications.

d. In conjunction with the Chairman, JCS, develop agreements with DCCSSA to delineate clearly the Command relationships with the DCCSSA field organizations to insure mutual responsiveness and coordination of effort.

8. Other Defense Agencies within their assigned areas of responsibilities shall:

a. Provide, within the limitation of available resources, full support and assistance to the Director, DCCSSA in accomplishing his mission.

b. Accept tasking from the Director, DCCSSA to conduct acquisition programs for command and control support systems with funds provided by DCCSSA.

G. AUTHORITY

The Director, DCCSSA, or his designee, is specifically delegated authority to:

1. Command the DCCSSA and its field organizations.

2. Establish DCCSSA headquarters and field organizations, and within overall authorized manpower, allocate military and civilian

spaces amoung such organizations in accordance with the policy of the Secretary of Defense.

3. Have free and unrestricted communications with all elements of DoD, as well as with other organizations having national command, control, and communications and intelligence responsibilities.

4. As system architect, engineer, and integrator, exercise technical control of subsystem/project management of the Military Departments, Unified and Specified Commands, other DoD Agencies, in those areas which support directly the development, acquisition, and evolution of interservice command and control support systems under his cognizance.

5. Prescribe technical specifications, interface standards and configuration procedures and monitor the installation status of new command and control support systems. In those cases where resource implications prevail, exercise of this technical systems authority could require agreement with the Military Department or Defense Agency concerned, and the Assistant Secretary of Defense to determine resource authority or availability.

6. Obtain, in coordination with the appropriate DoD components, such plans, reports, and information as are required to accomplish the DCCSSA mission.

H. ADMINISTRATION

1. The Director and Deputy Director, DCCSSA, shall be commissioned officers of suitable general or flag rank appointed by the Secretary of Defense from officers of the Armed Forces on active duty or qualified civilians of equivalent rank.

2. The appointment of other military personnel, and the selection of civilian personnel, for the DCCSSA will be subject to the approval of the Director, DCCSSA.

3. The DCCSSA will be authorized such personnel spaces, facilities, funds, and other administrative support as deemed necessary by the Secretary of Defense.

4. The Military Departments and other DoD components shall, within available resources, provide support as necessary to the DCCSSA.

5. Personnel, facilities, equipment, and other support required to maintain and operate specific elements of the DCCSSA shall be provided from resources available to DoD components as directed by the Office of the Secretary of Defense.

APPENDIX E

DoD Directive 5000.XX

ACQUISITION OF SUPPORT SYSTEMS FOR

COMMAND AND CONTROL

References: (a) Report of the Defense Science Board Task Force on Command and Control Systems Management

(b) DoD Directive 5000.1 "Major Systems Acquisition"

(c) DoD Directive 5000.2 "Major Systems Acquisition" Process"

(d) Charter for the Defense Command and Control Support Agency (DCCSSA)

A. PURPOSE

This Directive is based upon the following underlying principles.

1. The process designed for acquiring weapons systems is not completely applicable to command and control systems. ADP, communications, and intelligence systems which support command and control needs are by their nature highly interdependent. When aggregated into command and control systems they must evolve during their entire lifetime in order to be able to fulfill a wide variety of operational needs.

2. Development and continuing evolution of command and control systems requires the direct participation of the users (unified and specified command and subordinate operating units as appropriate). This participation is required from the original identification of the of the need, through system development, evaluation and deployment and finally, in the evolutionary growth and adaptation of the system in the field.

3. Effective command and control support systems in the field depends on the ability to adapt/modify a given system to meet the needs of various commanders in changing military situations which may be encountered in different theaters.

4. Interoperability of command and control systems at various command echelons is essential for effective command and control. Interoperability must be achieved and maintained while simultaneously providing the user with a capability for modifying and adapting a system to meet his particular needs.

B. APPLICABILITY AND SCOPE

1. The provisions of this Directive apply to the Office of the Secretary of Defense and the Organization of the Joint Chiefs of Staff and to the Military Departments and the Defense Agencies (hereinafter referred to as "DoD components"). As used herein the term "Services"

refers to the Army, the Navy, the Air Force, and the Marine Corps.

2. The provisions of the Directive apply to all command and control systems.

3. Command and control support systems which support all levels of command are included under this Directive.

4. References (b) and (c) are not applicable for command and control systems.

5. In the event of a conflict between this Directive and prior system acquisition Directives of OSD, the Services and DoD agencies, the provisions of this Directive shall apply.

C. DEFINITIONS

A definition of the terms used in this Directive is shown in Enclosure 2. (to be provided)

D. ACQUISITION GUIDANCE

1. Management of the acquisition of command and control systems will be in accordance with a Command and Control Systems Plan which incorporates the needs the various using commands and provides for the

evolution, material support and interoperability of the systems. Responsibility for the development and continuing evolution and maintenance of this plan is with the Defense Command and Control Systems Support Agency (DCCSSA) (see reference d) in corporation with the operational units, using commands, services and agencies.

2. Using commands and agencies are responsible for continuing analysis of mission areas to identify command and control support needs. Such analysis may employ the use of test beds where appropriate.

3. For DCCSSA managed programs the Services are responsible, as required, for providing facilities, technical and logistics support for the test bed and field operations described in paragraph D.

4. The acquisition of command and control systems under Command and Control Systems Plan shall normally be conducted in two phases.

a. Phase I, entitled "Design and Development" is initiated with the identification of a need by an appropriate using command or DoD component. The strucutre of Phase I will normally consist of three steps.

(1) Step 1 "Concept Formulation" consists of: (1) analysis of the identified operational needs and deficiencies of the existing capabilities in comparison to the Counter-Communications,

Command and Control projected threat, (2) an assessment of fiscal, timing, interoperability, standarization, etc., constraints, and (3) a program plan.

Laboratory test bed operations may be initiated during Step 1 if required to aid formulation of the initial concept. Step 1 shall result in a Command and Control Systems Needs Statement. The content of the Systems Needs Statement is shown in Enclosure 3 (to be provided)

(2) Step 2 "Test Bed Operations" is to refine the requirement, assess the technical approach and validate the concept. The using command or DoD component shall participate directly in this step. Maximum us shall be made of existing military and commercial hardware and software which is functionally acceptable to the using command or agency for subsequent Field Evaluation trails.

(3) Step 3 "Field Evaluation" transfers the system developed in Step 2 to the using command or DoD component for further evolution and evaluation in an operational environment. Evolution of the system shall be directed at tailoring the system to meet the identified need under the stresses of field operations when operated by personnel from the using command or DoD component.

Step 3 shall result in a detailed definition of the command and control system specification including operational software.

b. Phase II, entitled the "Implementation" phase is initiated by decision of the Secretary of Defense based on the results of Phase I. Phase II encompasses, to the extent required, modification of an existing systems, the full scale engineering development, production and deployment of the system for operational use. The structure of this may take one of four possible forms depending upon the availability of appropriate hardware and software at the Phase II initiation. The four possible forms are:

(1) Modification

It is to be anticipated that the needs for, and employment of, command and control systems will change in an evolutionary way over the lifetime of the systems. If the operational circumstances permit, changes will be made in the field by using personnel augmented as necessary by DCCSSA. Field changes should be made with due consideration of any possible impact on the interoperability with other systems and should be further evaluated for potential adverse impact on other command and control support systems as well as for possible wider application to other systems. DCCSSA will be responsible for overall interoperability standards.

(2) Deployment

The conditions are: sufficient hardware exists in either military or suitable commercial form and the software has been developed on this equipment during the design and development phase. The system may already be deployed in Phase I or all that remains to be done is to deploy the hardware to the using command or agency, supply replications of the software and conduct functional checkouts.

(3) Production and Deployment

The conditions are: suitable system hardware designs exist in either military or commercial form and the software has been developed during the design and development phase. Additional hardware must be produced to meet the anticipated operational usage.

(4) Engineering Development, Production, and Deployment

The conditions are: the design and development phase was conducted with modified or brassboard equipment (either military or commercial) which is not operationally suitable for the intended application. Thus full scale engineering development is required. This may also include revisions to the prototype software used in the design and development phase. In the event of a conflict or breach of cost

or performance thresholds reflected in the Command and Control Systems Plan the matter shall be referred to the Under Secretary of Defense for Research and Engineering (USDR&E) for resolution. The decision to employ either forms a,b,or c shall be made integral with the decision to enter Phase II. The decision to deploy the system for operational use rests with the using command or DoD component in consultation with the DCCSSA.

5. The foregoing methodology applies equally to those Command and Control Systems acquired by the Services for intra-service use.