MODERNIZATION OF THE WWMCCS

INFORMATION SYSTEM (WIS)

(Executive Summary)

PREPARED FOR

THE COMMITTEE ON ARMED SERVICES
UNITED STATES HOUSE OF REPRESENTATIVES

IN RESPONSE TO

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WITH THE ASSISTANCE OF

JOINT PROGRAM MANAGER
WWMCCS INFORMATION SYSTEM

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EXECUTIVE SUMMARY

1. INTRODUCTION

The purpose of this document is to provide an executive summary to the more detailed report to Congress, "Modernization of the WWMCCS Information System (WIS)," which delineates the specific measures instituted by the WIS Joint Program Manager (JPM) for the modernization of WWMCCS ADP. For the past few years, there has been a persistent need to provide a central focal point for WWMCCS ADP management. Hardware and software technology has rapidly advanced, while the WWMCCS ADP system has remained essentially unchanged. This document outlines the JPM strategy for recouping this technology gap and providing for a smooth, orderly transition into the future. The strategy revises the previous two reports supplied to Congress, with emphasis on instilling strong discipline into the current system and applying an innovative approach to the entire modernization effort.

The WIS encompasses the information collection, processing, and display system that includes WWMCCS ADP and related software systems, procedures and supporting telecommunications. The modernization focus is on the backbone of standard WWMCCS ADP which supports command and control functions on Honeywell H6000-based systems. The current WWMCCS ADP community consists of a number of CINC/Service/Agency sites, each of which has one or more H6000 ADP systems. The WWMCCS ADP community performs a limited number of applications which are "standard" throughout the community. Each site performs functions specifically designed to support the local CINC/Service/Agency. The WWMCCS ADP community today is a loose confederation of interests rather than a structured organization. This makes modernization a difficult task. There has been little centralized direction provided to this community and an overall baseline has not yet been established. The need for modernization stems from the fact that the H6000 hardware has become technologically obsolete. Although the application software undergoes constant improvement, the need for modernization is recognized. The high cost for operation and maintenance of these standard systems has highlighted the need for modernization. The JPM focus will be on software and data management techniques.

In January 1982, United States Air Force Major General D. L. Evans was appointed the WIS Joint Program Manager. The JPM defined three categories of WWMCCS ADP to help focus the JPM responsibilities and modernization priorities. Category A consists of the standard Honeywell systems mentioned above that perform standard (joint) command and control functions. Category B systems are unique to a particular Service or command mission and perform very specific functions. Many are not Honeywell based. Category C consists of emerging systems such as airborne, mobile, or transportable computers. The WIS JPM priority is the modernization of Category A systems under the direction and control of the JPM. Application functions performed by systems in this category correspond to those defined in the "WWMCCS ADP Concept of Operations and General Requirements for Post-1985" as belonging to two areas:

Resource and Unit Monitoring (RUM) and Conventional Planning and Execution (CPE). WIS JPM involvement in developments for systems in categories B and C will consist of cognizance of costs and the definition of interfaces to the modernized Category A systems or components. The precise delineation of categories has not yet been accomplished. It is realized that the large software investment in Category B systems could impose a burden on the already modest ADP manpower resources of the Services. This problem must be addressed more specifically as the WIS modernization concepts mature.

To execute the WIS modernization effort, the JPM has defined four largely parallel activities called segments. These segments are derived from the four phases described in the previous report on WIS modernization. The segment structure facilitates parallel WIS acquisition and development activities. The Maintenance Segment encompasses the maintenance and configuration control of all hardware and software, both for the current and the modernized systems. Also, near-term enhancements to the current system required to maintain operation are to be included in the Maintenance Segment. The Transition Segment provides a base for transitioning to the modernized system with the fielding of a set of modular system utilities at each site including capabilities for a local area network, message handling, and user support. Within the Joint Mission Segment, RUM and CPE application functions will be largely redesigned and then rehosted using modern hardware and system software. The fourth segment, Service and Command Uniques, addresses systems that are unique to a particular Command and Service which are in need of modernization.

The General Accounting Office (GAO) has expressed concerns over aspects of the WIS modernization planning. Figure 1 indexes major GAO concerns to sections in the Report to Congress where the concerns are addressed.

The remainder of this document describes the status of the major aspects of the WIS modernization. In turn, these sections address requirements, system structure, acquisition approach, management, costs and schedule and near-term initiatives.

2.   REQUIREMENTS

As with any development effort, the WIS program cornerstone is the careful definition and documentation of requirements that must be satisfied through the modernization. For WIS, a number of requirement areas must be addressed including: near-term requirements, generic system requirements, operational information requirements, performance requirements, and transition requirements.

Near-term requirements reflect shortfalls in the baseline, many of which require immediate attention and will be addressed in the Maintenance Segment of the WIS. These requirements are normally submitted in the form of System Development Notifications (SDN) as well as planned improvements in the Five Year Defense Plan (FYDP) or individual command plans.

CONCERNS	COMMENTS	REFERENCE
HARDWARE	Replace those systems having immediate shortfalls with modern upward compatible computers where a comparative cost analysis justifies such action.	SECTION 4.0
INFORMATION REQUIREMENTS	Complete the detailed information requirements to support command and control decision-making.	SECTION 2.0
SYSTEM STRUCTURE	Develop an architecture and system design that can satisfy detailed information requirements.	SECTIONS 2.0, 3.0
LIFE-CYCLE MANAGEMENT	Employ life-cycle management practices, including life-cycle costing, as presented in DoD Directive 7920.1 Life-Cycle Management of Automated Information Systems.	SECTIONS 5.0, 6.0
PROGRAM MANAGEMENT	Follow other sound management practices such as establishing measurable system performance and effectiveness goals and objectives, including periodic evaluation, providing cost-effective growth potential, and clearly delineating responsibilities and coupling them with needed authority and control of resources.	SECTION 5.0
SYSTEM RELIABILITY	Employ proven state-of-the-art technology in the WIS design to ensure the development of reliable systems.	SECTION 3.0
STANDARDIZATION	Specify standard network protocols, terminology, data elements, data formats, and data retrieval techniques for horizontal (between commands) and vertical (command to national military command centers) communications.	SECTIONS 2.0, 3.0
COMMAND/SITE-UNIQUE	Decentralize decision-making to allow individual WWMCCS sites to develop their own systems to meet command needs in compliance with the above standards.	SECTIONS 3.0, 4.0
NETWORK RESOURCE CONTROL	Centralize management and control of resources for the communications network and equipment interconnecting WWMCCS sites to ensure that local command needs do not pre-empt network operations.	SECTIONS 3.0, 5.0

Figure 1
Responses to Congressional Concerns
(Summary)

Generic system requirements relate to general system capabilities that are desired -- in many cases driven by technology advances -- or characteristics of the environment within which users expect to operate. The "WWMCCS ADP Concept of Operations and General Requirements for Post-1985" describes many generic system requirements such as survivability, responsiveness, and reliability. Others include the requirement for exploiting technology improvements which will result in reduction of user and operator training and system maintenance as well as reduced requirements for floor space, power, and air conditioning.

Operational information requirements refer to the information needed by personnel to perform command and control functions, as well as the characteristics of this information. Sources of these requirements include the formal reporting procedures in support of the National Command Authorities (NCA) defined by JCS, and the specific procedures and information required by the commands in order to support their particular defense missions. Four areas or families of functions have been defined in the approved WWMCCS ADP concept of operations as being required to support the NCA. These four families are as follows:

o   Resource and Unit Monitoring (RUM)
o   Conventional Planning and Execution (CPE)
o   Nuclear Planning and Execution (NPE)
o   Tactical Warning/Attack Assessment and
          Space Defense (TW/AA and SD)

The WIS modernization is to address both the RUM and CPE families within the Joint Mission Segment. Extensive requirements collection efforts are currently underway in both areas using teams of OJCS and Service personnel to visit each site. These requirements are being documented in a series of reports. Review and validation of the requirements is to be the responsibility of the Functional Project Manager established within the OJCS for this purpose. Once validated by the JCS, these requirements will be provided to the JPM. It is anticipated that JCS will complete requirements validation by 3rd quarter CY1983. Initial near-term modernization of the WWMCCS ADP in a generic sense can proceed in parallel with validation of specific operational requirements.

Performance requirements relate to the characteristics of the components of the automated system and are largely derived from the generic system and the operational information requirements. In addition to specifying such things as data transfer rates and reliability measures, performance requirements address those operating procedures and system capabilities needed to ensure that system operation and management is performed in an efficient and disciplined manner.

Transition requirements, as implied by the name, derive from the modernization process. These requirements address the particular approach to minimize disruption during transition and to ensure continuity of operations. These include such important considerations as increased personnel, space, environmental support and training to implement new capabilities, while continuing to operate and maintain existing systems. The length of time for these parallel operations affects system costs, and will vary from site to site.

3. WIS SYSTEM STRUCTURE

This section addresses four areas of interest concerning the WIS system structure: 1) the overall system structuring objectives; 2) the WIS nodal structure; 3) the WIS internodal structure; and 4) system design considerations.

Overall System Structuring Objectives

Overall system structuring objectives for the WIS are keyed to the system requirements. As a result, after thorough review, the four functional families as defined in the WWMCCS Concept of Operations were adopted as one of the bases for the WIS system structure. The concept of providing discrete ADP support to each of these areas provided an overall structure to the WIS. The concept was also extended to encompass additional types of functional families -- those defined for Command and Service-unique processing support. In addition, efforts to refine the RUM and CPE families have produced a structure of subfamilies which are envisioned as corresponding to separate system packages.

Additional objectives for WIS influenced the selected system structure. The need to provide efficient and effective ADP support to operational users influenced the placement of functions at the various WWMCCS sites. The need to minimize transition problems, as well as to provide a base for future upgrades to WIS, influenced the selection of the nodal structure.

WIS Nodal Structure

The nodal structure for WIS is shown conceptually in Figure 2. The approach consists of a set of locally distributed components using a local area network for interconnection. This structure provides both for flexibility in configuring to meet particular site needs as well as for the evolution from the current system to the new system. It also builds a mechanism for future modernization.

Functional components of the WIS node include host processors to support the functional families and Command and Service-unique processing needs. Each function may not require a separate and unique processor. User interface systems will support a common user terminal access to all nodal
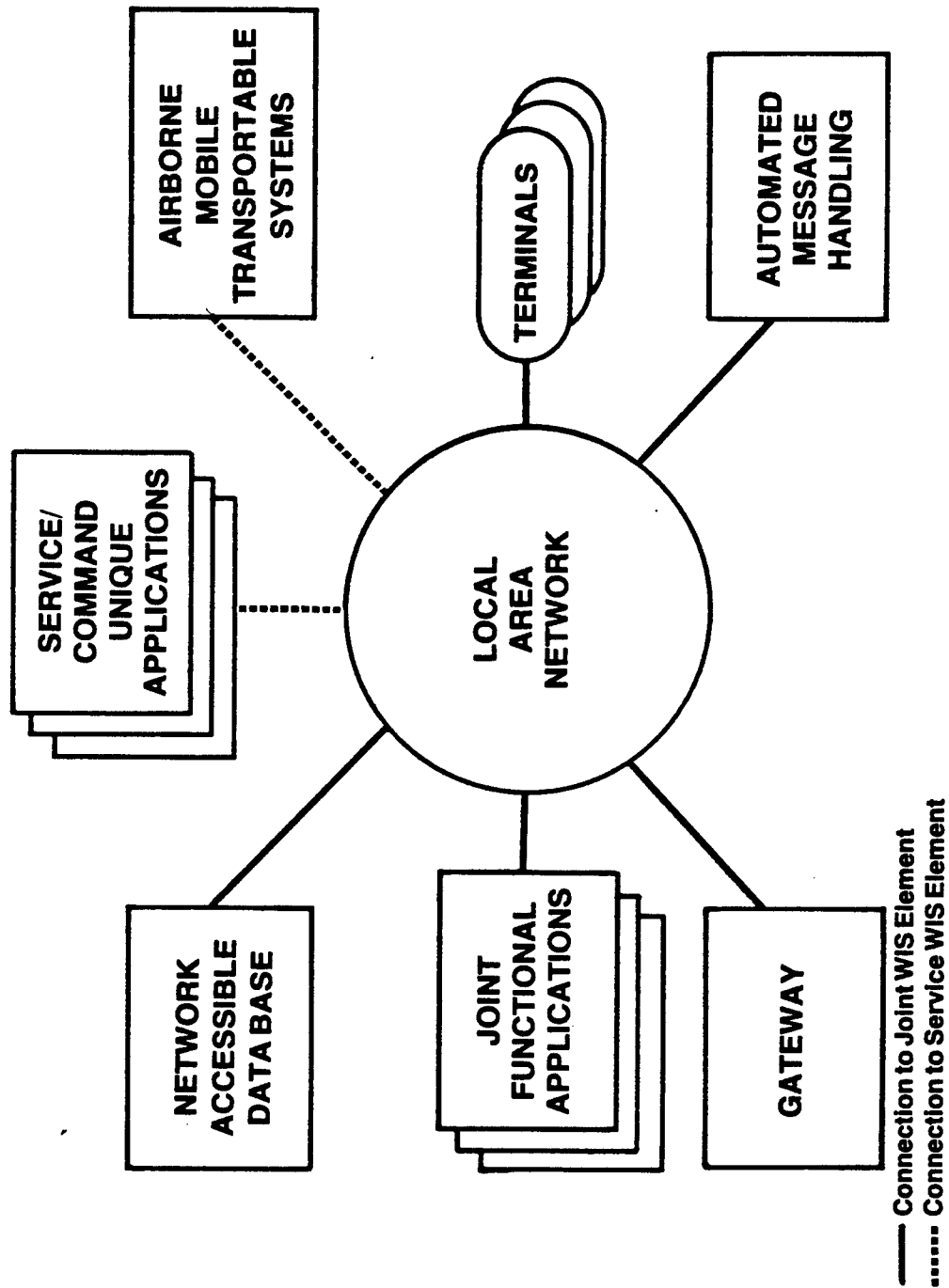
Figure 2
Nodal System Structure

Legend:
— Connection to Joint WIS Element
····· Connection to Service WIS Element

Boxes:
- AIRBORNE MOBILE TRANSPORTABLE SYSTEMS
- SERVICE/ COMMAND UNIQUE APPLICATIONS
- TERMINALS
- LOCAL AREA NETWORK
- AUTOMATED MESSAGE HANDLING
- NETWORK ACCESSIBLE DATABASE
- JOINT FUNCTIONAL APPLICATIONS
- GATEWAY

components through the local area communications network. System support capabilities within the node include a network accessible data base to store data of interest to other sites, gateways to other WWMCCS sites and other U.S. and allied systems, and support for automated message processing.

The nodal structure permits the separation of common functions from the Service and Command-unique functions while affording the advantages of 1) interconnection of heterogeneous equipment (where required), 2) multi-function user workstations, and 3) graceful degradation in case of equipment failure. It also permits a phased modernization with priority attention to critical improvement needs.

WIS Internodal Structure

Adoption of the Functional Families as the structure for WIS alleviates the need for a one-for-one CPU replacement. Functions will be allocated according to the specific needs of an individual site. Hardware and system software will be tailored to the specific subsets (subfamilies) of the functional families and the specific support capabilities required at each node.

A preliminary allocation of functions among nodes has been performed and was used as a basis for costing the WIS modernization. The allocation was based on four potential levels of support to a site. This support ranged from a Level 1 site which would consist of a full set of generic system capabilities (local area communications network, network accessible data base, and automated handling of command and control messages, in addition to one or more functional processors), to a Level 4 site which has a terminal connected to a remote processing facility. Many of the current WWMCCS H6000 sites were tentatively defined as Level 1 sites. Some sites were defined as only needing a lesser level of support, relying on remote capabilities for portions of ADP support. Training and development sites were also identified.

The internodal communications backbone is the DoD approved Defense Data Network (DDN). System-wide monitoring and control are to be an integral part of the DDN operations centers. The system will ensure proper networking and the ability to control networking resources. Survivability is a primary goal of DDN. Procedures and equipments are to be installed to maximize network availability to high priority users in crisis or wartime situations. The DDN will also provide for interoperability with other networks.

System Design Considerations

Major design considerations for WIS include the use of standardization, an approach to ensuring flexible security controls, and attention to generic system attributes.

Focus will be on software rather than hardware. Data management systems should allow system users the capability to easily input, manipulate, and dynamically display information without the aid of software programmers. Fundamental to WIS design will be considerations to improve survivability. This includes the ability to provide systems that are transportable. An important issue will be to ensure that hardware and software maintenance can be accomplished with fewer personnel than the present system. This maintenance support should be responsive to the site being supported. This is especially important in areas outside the CONUS.

The possibility of the use of heterogeneous equipment within WIS requires that standardization be employed in several areas. In the networking area, several protocols have been designated as DoD standards and others are in the development and approval cycle. WIS will employ DoD standard protocols. Standardized software development and control methods, including the use of Ada as a design language, are also planned for WIS. An additional key standardization area for WIS involves standards for data definition to ensure interoperability and to permit program and data base transportability.

Interfacing with allied commands is another important design consideration. WIS should be capable of interoperating with NATO systems, for example the Allied Command Europe/Automated Command and Control Information System (ACE/ACCIS). Interfaces with the other allied systems must also be anticipated. A NATO interface could be a gateway between the planned ACE/ACCIS intercomputer network -- the NATO Integrated Communications System (NICS-II) -- and the DDN. The characteristics of these interfaces must still be determined. Although three ACE sites currently use the WWMCCS ADP standard H6000 hardware and system software, there is no on-line connection with the WWMCCS ADP systems. Future interfaces between WWMCCS and allied systems will take these factors into consideration.

The ADP security approach for WIS employs low-risk, near-term technologies to increase reliance on hardware and software controls, and in turn to improve overall system effectiveness. Specifically, security controls in the local area communications network and other selected components will be designed to permit operation of these components in a multi-level or controlled mode as defined in DoDD 5200.28. Other components will rely on system-high operation and will be candidates for application of improved security solutions as they mature. The DoD Computer Security Evaluation Center will technically support the definition and implementation evaluation of the WIS security controls. Implicit in this security approach is the proper classification of data and resources.

4. ACQUISITION

The approach for WIS modernization (Figure 3) calls for an evolutionary upgrade which will provide expanded support for current WWMCCS ADP applications and growth for new user functions and applications. The WIS structure and the acquisition approach encompass the modular, specialized orientation of modern ADP technology and the need to provide appropriate capabilities for the diverse WWMCCS sites. Within WWMCCS, the need for timely upgrades is of prime importance in developing an appropriate acquisition strategy.

Program Segments

As mentioned, the WIS program has been divided into four largely parallel segments: Maintenance, Transition, Joint Mission, Command and Service Uniques. Segment definition was based on the nature of the activity, the management responsibility for the work, and the source of funding. Segments have been subdivided into blocks which correlate with specific time periods, capabilities, and contracts.

The objective of the <u>Maintenance Segment</u> is to provide a single source for WIS maintenance and configuration control. This maintenance responsibility includes the following: maintenance of and near-term upgrades to the current system; a transition phase when both current systems and new WIS systems are supported; and finally, support for new equipments provided under the WIS upgrade. The satisfaction of near-term hardware requirements will continue under the current WWMCCS Standard contracts and new contracts designed to be compatible with WIS. The <u>Maintenance Segment</u> of WIS has already begun with the installation of the currently deployed WWMCCS Standard System Software Release (W7.2.0).

The objectives of the <u>Transition Segment</u> are to provide the foundation for the evolution of the WIS, and a bridge from the existing WWMCCS ADP to WIS. The Transition Segment introduces a modular structure to WWMCCS ADP that allows for WIS products to be tailored to meet site differences while relying extensively on capabilities currently existing within the technology. Automated message handling and user support software, with a local area communications network, are to be introduced in the Transition Phase. Software development tools, an Ada training capability, a development and engineering test bed, and distributed processing support capabilities are vital components of this segment.

The objective of the <u>Joint Mission Segment</u> is to upgrade WWMCCS multi-command (joint) applications. This Segment focuses on software modernization and the design of application software. The two applications areas to be addressed are Resource and Unit Monitoring (RUM) and Conventional Planning and Execution (CPE). RUM and CPE software systems will include a mixture of joint, Service standard and command unique systems which will be developed and maintained by the appropriate Services, commands and agencies under the cognizance of the WIS JPM. When the design is sufficiently firm, using software design techniques including Ada as a program design language, the Joint Mission hardware base and system software will be selected and acquired.

Within the Command and Service Uniques Segment, the objective is to provide resources for improvements to service and command-unique applications. The selection of hosts and the development of applications software will be the responsibility of the Services and commands. The Services and commands may choose to use the processing hardware and system software chosen for the Joint Mission Segment. Given the current investment in Service and Command-unique software, this is the most complex segment of the program. This segment could be accomplished in parallel with the Joint Mission Segment as individual Services and Commands complete their planning. The WIS JPM will provide guidance and interface direction to these systems.

Contracting Approach

The selected contracting approach for WIS clearly delineates product responsibilities while providing for integration of products into combinations that match site needs. Four contractors will participate in the WIS Segments and blocks: an Integration contractor, a Common User Capability contractor, a Joint Hardware contractor, and a Configuration Management contractor.

The Integration contractor will be responsible for overall system integration, and for specific products such as the local area communications network, applications software, data base management software, distributed processing support, and the development and engineering facility. The Common User Capability contractor will be responsible for the message handling system, as well as for WIS workstations and user support software. Processors, peripheral hardware, and terminals required to support message handling and general user services in the Transition Segment will be provided by the Common User Capability contractor. The Joint Hardware contractor will provide the selected hardware base for the joint applications, and the system software to integrate it. The Configuration Management contractor will provide hardware and software configuration control during the program.

5. MANAGEMENT

The Chief of Staff Air Force was designated as the Executive Agent for WIS and was directed by the Deputy Secretary of Defense to appoint a Joint Program Manager. The WIS JPM has been tasked to provide centralized management of all modernization planning and implementation activities, including day-to-day direction, fiscal review, and life-cycle management.

The JPM receives policy guidance and requirements from the JCS and reports through the JCS to the Secretary of Defense. Specific JPM responsibilities and organization relationships for the WIS will be defined in the WIS JPM Charter. The Air Force also established a WIS System Program Office (SPO) within the Electronic System Division (ESD) of the Air Force Systems Command. The SPO will be responsible for the acquisition of the WIS.

6.   SCHEDULE AND COSTS

The WIS schedule is shown in Figure 3. The WIS Maintenance Segment has begun with the installation of WWMCCS Standard System Software Release W7.2.0. Installation of new Transition Segment capabilities will begin in 1985, the initial fielded components being proven, off-the-shelf capabilities. Specification and development of the Joint Mission application software can proceed in parallel with the development and installation of the Transition Segment. This will permit the installation of the Joint Mission hardware and software to begin on a site-by-site basis in parallel with the later portion of the installation of the Transition Segment.

Estimates of WIS costs have been prepared with attention toward overall life-cycle cost management. The preliminary total life-cycle cost estimate from FY 83 through FY 95, including O&M for both the current and modernized systems, is 5.3 billion dollars. Previous reports on the WIS modernization have focused on those portions of the WIS life-cycle costs attributable to RDT&E and procurement expenditures; and all costs were presented in constant 1982 dollars. In Figure 4, the costs in constant 1982 dollars for RDT&E and procurement for the WIS are shown. As noted before, responsibility for the planning and costs associated with the Command and Service Uniques Segment lies with the individual Commands and Services. In some instances, Services/Agencies requirements for the Command Unique Segment were not sufficiently well defined nor validated at the time of WIS cost estimate development reflected in Figure 4. As definition and validation efforts progress, WIS cost estimates will require commensurate adjustments to properly reflect Services/Agencies requirements. The life-cycle cost estimates extend through 1995, the minimum anticipated life of the modernized WIS components. However, they do not include funds for military construction (MILCON) which are yet to be defined. In some instances, the current Five-Year Defense Plan (FYDP) does not reflect sufficient budgeting of funds in many areas to support the WIS modernization.

Examination of these life-cycle costs permits the evaluation of WIS costs versus the benefits to be realized through the modernization in terms of reduced operation and maintenance, in addition to the ability to satisfy many critical requirements that cannot be satisfied with the current baseline system.

Operation and Maintenance (O&M) costs represent the most significant portion of WWMCCS ADP expenditures. Figure 5 shows the total expenditure in O&M costs for WWMCCS ADP for FY 82. The costs are subdivided to show where these O&M dollars are being spent. Through the WIS modernization, significant reduction in O&M costs will be realized due to the use of improved hardware technology and more-easily maintained software.

7.   NEAR-TERM INITIATIVES

Several WWMCCS ADP projects focus on early delivery of capabilities that directly support operational mission users have been initiated. Fundamental data management and software modernization issues will be given immediate attention. In consultation with WWMCCS sites, Services and the JCS as

83 | 84 | 85 | 86 | 87 | 88 | 89 | 90

MAINTENANCE

WWMCCS

ADP

WIS

TRANSITION

FOUNDATION

ENHANCEMENT

DISTRIBUTED PROCESSING

JOINT MISSION

APPLICATIONS

HARDWARE/SYSTEM SOFTWARE

COMMAND UNIQUE

APPLICATIONS

HARDWARE AND SYSTEM SOFTWARE

Figure 4 – Preliminary WIS Cost Estimate For RDT&E and Procurement
(Constant FY82 $ in Millions for FY83 through FY95)

	MAINTENANCE SEGMENT	TRANSITION SEGMENT	JOINT MISSION SEGMENT	CMD & SERVICE UNIQUES SEGMENT	TOTALS
RDT&E	18.	38.	318.	531.	905.
PROCUREMENT	23.	175.	104.	51.	353.
TOTALS	41.	213.	422.	582.	1,258.*

*Equivalent to $1,618.M in then-year dollars.

WWMCCS ADP — $144.4M

CCPDS, NORAD ADP, TRICOMS, OPERATIONS & APPLICATIONS	STANDARD WWMCCS ADP SYSTEMS
$36.2M	$108.2M

STANDARD WWMCCS ADP SYSTEMS — $108.2M

AIR FORCE	ARMY	NAVY USMC	D N A	DCA/CCTC
$29.7M	$17.1M	$17.1M	$1.9M	$45.2M

DCA/CCTC WWMCCS — $45.2M

COMPUTER OPERATIONS	C I V P A Y	SYSTEM SOFTWARE (CONTRACT SERVICES)	CIVILIAN PAY	JOINT APPLICATIONS SOFTWARE (CONTRACT SERVICES)
$11.6M		$11.0M	$12.0M	$10.6M

Figure 5
WWMCCS ADP O&M Costs For FY 82

appropriate, certain candidate projects will be finalized for early
implementation under stringent time schedules. Off-the-shelf technology will
be exploited to the maximum extent to reduce development time. Work requiring
innovative scientific and technical advances will be separated and merged with
basic research programs of the Advanced Research Projects Agency (DARPA) or
the Services.

8.   SUMMARY

Considerable progress has been made toward the goal of achieving a
modernized WIS to provide timely, cost-effective support of the National
Command Authorities by the various military commanders. The "WWMCCS ADP
Concept of Operations and General Requirements for Post 1985" was approved by
the JCS and the Services in February 1981. On 5 November 1981, the Chief of
Staff of the Air Force was designated as Executive Agent for the WIS and was
directed by the Deputy Secretary of Defense to appoint a Joint Program
Manager. The revised WIS Joint Mission Element Needs Statement was approved
in February 1982. Operational information requirements are in the final stage
of collection. This report includes, among other things, the resolution of
some technical issues, the acquisition strategy, the estimated life-cycle
costs and the proposed modernization schedule.

Analysis of the life-cycle costs leads to the conclusion that the
dominant life-cycle cost factor in WIS modernization is in Operations and
Maintenance. The WIS modernization is designed to significantly reduce the
Operations and Maintenance costs while providing a major improvement in
functional capability.

Today, WWMCCS ADP is a complex amalgamation of systems that serve a
variety of specific missions. The WIS modernization strategy includes
emphasis on discipline and strong central management. The WIS system
structure will support an orderly transition from today's WWMCCS ADP to the
modernized WIS.