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IMPLEMENTATION OF AUTOMATED INFORMATION SYSTEMS: ARE NONDEVELOPMENTAL ITEMS THE SOLUTION?

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BY

LIEUTENANT COLONEL WAYNE L. SITTLER
United States Army

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The requirement for an Automated Message Handling System (AMHS) has been documented in a Multi-Command Required Operational Capability (MROC) for ten years. The AMHS and a number of other requirements for automated information systems have not been fielded partly because of implementation strategies. This study describes two approaches used to satisfy the MROC requirements. Originally, the AMHS was to have been implemented as a portion of the World Wide Military Command and Control System (WWMCCS) information system modernization program. After six years of developmental effort and little progress, the Program Manager for the Army WWMCCS Information System initiated an implementation strategy to use non-developmental items. This strategy deserves special attention since the AMHS will be installed within 24 months and at a fraction of the cost spent on the original effort. Following a description of the implementation strategy and system capabilities, there is a review of steps taken by Congress and the Department of Defense to enhance the use of commercial nondevelopmental items.

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USAWC MILITARY STUDIES PROGRAM PAPER

IMPLEMENTATION OF AUTOMATED INFORMATION SYSTEMS: ARE NONDEVELOPMENTAL ITEMS THE SOLUTION?

AN INDIVIDUAL STUDY PROJECT

by

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IMPLEMENTATION OF AUTOMATED INFORMATION SYSTEMS: ARE NONDEVELOPMENTAL ITEMS THE SOLUTION?

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ACRONYMS

ADCP	Acquisition and Distribution of Commercial Products
ADP	Automatic Data Processing
AFCEA	Armed Forces Communication and Electronics Association
AMHS	Automatic Message Handling System
AUTODIN	Automatic Digital Network
AWC	Army War College
AWIS	Army WWMCCS Information System
CCS	Command and Control System
COTS	Commercial-Off-The-Shelf
DBMS	Data Base Management System
DCA	Defense Communications Agency
DFARS	DOD Supplement to the Federal Acquisition Regulation
DOD	Department of Defense
DMS	Defense Message System
DSB	Defense Science Board
FAR	Federal Acquisition Regulation
GAO	General Accounting Office
GFE	Government Furnished Equipment
GTE	General Telephone and Electronics
IBM	International Business Machines
IOC	Initial Operational Capability
JCS	Joint Chiefs of Staff
JDSSC	Joint Data System Support Center
JPL	Jet Propulsion Laboratory
JPMO	Joint Program Management Office
LAN	Local Area Network
MROC	Multi-command Required Operational Capability for Automated Message Handling
NDI	Nondevelopmental Items
OASD-C3I	Office of the Secretary of Defense for Command, Control, Communications, and Intelligence
OFPP	Office of Federal Procurement Policy
PM	Program Manager
RFI	Request For Information
SDDM	Secretary of Defense Decision Memorandum
SDN	System Development Notification
SSDD	System/Segment Design Document
TCP/IP	Transmission Control Protocol/Internet Protocol
UPI	United Press International
USAWC	United States Army War College
WAM	WWMCCS ADP Modernization
WIN	WWMCCS Information Network
WIS	WWMCCS Information System
WWMCCS	World Wide Military Command and Control System

INTRODUCTION

Historically the Department of Defense (DOD) has had difficulty in implementing automated information systems. In a May 1989 hearing, a Subcommittee of the Committee on Government Operations reviewed the Department of Defense's management of general purpose automated information systems.

In an opening statement the Chairman, Representative John C. Conyers (D, MI.), reviewed the General Accounting Office (GAO) findings following an audit of eight automated systems. The cost of all eight systems reviewed had grown; some by hundreds of millions of dollars. The estimated cost of developing and deploying all eight systems was almost two billion dollars; nearly double the original estimates. Four of the systems had been in development for at least eight years. Implementation of two systems, an Army Civilian Personnel system and a Navy Standard Automated Financial system, were discontinued after two hundred thirty-seven million dollars had been invested.[1]

During the hearing Mr. Charles A. Bowsher, Comptroller General, U.S. General Accounting Office, testified that, "Government agencies generally do not do a good job in identifying mission-essential needs and prioritizing user needs, defining functional requirements, or fully evaluating the costs and benefits of available

alternatives." Mr Bowsher, comparing the acquisition of automatic information systems with major weapon systems, stated "Unlike major weapon systems, however, the automated information systems being developed by Defense are not for unique, one-of-a-kind functions."[2]

The GAO auditors concluded that although the Defense Department had tried to improve the acquisition process, the causes of the problems are complex and long standing. They include underestimated costs, poorly defined requirements, and redirected strategies. The GAO auditors found that the military often preferred to develop costly new automated systems rather than determining how to use existing systems to do the job.[3]

In a 20 February 1989 editorial article in the Government Computer News another information system was reported to be in trouble. It began: "Yet another federal ADP megaproject is on the rocks and threatening to break up." This article reported on upgrading the World Wide Military Command and Control System (WWMCCS) Information System (WIS). After ten years of effort the program was behind schedule and over budget. The article concluded by questioning,

"What can be done? How can the federal IRM community solve its continuing big system problems? The Internal Revenue Service tried brute force; the Social Security Administration called in independent panels of advisors; the Federal Aviation Administration extended its planning site until next century; the Patent and Trademark Office threw a

lot of money at a systems integrator. None of these approaches proved any better than the others. None has assumed success."[4]

These examples demonstrate the Federal Government's continuing problems in procuring automated information systems. These failures are costly and prevent government users from receiving the necessary tools to perform critical missions.

This paper describes two approaches used to implement the requirement for fielding Automatic Message Handling Systems (AMHS) at DOD command centers. Originally, the AMHS was being installed as part of the WIS modernization program. Recognizing that this program was failing, the Program Manager (PM) of the Army WWMCCS Information System (AWIS) initiated a second approach using Nondevelopmental Items (NDI's).

An account of the original implementation strategy is followed by a description of the initiative introduced by the PM AWIS. There will then be a discussion of the PM AWIS implementation and a description of the system's capabilities and shortcomings. This implemention deserves special attention since the approach used has, thus far, promised to meet both time and dollar schedules and provide the user with a system that satisfies a majority of the requirements. Finally, there will be a review of

initiatives by Congress and the DOD to promote the government's use of NDIs.

AMHS REQUIREMENTS

The Automated Message Handling Systems has been a known, yet unfulfilled requirement for over a decade. In the early 1980s many command centers throughout the DOD were receiving critical information too late to assist commanders in making decisions. Specifically, while Commander of forces in Korea, General John W. Vessey, Jr. was not receiving important messages from forward forces during exercises. Messages were taking too long to reach his staff. He found message centers jammed with too much information and dozens of people working to process stacks of messages while critical information for the commander's attention was being delayed. General Vessey concluded that communication systems were not being employed in a disciplined way.[5] This was true, but if an AMHS had been available all required information could have been automatically routed to the appropriate staff officers.

The requirements for such a system were documented in the Multi-Command Required Operational Capability for Automated Message Handling (MROC) in 1981. This MROC was later revised and revalidated in 1983. The MROC documents that information flow in command and control centers is delayed by inefficient handling of message traffic. Post-exercise evaluations of crisis management operations, cited

in the MROC, show that effective command, control, and support of military operations is hampered by delays in information flow caused by the existing manual, paper-based message handling systems.[6]

Although it has been ten years since the requirement for an AMHS was documented, the DOD has failed to field a system. The need for such a system still exists, and it is likely that this need is even greater today with the increased information available for today's commanders. Today the DOD is on the threshold of fielding an AMHS using an innovative implementation approach that is taking only two years.

EARLY ATTEMPTS TO IMPLEMENT THE MROC

In September 1983 the AMHS MROC became a part of the requirements of the World Wide Military Command and Control System (WWMCCS) Information System (WIS) modernization program.[7] This program was designed to upgrade computer systems at thirty-five sites in a worldwide network that supports information processing requirements for the Department of Defense missions, as well as service and command unique applications.[8]

In 1981, the Deputy Secretary of Defense designated the United States Air Force as the Executive Agent for WWMCCS standard Automatic Data Processing (ADP) modernization and established the WIS Joint Program Management Office (JPMO). The WIS program was designated as a Major Defense Acquisition program.[9]

In May 1984 the Defense System Acquisition Review Council evaluated the WIS modernization program strategy. The council concluded that the program should be developed in clearly defined cost phases. The council designated the phases as Blocks A, B, and C. Block A included the AMHS (MROC requirements), computer workstations, and a local area network. Block B included replacing computer hardware systems, developing new application software, acquiring a management system, and improving security control over

access to information. Block C included enhancing joint mission planning and execution functions and improving interfaces with DOD and NATO systems.[10]

WIS BLOCK A MODERNIZATION

To satisfy the Block A requirements the JPMO awarded two contracts. First, in October 1983, General Telephone and Electronics (GTE) Corporation was awarded a competitive cost plus award fee contract to serve as the WIS integrator. GTE had the major responsibility to design and implement a cost affordable system to include the local area network portion of the Block A phase.

In October 1984 International Business Machine (IBM) Corporation was awarded a contract to develop an automated message handling capability with user support software, workstations, printers, and processors on a delivery order basis.[11] The contract contained a list of seventy-two specification documents for the product that established the minimum operational, performance, design, development, and test requirements. These specifications seem to have covered all conceivable areas to include grounding electronic equipment, standard general requirements for electronic equipment, management of logistic support,

reliability production of electronic equipment, and parts control programs.[12]

In September 1985 the Secretary of Defense approved Milestone II (full scale development) for the WIS Block A capabilities which was expected to end in June 1990.[13] The Secretary of Defense Decision Memorandum (SDDM) for WIS Block A full scale development approval limited procurement and installation of the product to not more than fifteen sites and approved a development threshold cost of 259.1 million dollars.[14] The total cost of the WIS Block A phase was estimated at seven hundred million dollars. This was to configure approximately thirty-five WWMCCS sites with an Automatic Message Handling System/Local Area Network (AMHS/LAN) capability.[15]

During the 1980s a number of problems adversely impacted the development of the Block A capabilities. As a result, the Initial Operational Capability (IOC) slipped from November 1987 to June 1990. During a review of the WIS program in December 1988, the Office of Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (OASD-C3I) determined that financial support for the program was in jeopardy. Technology and commercial systems had surpassed those in development, and pressing operation needs could not be met with the current funding level and program strategy.

As a result OASD-C3I convened a study group with representatives from organizations that included the Air Force, the WIS Joint Program Management Office, the Defense Communications Agency (DCA), and the Joint Staff. The objectives of the group were to assess the WIS program, study alternatives, and report to OASD-C3I with a recommended approach to satisfy the WIN modernization program. A consequence of this study was termination of the Air Force directed WIS program in March 1989 and assigning DCA responsibility for a newly defined WWMCCS ADP Modernization (WAM) program.[16] Therefore, after almost six years and at a cost of over 250 million dollars, the development of an AMHS as defined by the requirements in the MROC had failed to materialize.

The new DCA implementation strategy to implement the AMHS/LAN requirements changed from a major development effort to one of evaluating, testing, and integrating commercial products into the WWMCCS standard ADP environment to meet operational requirements. This new strategy included the use of commercial and government nondevelopment items to meet the requirements in a cost effective manner.[17]

THE WIS MODERNIZATION PROGRAM AMHS

When the Air Force JPMO for the WIS program was terminated in March 1989, the Defense Acquisition Board directed the Air Force to negotiate with IBM to have a prototype of their AMHS delivered. This system was delivered in March 1990 and subsequently tested by MITRE Corporation.[18]

The DCA Joint Data System Support Center (JDSSC) was tasked by OASD-C3I to assess the operational and performance capabilities of the IBM AMHS. They were to determine the AMHS' utility (as delivered or with reasonable modification) for use as an AMHS by the WWMCCS and Defense Message System (DMS) communities. The system was evaluated for technical features and operational characteristics to determine the system's near and long term applicability.

Because the required Category III testing was not accomplished, the system was not connected to the AUTODIN and all system testing of the AMHS was performed in a stand alone mode.[19] The report of the assessment concluded,

" In summary, while the WIS AMHS satisfies a documented need and has no major functional deficiencies that prevent its use, it should be considered a high risk solution. A critical drawback to the system is its cost -- both acquisition and operational support and its use of proprietary components. These facts suggest that the WIS AMHS is not a practical or feasible solution for the immediate needs of the WWMCCS community; additionally, based on the JDSSC assessment, as well as that of the DOD AMHS task team, the WIS AMHS is not a suitable candidate for the

integration in the DMS architecture. Therefore, the recommendation is made to examine other alternatives before making a commitment to this particular solution."[20]

It was estimated that the cost to install the IBM delivered WIS AMHS at a small site (approximately 100 users, 20 active at one time) would be approximately one million two hundred and fifty thousand dollars. This includes costs associated with installation ($125,000), operational support for one year ($300,000), hardware procurement and maintenance for one year ($652,000), and COTS software licenses ($178.000).

This cost reflects installation of a stand alone system consisting of a main frame, file server, front end communications, and a printer. To provide the site with an AMHS/LAN capability additional cost would be incurred to install a local area network, conduct Category III certification for the Automatic Digital Network (AUTODIN) connection, and to integrate the systems.[21]

PM AWIS INITIATIVE

Recognizing that implementation of the AMHS MROC requirements through the WIS modernization program was in jeopardy, the Program Manager of the Army WWMCCS Information System/Command and Control System (PM AWIS/CCS) proposed a new approach to implement an AMHS in late 1988. In a briefing to the JPMO, the PM proposed to satisfy the AMHS/LAN MROC requirements by using the lessons learned from previous efforts and taking advantage of both the academic and industrial environments.[22]

The approach would use NDIs to produce automatic message handling and local area network systems to satisfy WWMCCS information system requirements. The intent was to use standard non-proprietary software and maximize the use of commercial off-the-shelf hardware and software. It was intended that the lowest possible lifecycle hardware and software costs would be obtained by leveraging off industry developments.

The PM proposed a dual implementation strategy with independent tracks. The two tracks were termed the "Honest Broker" and "Good Candidate" solutions. The "Honest Broker" was to be an independent, non-profit organization and the "Good Candidate" was to be a company with considerable expertise in the AMHS/LAN fields. Both organizations were

tasked to analyze existing technology to develop and implement an AMHS/LAN.[23] The PM AWIS approach was to satisfy common user requirements for an AMHS/LAN configuration at both strategic (fixed) and tactical (mobile) command centers.[24]

During implementation and development there was to be extensive user involvement. The intent was to demonstrate basic capabilities within six months from contract initiation and full capability within eighteen months. It was estimated that the cost should be less than three million dollars. Moreover, it was expected that a system that significantly out performed current WIS AMHS and LAN's capabilities would occur.

The plan was to have monthly assessments of progress made by both contractors to facilitate maximum exchange of ideas and solutions. The "Honest Broker" effort was to be a not-for-profit organization that has had experience in the AMHS/LAN arena. The approach would field a prototype system at the U.S. Army War College (USAWC) and then a system at the U.S. European Command (EUCOM). The "Honest Broker" was in the unique position to independently analyzing existing AMHS/LAN technologies without being tied to a corporate solution.[25]

This paper describes implementation of the "Honest Broker" approach which was contracted to the Jet Propulsion

Laboratory (JPL) of the California Institute of Technology in January 1988. The "Good Candidate" approach was contracted to TRW Corporation in February 1990. Since The TRW approach is to satisfy different applications (the TRW effort is to provide a mobile AMHS rather than the JPL fixed version) and because it was tasked out one year later, this paper will focus in on the JPL effort.

JPL TASKING

In January 1989 a task plan was issued to JPL of the California Institute of Technology to begin work on implementing an AWIS AMHS/LAN. The period of performance for this task is from April 1989 through April 1991.

The object of this task is to implement an AMHS/LAN system to satisfy as many MROC requirements as possible within a cost limitation of two million dollars. The task includes designing, engineering, procuring, installing, and integrating the system.

This task plan requires JPL to define an AMHS/LAN system based on an assessment of user needs. The requirement is for the system to employ non-proprietary standards and protocols using available commercial off-the-shelf (COTS) software and hardware. JPL is to conduct a limited demonstration of the AMHS at their facility followed by a demonstration of the system at the Operations Group, Army War College, Carlisle, Pennsylvania.[26]

IMPLEMENTATION PHASES

The JPL task is defined in four phases. The first phase is developing the Automatic Message Handler (AMH). JPL is to recommend a solution to meet as many user

requirements as possible, assess modifications necessary to interface with the local area network, and identify advantages and disadvantages for long term maintenance support and reliability.

The second phase is to develop the non-proprietary local area network. JPL is to define an open architecture based LAN to interconnect the Automatic Message Handler with dissimilar host computers and establish a LAN path to accept remote connections throughout an area. JPL is also required to identify advantages and disadvantages of selected LAN architecture for long term stability and growth.

With the first two phases JPL is required to implement and demonstrate a prototype version of the selected AMH and LAN at their facility. The purpose of this demonstration is to evaluate conformance to the requirements and to measure the performance of the prototype system.

The third phase is to define special requirements and certify the system for connection to the AUTODIN, Category III certification, and for connection to the WWMCCS. JPL is required to develop an AMHS/LAN security user's guide and investigate available multi-level security LAN's.

The fourth phase requires JPL to reinstall, test, and demonstrate the LAN/AMHS at the Army War College (AWC) site. This includes implementing the AMHS/LAN specifically tailored to support this first installation. JPL is to

develop and submit as installed documentation, provide software and hardware maintenance, conduct a performance evaluation of the system, provide software and hardware anomaly corrections, and provide user orientation and training.[27]

TASK PLAN REVISIONS

The January 1989 JPL task plan has been revised twice. The first revision contained insignificant changes. The second revision, Revision B, changed the cost of the program from the original two million dollars to a new estimate of two million seven hundred thousand dollars. The additional seven hundred thousand dollars was to procure and install a second AMHS/LAN system at JPL. This system is used to evaluate new AMHS/LAN COTS hardware and software products; test and evaluate software revisions to the existing COTS software installed on the AWC system; detect, verify, and repair software abnormalities; and perform subsystem performance evaluations.[28]

IMPLEMENTATION AT USAWC

The specific requirements to satisfy AMHS/LAN requirements at the AWC were developed by using the basic AMHS functionality requirements from the MROC document as the baseline. The AMHS requirements in this document were rated by the future users of the system at the AWC Operations Group as highest priority, high priority, or priority. These baseline requirements, coupled with JPL's systems engineering served as the criteria in selecting COTS hardware and software for the AMHS rapid development.

JPL conducted a survey to determine what existing hardware and software products were available. They used responses received from an AMHS request for information (RFI) advertised by the Air Force WIS program office at Hanscom Air Force Base. In addition, JPL contacted vendors at an Armed Forces Communication and Electronics Association (AFCEA) convention and received calls from vendors who had heard of the survey and wanted their products included in the analysis.[29]

The hardware and software were analyzed to compare all COTS and Government Furnished Equipment (GFE) products to determine the largest set of requirements that could be satisfied by a product or combination of products. The requirements were categorized into broad functional areas

for analysis. These areas included AMHS's, Data Base Management Systems (DBMS), text search engines, word processing, electronic mail, user interface, network interface units, cable plant, and network bridges.

Nearly one hundred and fifty different products were evaluated during this survey of COTS and GFE hardware and software. During the evaluation JPL identified appropriate COTS software to satisfy all requirements except message generation, coordination, and release. The software to accomplish these activities was developed by JPL as part of the contract and is now government owned software. Commercial equipment was identified to satisfy all hardware requirements.[30]

After the survey, JPL conducted a baseline system design review to ensure that the selected system design met the functional and design requirements and developed a System/Segment Design Document (SSDD). This document describes and establishes the minimal operational and performance requirements for the AWIS AMHS/LAN rapid development. The document also identifies the capabilities of this system based on the capabilities of the hardware and software that were selected during the survey phase. The SSDD paragraphs are cross referenced to the MROC paragraphs for requirements traceability. Based on the 31 July 1989 edition of the SSDD, it is determined that over seventy

percent of the initial MROC requirements will be satisfied.[31]

SYSTEM CONFIGURATION

The USAWC Automated Message Handling System/Local Area Network (AMHS/LAN), as configured, consists of two major systems. First, the Local Area Network serves as the common communicators media to tie the computer hardware together and facilitates information exchange and sharing of common computer hardware (equipment) and software. Second, the automatic message handling system provides information processing service.

When completed, the system will be capable of receiving information from the AUTODIN, and the United Press International (UPI) wire service. The system will also be capable of accessing the WWMCCS Information Network (WIN). The system will support messages generation, coordination, and transmission over the AUTODIN. Additional capabilities include automatic user receipt of selected traffic based on profiles and local electronic mail.

The Local Area Network for the system is located in two buildings (building number 200, Root Hall and building number 637, the Operations Group Command Center) at Carlisle

Barracks. Each location has separate LAN cable plants that are connected by a fiber optic communications link.

The AMHS resides on a workstation located in building 200 where the system accesses AUTODIN. The UPI system is accessed from building 637. The file server for the system is located in building 637. The Local Area Network is engineered to be flexible with the capability to be modified for changing requirements. The LAN is configured physically as a star topology that performs as if it were a bus configuration with all devices receiving all traffic. The system uses Transmission Control Protocol/Internet Protocol (TCP/IP) that is supported by the logical bus topology.[32]

To procure and install a similar system at another location, it is estimated that the total cost, in 1989, would be approximately eight hundred and seventy thousand dollars. The hardware and software costs equate to a total of approximately four hundred and seventy-eight thousand dollars and an annual operational and maintenance cost of approximately two hundred and ninety thousand dollars. An additional cost for integration/installing the system would come to approximately one hundred thousand dollars.[33] This cost reflects an AMHS LAN system capable of supporting one hundred workstations with twenty terminals active at a time.

CURRENT STATUS

The AMHS/LAN project is on schedule, and with the exception of the additional seven hundred thousand dollars (to procure and install an additional system at JPL), the project is within cost. The twenty-four month implementation schedule ends on 30 April 1991 and all indications are the system will be installed and operational on this date.

Today, the system is installed and operational with the exception of connecting to the AUTODIN and WWMCCS. Hardware and software requirements for the AUTODIN connection are in place and will be activated when training for message preparation and handling is completed. Connection to the WIN will also be accomplished when the System Development Notification (SDN) is approved. The SDN is notification that a system has been engineered to connect to the WIN and must be approved by the Joint Chiefs of Staff (JCS). The SDN was submitted for approval in early 1990.

AWC AMHS CAPABILITIES

The objective of the AWC AMHS/LAN rapid development is to implement a system that satisfies the needs and functional requirements of users at the AWC using COTS hardware and software. With this approach it is understood that some of the MROC requirements will not be satisfied, but it is believed that providing users with some capability is far better than providing them with nothing.

MROC REQUIREMENTS

Requirements listed in the MROC are organized into four categories. First, basic functional requirements for AMHS are listed. These basic requirements are divided into requirements for operation, human factors, and security. Then requirements are listed for hardware and software characteristics, external interfaces, and AMHS support. All requirements are categorized as initial system (mandatory requirements), fully responsive system requirements, or optional requirements.[34]

There are a total of four hundred and twelve mandatory requirements. Two hundred and ninety-five or just over seventy percent will be satisfied with this first installation at the Army War College.[35] In fact, this

percent could easily be higher because software and hardware enhancements may have occurred since the products to configure the system were selected.

MROC MANDATORY REQUIREMENT SHORTFALLS

Reviewing the MROC mandatory requirements that will not be achieved with this fielding leads to the question, "Are they really mandatory requirements?" In the following paragraphs a few examples of what appears to be the most significant mandatory requirement shortfalls will serve to illustrate this point.

In the basic AMHS requirements category these shortfalls center around message generation and coordination. First, when draft messages are sent for coordination they must be sent to individuals and not to organizations. Second, during message coordination drafters will be unable to determine the coordination status, halt the coordination process, and index, store, transfer, and manipulate source and reference material. Next, message coordinating officials will be unable to change a concurrence or nonconcurrence. Finally, releasing officials will be unable to route messages for additional coordination; messages must be returned to the drafter before they are forwarded for further coordination.

Other mandatory requirements not attained fall into the operational, human factor, and hardware and software categories. Because of these shortfalls users will be unable to determine the status of other accounts on the system such as information on users, office symbols, and telephone numbers. The system will not have a window multi-tasking capability to assist user operations. Commands that are erroneous and might result in lost data will not be challenged, and users will not be informed of system delays. Other missing features include a screen size that allows full page viewing, keys labeled for AMHS control codes, and a system that notifies users of degradations to the AMHS such as printers being out of service.[36]

These examples seem to confirm the question posed earlier about defining these functions as mandatory requirements. Despite these shortfalls, the AMHS will be available to users at the AWC dramatically enhancing their information processing capabilities. Users will automatically receive information based on their profiles and have the ability to generate, coordinate, and release AUTODIN messages. If it is determined that these functions are necessary in the future, they will probably be implemented through software and hardware enhancements.

One shortfall that will likely require attention before this system is installed in major command centers is the

lack of redundancy. This equates to an AMHS that is susceptible to the failure of components, power losses, and fluctuating line voltages. The failure of a component could degrade system performance and the system will not be available during routine maintenance. This problem should be relatively easy to fix by integrating additional hardware and software into the AMHS/LAN. Additionally, an uninterrupted power system could be installed to maintain system integrity during power failures and to protect the system from power fluctuations.

BACKGROUND ON DODs USE OF NDI

For nearly twenty years many studies have endorsed the use of commercial products and nondevelopmental items by the DOD. The push for using commercial products was initiated with a 1972 report by the Commission on Government Procurement which concluded that there is a need to shift emphasis on commercial product procurement.

After this initial report, other reports from a variety of organizations including the Defense Science Board (DSB), the Office of Federal Procurement Policy (OFPP), and the General Accounting Office (GAO), have supported the use of commercial products whenever possible. Generally, these reports conclude that government specifications are too complex and contain many unnecessary burdensome contract requirements.[37]

DODD 5000.37

In 1978, DOD issued Directive 5000.37 on the "Acquisition and Distribution of Commercial Products (ADCP)". This Directive established the policy that DOD components were to purchase commercial products when the products satisfy government needs and have an established

market acceptability. The objectives of this directive included eliminating unnecessary government specifications; tailoring government specifications to reflect the best commercial practices in form, fit, function, or performance; and encouraging, recognizing and evaluating technological innovation that are applicable to defense needs.[38]

EXECUTIVE ORDER 12352

In 1982, with little progress by the DOD in using commercial products, President Reagan emphasized the need for increased use of commercial products in Execution Order 12352 on Federal Procurement Reforms. This executive order was enacted to "ensure effective and efficient spending of public funds through fundamental reforms in government procurement." Among a number of requirements, heads of executive agencies involved in procurement of products and services were ordered to,

"Establish criteria for enhancing effective competition and limiting noncompetitive actions. These criteria shall seek to improve competition by such actions as eliminating unnecessary Government specifications and simplifying those that must be retained, expanding the purchase of available commercial goods and services, and , where practical, using functionally-oriented specifications or otherwise describing Government needs so as to permit greater latitude for private sector response." [39]

PACKARD COMMISSION

More recently, in June 1986, the final report of the President's Blue Ribbon Commission on Defense Management (The Packard Commission) recommended increased use of commercial products and buying practices. In the report to the President on Defense Acquisition the Commission concluded that,

"Rather than relying on excessively rigid military specifications, DOD should make greater use of components, systems, and services available "off the shelf". It should develop new or custom-made items only when it has been establish that those readily available are clearly inadequate to meet military requirements".[40]

Another conclusion reached by the Commission of significance to the JPL AMHS/LAN implementation is that major savings are possible in developing weapons systems if the DOD follows procedures used in successful commercial programs. The commission identified six common features found in the most successful commercial programs.

First, the program manager had clear responsibility for his program. Second, at the onset of the program the manager entered into an agreement with his organization on specifics of performance, schedule, and cost. Third, there was limited reporting to his organization with typical reporting focusing on deviations from the plan. Fourth, the staffs were generally small but of very high quality.

Fifth, the manager established a dialog with the customer at the conception of the program and maintain the communication throughout the program. Last, a system was prototyped and tested under simulated operating conditions. This enabled the manger to identify and correct problems in a timely manner.[41]

These characteristics are rarely found in typical defense acquisition programs. All of these characteristics can be identified in the AWIS/AMHS implementation by JPL. The PM AWIS received approval from the JPMO to initiate this implementation strategy and was given full authority to carry out the program. The tasking to JPL is specific; it requires implementation of a system to satisfy as many MROC requirements possible within a two million dollar limit. Required reports are limited to monthly reviews to discuss progress and implementation problems. The JPL staff is very small and talented. The system is being prototyped and tested under simulated operating conditions and there is extensive user involvement.

LEGISLATION

Since publication of the Packard Commission Report on acquisition, legislation to implement the use of nondevelopmental items has appeared in Section 907 of the

National Defense Authorization Act for fiscal year 1987 and Section 824 of the National Defense Authorization Act for fiscal years 1990 and 1991. Both of these acts require the DOD to take specific steps to enhance the use of NDIs when satisfying government requirements.

Two other legislative proposals were introduced in 1990 but were not passed as law. Section 202 (Commercial Style Acquisition Practices) of Senate bill S.2440, the Defense Management Improvement Act was drafted by the OFPP. The purpose of this section was to require the development of commercial style purchasing procedures, enhance the use of market research, reduce overly detailed specification, and facilitate the procurement of commercial equipment.[42] This section was dropped from the act following testimony at a Senate subcommittee hearing on the bill. The committee members felt that the proposed legislation was too broad and waived too many statutory and legislative requirements to enhance the use of NDIs.[43] The conferees also agreed that the DOD should implement other commercial product reforms enacted in previous years before new major legislative initiatives are undertaken.[44]

Senate Bill (S.1957), "The Nondevelopmental Items Acquisition Act of 1989", was introduced in November 1989.[45] The bill was approved by the Senate and House without a dissenting vote. The House version of the bill differed

slightly from the Senate version so it was returned to the Senate for another vote to accept or reject the House version, but the Congress recessed before the Senate could vote.[46] This Bill was reintroduced to the Senate on 24 January 1991 as S.260, "The Nondevelopmental Items Acquisition Act of 1991".[47]

This bill, if passed, will create a preference for nondevelopment item acquisitions. Major provisions of the bill will require federal agencies to state, when possible, requirements in terms of functions or performance, rather than detailed design specifications. It will require federal agencies to conduct market research prior to developing new specifications to determine if nondevelopment items are available to satisfy requirements. Federal agencies will be required to make maximum use of warranties. Competition advocates will be responsible for promoting the acquisition of nondevelopment items.

This bill will codify, in one body of law, procedures to enhance the use of commercial products. The legislation will require changes to the Federal Acquisition Regulation (FAR) and extend to all federal agencies measures already applicable to the DOD under the 1987 and 1990 Authorization acts. This will restore the uniformity of federal procurement laws and make it more difficult for the DOD to resist using commercial products.[48]

DOD RESPONSE

The DOD has been slow in responding to legislation designed to enhance the use of nondevelopment items. A requirement of Section 907 of the National Defense Authorization Act for fiscal year 1987 required the Department of Defense to identify and remove regulatory impediments to the acquisition of NDIs and notify Congress of any statutory impediments to the acquisition of NDI.

In a May 1989 hearing before the Subcommittee on Oversight of Government Affairs, the committee concluded that the DOD had made little progress in implementing the 1986 legislation.[49] In another hearing in May 1989, the Senate Committee on Armed Services heard testimony on the DOD's inadequate response to the Packard Commissions recommendation to increase the use of commercially available products. The committee was informed that, while some actions have been taken to encourage the use of commercial products, more needs to be done.

A number of shortfalls in implementing appropriate nondevelopmental procurement practices were identified. The DOD was giving insufficient attention to NDI acquisition practices; the position established by the DOD, Assistant for Commercial Acquisition, had only dedicated approximately

twenty-five percent of his time on this effort. There was a a delay in developing the guidance for managers, and the need for NDI procurement training for acquisition personnel had not been fulfilled.[50]

With little progress made by the DOD to increase the use of NDIs, The Defense Authorization Act of 1990 and 1991 (Public Law 101-189) directed that specific steps be initiated to improve their use. Section 824 of this legislation, Acquisition of Commercial and Nondevelopmental Items, outlines steps to be taken by the DOD.

The DOD was directed to prescribe regulations to enhance the process of using NDIs and conduct an analysis of impediments to NDI acquisition. Additionally, the DOD was required to develop a simplified uniform contract to be used for NDI acquisition, develop streamlined inspection practices for acquisition of commercial items, and use standard commercial warranties when appropriate.

In the analysis of impediments to the acquisition process, the DOD was to consider modifying regulations to enhance the use of nondevelopmental items and revise specification regulations requiring product specification to be stated in terms of performance functions and requirements. Other initiatives to be considered during the review included, reducing requirements for technical data on commercial items and exempting defense contracts for

commercial items from selected acquisition requirements.[51]

Since this law was passed in November 1989, the DOD has made significant progress in a number of areas to promote the use of NDIs. The DOD has issued new policy and guidance, recommended changes to the Federal Acquisition Regulation (FAR), published for comments proposed changes to the DOD supplement to the Federal Acquisition Regulation (DFARS), and initiated an NDI training program. The training program emphasizes the use of market research in preparing purchase specifications and preparing commercial item descriptions techniques.

The proposed changes to the FAR and DFARS coupled with the policy and guidance issued by the DOD will reduce impediments to NDI acquisition. Recent DOD policy, guidance, and proposed changes to the DFARS will limit the use of government design specifications that restrict the use of commercial products, establish a simplified set of clauses for use in commercial product solicitations, and eliminate the requirement for certified cost or pricing data from commercial contractors.

The DOD's proposed changes to the FAR emphasize writing specifications in terms of functions and performance characteristics to foster the purchase of commercial products, establishing new procedures to procure commercial items, and modifying laws to enhance the use of catalog

prices. A final recommendation will hold contractors responsible for the quality of the product and keep government inspectors at supplier facilities to a minimum.[52]

The United States Government has been concerned about the limited use of commercial products by the DOD for almost two decades. In the past, few steps have been taken by the DOD to promote the use of commercial products; however, with the new policies, proposed legislation, and training programs initiated, progress is being made today and indications are it will continue.

CONCLUSION

The DOD has not been successful at implementing automated information systems. A number of past efforts have ended in failures. There have been sizable cost overruns and cancelation of incomplete development efforts causing unfulfilled requirements.

A comparison of the two implementation strategies used to develop an AMHS/LAN automated information system illustrates the advantage of using commercial NDIs. Two significant differences in these approaches, cost and time, become obvious.

Originally, the AMHS was to have been implemented as a portion of the JPMO WIS modernization program. The strategy initiated by the JPMO was to develop new hardware and software for the AMHS. This effort was six years in development when cancelled. The cost was over two hundred thirty million dollars and an AMHS that is, according to the JDSSC assessment report, not a practical or feasible solution was delivered.

In comparison, the COTS hardware and software AMHS/LAN implementation strategy initiated by the PM AWIS will be installed and operational within two years and at a cost of two million seven hundred thousand dollars. This system will satisfy over seventy percent of the MROC requirements

and all indications are it will be a practical and feasible solution.

The purpose of this study is not to place the blame on the JPMO or a contractor. Instead, by looking at the requirements that were placed on the contractors it will assist to explain why there is such a difference in the cost and time spent on the two approaches.

The contract issued to IBM was a typical DOD contract. It required the contractor to conform to a list of seventy-two specification documents that described how to build the system and to implement an AMHS capable of performing a long list of mandatory requirements. These specification documents and mandatory requirements established the minimum operational, performance, design, development, and test requirements for the AMHS. On the other hand, the task plan issued to JPL did not specify how to build a system but tasked the contractor to satisfy as many requirements using COTS hardware and software within a specific cost.

As a rule the DOD uses design instead of performance or functional specifications; therefore telling contractors not only what to build but how to build it. When detailed specifications are used for common items, they can be a significant impediment to the acquisition of NDIs, because they frequently overstate needs or state needs in excessive detail. Over specified requirements cause contractors to

perform unnecessary work fabricating products to conform with the requirements. The contract issued to IBM contained specifications that required a costly and time consuming research and development effort, although there were available commercial products that could have met the requirements.

Implementation of the AMHS by JPL appears to have broken the code on how to field automated information systems. Although the use of commercial NDIs can be considered a key to this success, there seem to be other contributing factors. First, The system is being developed and tested under simulated operating conditions with extensive user involvement. Second, by using standard non-proprietary protocols and common hardware the cost is being kept to a minimum, and the lowest possible lifecycle hardware and software costs are made possible by leveraging off industry developments. Next, a small, dedicated, and professional group of personnel is implementing this system. Fourth, reports are minimized to monthly reviews. Finally, the "Honest Broker" approach, using a non-profit motivated contractor to independently analyze existing AMHS/LAN technologies without being tied to any corporate solutions, may be a significant factor.

The twenty-four month implementation schedule ends on 30 April 1991. The project is on time and within cost, and

probably more important, users will have a state-of-the-art system to assist them in doing their missions. This is something the DOD has been trying to accomplish since 1983. When the system becomes fully operational, an analysis of its performance can be tested to determine if there are any serious shortfalls and what steps will be necessary to rectify them.

It could be argued that the system has satisfied the easier MROC requirements; however, an analysis of the system's capabilities confirms that it will perform some of the more difficult functions. When fielded the system will perform over seventy percent of the MROC requirements. The lack of a redundant capability is likely the most serious deficiency but it should be relatively easy to overcome.

Ironically, during implementation of the AMHS, Congress introduced some initiatives that have started to enhance the DOD's use of NDI. Perhaps the most significant was section 824 of The Defense Authorization Act of 1990 and 1991. This legislation directed the DOD to take specific steps to promote using NDIs. As a result of this legislation the DOD has made significant progress by issuing policies, proposing changes to the FAR and DFARS, and initiating a training program to enhance the use of NDIs.

The success of the AWC AMHS implementation should serve as guide for the use of NDIs. The implications seem

relatively clear. The Department of Defense should continue developing appropriate policies and regulations to further enhance the use of NDIs. With commercial technology available, especially in automated information systems, NDIs should always be consider when implementing new systems.

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