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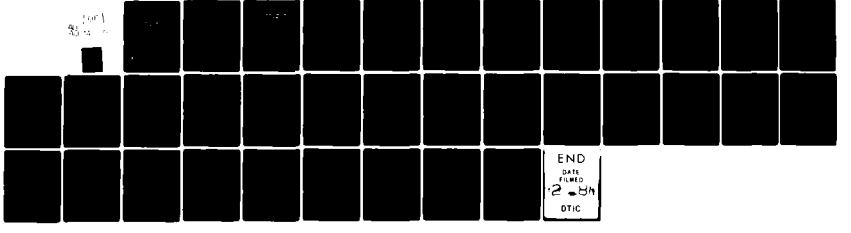

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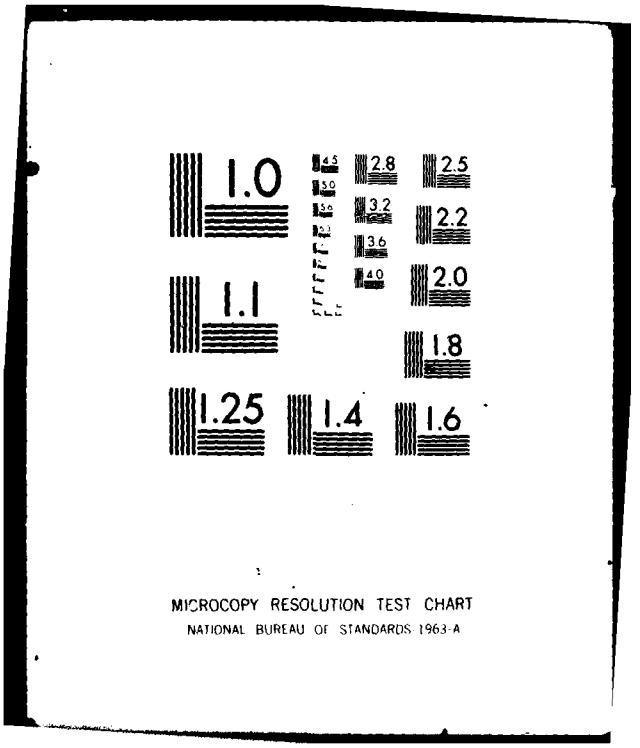
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ACSAC Network Support Project-Final Report

C. J. LaSonde
M. L. Duffy

December 1980

MITRE

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This small study effort was a preliminary analysis initiating a requirements concept for HQDA data processing support for the mid-1980's. The report reviews automation support needs and the value, accuracy, access, and timeliness of data required.

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ABSTRACT

This paper summarizes the work done on a two-month study for the Office of the Assistant Chief of Staff for Automation and Communication, U.S. Army. The effort was a preliminary analysis initiating the Network Support Project. The report reviews preliminary findings, conclusions and recommendations.

ACKNOWLDGMENT

The authors gratefully acknowledge assistance provided by members of the OACSAC. Specifically, we were greatly helped by Lt. Col. George King and by Mr. Donald Leipertz.

We also acknowledge the support provided by Ms. Betty Anne Francis and Ms. Grace Hyder. Their work is reflected throughout the document and, in particular, they wrote Appendix 1.

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1.0 INTRODUCTION

This paper is the final report of the MITRE Network Support Project, for the Office of the Assistant Chief of Staff for Automation and Communications (OACSAC). The project took place during a six-week period from mid-August through September 1980.

This study is preliminary and, due to time constraints, did not include the in-depth investigation more time would have permitted. Nonetheless, a good start was made and some conclusions and recommendations can, and are, made. Section 2 summarizes the study activity. Section 3 discusses briefly those topics which appear to us to be pertinent and which pertain to the conclusions and recommendations contained in Section 4. Three appendices are included:

1. Summary of Data Bases
2. Individuals Contacted
3. Documents Reviewed

1.1 Background of the Study

This study activity grew out of MITRE work for TRIMIS-Army at Walter Reed Army Medical Center and for the CEEIA-CONUS. The test bed activity at Walter Reed demonstrated the efficacy of local area networks. ACSAC determined that extensions of this technology could be of use within the Army staff and, specifically, within the OACSAC, itself.

The initial portion of work was to determine where distributed data processing and multiple-access network communications could be applied to help Action Officers with their tasks. The initial focus was on selecting data bases that could support AO work, on recommendations for improving support to the AOs, and on concepts for follow-on study and test bed activity.

2.0 PROJECT SUMMARY

The FY80 study activity was preliminary work leading to early conclusions and proposals for the completion of the study and for follow-on development work. With assistance from OACSAC-NIP, MITRE did the following:

1. Held discussions with representative Action Officers (AOs) and ACSAC staff personnel with respect to AO jobs, their ideas on needed automation support, and the value and timeliness of data.

2. Discussed with Network Integration (NI) staff personnel the goals of ACSAC and the long-term plans for ways in which the organization can improve its capability to support PPBS activity.

3. Reviewed several data bases and their support systems with the organizations that maintain and/or use them.

4. Observed the operation of the U.S. Army Management Systems Support Agency (USAMSSA) data processing center.

5. Discussed support programming, data base conversion, and Project Redbook with USAMSSA programming personnel.

6. Discussed the telecommunications within the Pentagon and to other major Data Processing Installations (DPIs) and installations with USAMSSA telecommunications personnel.

7. Reviewed documents relating to the ACSAC mission, PPBS, data bases, etc.

8. Discussed Four-Phase equipment, software systems, and communications capability with Four Phase Systems, Inc. and acquired background technical documentation on the equipment/systems used by ACSAC.

9. Reviewed Data Base Management Systems and, in particular, ADABAS and the MITRE experience in bringing its ADABAS on-line.

10. Demonstrated for ACSAC management, The Adjutant General (TAG), and Information Research Management Office (IRMO) personnel related local area network activity underway at MITRE. This included Multi-Function Terminal development, Mailgram and Voicegram work, and Public Key Cryptosystems activity.

3.0 DISCUSSION

This section summarizes briefly the major aspects of the study activity that bear on the conclusions and recommendations to follow. The sections are not in priority order.

3.1 ACSAC Mission and Goals

ACSAC has responsibility for all U.S. Army data processing and communications systems at the budgetary level. They operate under the Planning, Programming, and Budgeting System (PPBS) and support the PPBS process on an ongoing basis. Each Army system or set of equipment under the cognizance of ACSAC is assigned to an Action Officer (AO); some AOs have 30 or more assignments. AOs are the advocates for their assigned equipments/systems during the budgeting cycle, and they provide material to fight for needed resources, including people. Their responsibilities include specific existing equipments, things in the planning and procurement stages, and joint service programs. Action Officers try to insure proper transition and integration into the Army inventory for new equipment and proper Operations and Maintenance (O&M) resources for those already in the inventory. An ACSAC AO has responsibility for his items as long as they are in the inventory.

ACSAC is also responsible for establishing the goals and standards for automation and communications and for bringing structure and discipline to the scattered and diverse data processing and communication resources of the ARMY. They direct USAMSSA activities.

3.2 Project Redbook

Project Redbook is to provide on-line data concerning the status of the US ARMY to the Chief of Staff. The present system consists of a red, loose-leafed reference notebook provided periodically to the Chief of Staff. Individual sections are the responsibility of various staff groups. The goal is to automate inputs both for easier access and for more up-to-date information. The project is in the first of three phases. During this first phase, three terminals will be implemented in IRMO, TAGO, and C of S offices. Data will be collated and manually entered by IRMO and TAGO

personnel. Phase II will provide for automated update from a large number of sources (staff sections) and terminals. Phase III will provide integration of present sources with other ARMY data bases. IRMO is responsible for the project with both ADP and telecommunications support being provided by USAMSSA.

3.3 USAMSSA Data Processing Center

USAMSSA provides support to the ARMY staff, some segments of OSD, the Secretary of the ARMY and the Military District of Washington. Three large IBM computers and considerable on- and off-line storage are available as well as communications to major installations and DPI'S.

Software support is provided by two applications divisions. Programmers utilize ASSIST and write COBOL programs to create reports for staff agencies. Batch and TSO support is provided and the present DBMS system is TOTAL. Conversion to ADABAS is planned in early 1981.

3.4 AAPPES

The Army Automated Program Planning and Evaluating System (AAPPES) reports the costs of data processing for all Army ADP systems. Data are reported in two forms: gross costs for a large number of years for the program cycle; and detailed costs for four years for the budget cycle. The program runs on the USAMSSA 370/165 computer, with input and output by means of a Four-Phase minicomputer plus terminals located at DAAC-RN. Source data are obtained directly from subordinate commands. AAPPES does not include an inventory of DP hardware.

AAPPES is designed specifically for supporting the PPBS process. As such, it contains the cost data needed by ADP AO's for their jobs. If flexible, on-line cabability to search and to format reports can be provided, this data base can be the basis for a powerful AO support tool.

3.5 TAEDP and ARM

The Total Army Equipment Distribution Program, TAEDP, is maintained by Logistics Command at headquarters, DCSCOM, in Chambersburg, PA. Its purpose is to provide to major agencies the status of equipment and equipment acquisition programs witnin the Army. Data is received by Log Command continually from the major data bases concerned with equipment status. Log Command maintains the data base and provides reports to several staff agencies and major commands.

The Asset Redistribution Model (ARM) was created and is used by the Program Analysis and Evaluation (PA&E) Directorate of OSD. Periodically, PA&E receives copies of the TAEDP data base on magnetic tape which are used for various analyses and as input to the ARM. ARM permits on-line searches of the data base and re-structured projections based on changes in priorities, fill factors, and programmed budgets. The ARM programs are written in PL-1 and utilize the JANUS DBMS which runs on the MULTICS. JANUS, developed at MIT, is a powerful data base management system in use at only three locations: General Motors, the White House, and this OSD facility.

Discussions are underway concerning the conversion of these programs to operate under ADABAS within USAMSSA.

The TAEDP does not contain cost data breakdowns on ADP and Communications as needed by the respective AO's. However, it may be possible to utilize the AAPPES data base with ARM to provide the AO's with flexible on-line report generation and "what-if" query capability.

3.6 Local Area Networks

Local area bus networks provide the opportunity for the flexible sharing of multi-media communications among several users. Their application is particularly appropriate where requirements are changing and where the needs of users are unpredictable. Within ACSAC they could serve two purposes. First, to provide

a flexible means of interconnecting several different Data Processing systems to serve the needs of the Action Officers. Second, to serve as a prototype test-bed for bus network applications on a wider scale throughout the Army staff.

One advantage provided by the flexible addressing and interconnectivity of local networks is the use of single terminals to perform several functions. These multi-function terminals can permit access to several disparate systems without the need for separate terminals for each.

Of particular interest to the ACSAC, as additional functions along with file access, are mailgram and voicegram applications which would permit easy intra-communications between AOs and between AOs and ACSAC management. Superimposed on these functions would be experimental use of public key cryptosystems for privacy and for authentication.

3.7 DBMS

Data Base Management Systems are program structures which permit the easy establishment and maintenance of data bases and provide flexible query capability and report generation. They can be categorized, in general, into two classes. First, pointer-based systems (sometimes called designer systems since they require highly-skilled designers to establish file structures, etc.) that use complex linked lists to provide the data structure. Second, inverted file systems (called user systems since user's can modify, the file structures with relative ease) that use partially inverted files as "keys" to the data.

TOTAL, the present USAMSSA system is an example of the first class. ADABAS, the new USAMSSA system, is in the second class.

The conversion from TOTAL to ADABAS will present some problems due to the differences in structural philosophy between these systems. The data itself can be reformatted readily, but providing for a full range of response capability will require more time and effort from the support activity.

Nevertheless, ADABAS is an excellent system that can provide a powerful support tool to AOs and to ACSAC management. It could serve effectively as the basis for an overall Management Information System (MIS) development for ACSAC and the ARMY staff.

3.8 Action Officers and PPBS

Action Officers are driven by the periodic, cyclic activity of the Planning, Programming, and Budgeting System (PPBS). They must continually supply inputs to the various reports required and to answer questions from other agencies and management concerning status and the impact(s) of changes on the plans and programs affecting their areas.

They need, in general, to know five things: What specifically is this piece of equipment - size, structure, use, function, etc.? What is its cost? Where is it distributed now? Where is it planned to be? What if something changed - priority, funding, fill factors, etc.?

AO's today use various data bases from a variety of organizations and agencies to answer these questions. They request data and it is later supplied in the form of reports that may, or may not, contain those data needed in the right form. The real need is to provide a simple, flexible way for AO's to access the data in a variety of data bases, to be able to restructure outcomes on a "what-if" basis, to format reports and summarys of only pertinent data, and to be able to communicate this information readily to other AO's and to management.

3.9 Four-Phase Systems

There are two Four-Phase IV/90 systems with over 20 terminals within the ACSAC area. They are used both as word processors utilizing the ForeWord software package and as TSO terminals to the USAMSSA 360(s). The terminal to Four-Phase CPU utilizes composite video interfaces (digital RS-232C channels are an option) and serial RS-232C channels to the USAMSSA center.

These are minicomputers with considerable flexibility and capability. They may be able to

serve as the nucleus of an on-line query system for the Action Officers.

3.10 Automation Support Efforts Within ACSAC

ACSAC has initiated several efforts to introduce and improve automated support to their operations. These efforts indicate the functional improvements which ACSAC personnel consider important.

Specific efforts surveyed and their place in the pattern are the following:

1. The creation and continuing development of the AAPPES data base is indicative of the need for special ACSAC data bases tailored to their specific tasks; especially for providing timely and accurate data to the AOs. Another similar example, on a smaller scale, is the PROBEC data base for non-tactical communications which is operated by DAMC-RMC.

2. The recent initiative to transfer the ARM model from OSD PA&E recognizes the need for automated tools to examine options and answer "what-if" questions.

3. The acquisition of the Four-Phase systems provide automated support for report generation and may be used for improved internal data distribution.

4. The DEVIS program which is being developed on the Four-Phase system, is an example of an automated management information system which can improve communication between AOs and between AOs and management.

5. The initiatives taken to survey the availability and accessability of external data bases and the upgrading of the Four-Phase hardware and software in DAAC-NI afford the potential for improving support to the AOs, by providing better access to a broader range of data.

6. The establishment of a special committee to evaluate the need for changes in USAMSSA data processing support for ACSAC emphasizes the importance of general ADP support to the success of ACSAC's operations. The success of all the above efforts is dependent upon the type of support available from USAMSSA.

In summary, ACSAC has accomplished or intitated automation efforts which functionally support the following objectives:

1. Timely and accurate data for AOs, tailored to their specific jobs.

2. Automated support for examining alternatives, including answering "what-ifs".

3. Improved internal data distribution.

4. Improved information system for managers and for communication among AOs.

5. More direct and up-to-date access to a broader range of data bases.

6. Improvements in the breadth and responsiveness of support from the data processing center.

3.11 Data Bases

There are a large number of diverse data bases which contain data of potential interest to AOs; each with its own special purpose. These data bases, both for ADP and for communications, are structured differently, updated differently, and have a variety of different outputs. In some cases, even where there is considerable overlap in the information content of separate data bases, they do not agree in either element definition, actual values, or both. This is not surprising since each was created for a different purpose. Neither is this a problem specific to the ACSAC. Any large organization using ADP has built over time a disparate set of data bases and, eventually, must face the need to standardize and make the data commonally available.

However, this lack of agreement will complicate ACSAC's use of these data. It will be necessary to select carefully among these data bases and establish procedures for resolving conflicts, or create a special data base for ACSACs purposes, or both.

4.0 CONCLUSIONS AND RECOMMENDATIONS

As a result of our survey, observations of recent ACSAC initiatives, and discussions with ACSAC personnel, we have concluded that there are two separate goals being addressed. These are the longer term goal of developing a capability for dealing with the problems of supervising the planning, development, and coordination of the Army data processing and communications capability on a world-wide basis, and the more immediate goal of providing needed automation to support the on-going tasks of the OACSAC.

These goals are complimentary; what is being sought is a technical approach to the near term goal which contributes to and can be expanded toward achieving the longer term one. Therefore, our conclusions and recommendations are divided into two parts. The first deals with the system level issues. The second deals with those immediate actions which we believe will support the on-going tasks and contribute to achieving the longer range goal.

4.1 System Level Issues

The ACSAC is undertaking a long term, large scale program to incorporate automated support into their operations. Inevitably there will be changes both in ACSAC's needs and in technology as the program progresses. In order to coordinate successfully the efforts required, ACSAC needs to formalize their functional requirements and to create both a development concept and a multi-year plan.

The requirements are essential for identifying what needs to be accomplished and for determining whether or not it has been. The more clearly requirements are communicated, the more likely it is that they can be met successfully.

The development concept should provide a basis for more detailed planning, and should address how ACSAC will proceed with respect to:

1. The need for resources not now available within ACSAC and how to use outside government and contractor resources.

2. The use of existing technology and plans for incorporating new technology as it becomes available.

3. Adapting plans to changes in ACSAC's needs.

4. Training and support of ACSAC staff during transitions.

5. Changes to USAMSSA's support goals and capability.

Using the basic requirements and the procedures from the development concept, a multi-year plan should then be developed with sufficient detail to establish a baseline for assigning priorities and allocating resources to specific work.

4.2 Recommendations More For Immediate Actions

In the near term, there are several actions which should be taken. Some will provide immediate improvement in AO support; others will provide the base from which longer-term benefits can be delivered.

1. Continue to evaluate AO functions to be automated for both DP and Communications AOs.

2. Provide interactive multi-function terminals for AOs.

    a. Investigate/demonstrate the use of mailgram and voicegram functions for ACSAC intra-communication.

    b. Provide on-line, interactive access to the AAPPES data base for ADP AOs.

c. Investigate the use of the existing Four-Phase System terminals for use as multi-function terminals and/or for interactive on-line terminals for access to existing data bases.

3. Acquire a Test Bed Cable for the ACSAC local area network, including a USAMSSA Data Center connection. As the first applicationof the test bed, interface multi-function terminals with the AAPPES system via the cable.

4. Investigate the use of ADABAS for AO on-line access to multiple external data bases.

5. Investigate Privacy/Encryption requirements for supporting classified work on the local area network.

6. Develop AO programmer teams within the OACSAC using the OSD PA&E teams as a model.

7. Locate and transfer existing software aids such as OSD's ARM, to the ACSAC system.

APPENDIX A

Summary of Data Bases

Some of the data bases that are available or might become available to personnel within the Office of the Assistant Chief of Staff for Automation and Communications (OACSAC) are listed and described briefly. All of these data bases are in current use by one or more of the following organizations: OACSAC, Army Communications Command, Army Computer Systems Command, U. S. Army Research, Development, and Acquisition Information Systems Agency, Army Deputy Chief of Staff for Research, Development, and Acquisition, and the Defense Communications Agency.

AUTOMATIC DATA PROCESSING DATA BASES

OACSAC Data Bases

AAPPES

The Army Automated Program Planning and Evaluation System reports the cost of data processing for all Army ADP systems. Data are reported in two forms: gross costs for a large number of years for the program cycle; and detailed costs for four years for the budget cycle. The program runs on the USAMSSA 370/165 computer with input and output by means of a terminal plus minicomputer (Four-Phase) located at DAAC-RM. Source data are obtained directly from subordinate commands. AAPPES does not include an inventory of DP hardware.

Research, Development, and Acquisition Information Systems Agency Data Bases

RDTE

The Research, Development, Test, and Evaluation data base is used as an aid in computation, evaluation, and justification of RDTE capital expenditures, and also as an aid in procurement of Army material. It is comprised of several support systems: procurement data base (PDB), Army acquisition objective (AAO), Army research and development information system (ARDIS), and modernized Army research and development information system (MARDIS). RDTE reports assets, personnel, and funding; it is updated continually with financial data, and twice yearly with data on assets. Each January, the entire data base is initialized to zero and then updated.

The RDTE runs on a Univac 1108 located at Radford, Virginia. A larger computer will be installed shortly.

PDB

The Procurement Data Base contains data on inventories, including receipts, losses, and age; funding; procurement costs, quantities, priorities, and lead times; and similar data needed for procurement and budgeting purposes. It runs on the same computer as the RDTE.

Computer System Command Data Bases

AIDS

Army Inventory of Data Systems is the data base that contains information on all of the Army data systems and data bases. A microfiche printout is available and covers some 12,000 pages.

ADPMIS

Automatic Data Processing Management Information System is an inventory type of data base consisting of three major files which contain information on data processing installations (DPIs), systems, and machines. The files include cost data for three fiscal years. The installation data include a hardware inventory. The type of data in the files is as prescribed in Army Regulation 18-3. Monthly updates are processed through a pre-edit program that passes good data to an update program and prints error messages for data which do not meet AR 18-3 criteria. Data can be added, deleted, or changed. After the files are updated, a post-edit program edits the files and prints applicable error messages. Further monthly batch processing includes a summary report (DADPI) which specifies summary DPI and system data. Quarterly or other reports are printed as follows: DADP2 - complete hardware inventory by DPI and systems; DADP3 - complete inventory in manufacturer sequence; DADP4 - system function and utilization data; DADP5 - DPI cost summary data for the last, the current, and the next fiscal years. The on-line retrieval portion of the system is simply a dictionary specification of the data base which uses a USAMSSA retrieval system. ADPMIS contains no telecommunications network interfaces.

ADPMIS consists of 20 programs with 25,000 source code instructions. It runs on the USAMSSA IBM 370/165 computer.

COMMUNICATIONS DATA BASES

OACSAC Data Bases

PROBEC

The Program Optimization and Budget Execution -- Communications keeps track of operations and maintenance (O&M) costs for non-tactical communications for six commands. Line leasing charges are included in the O&M cost. The program is operated by DAAC-RMC and runs on a computer owned by the Computer Sciences Corporation which is located in Beltsville, Maryland.

Army AUTOSEVOCOM Subscribers

This is a small data base contained completely in decks of computer cards. Associated with it is a small enabling program for sorting, arranging, and printing by means of a computer. The deck of cards contains all AUTOSEVOCOM subscribers; the program enables listings of subscribers in a depot, subscribers with each level of service, etc. It is planned to augment the data base with all subscribers added through the secure voice improvements program (SVIP); there are 3,000 potential new subscribers. The contents of the data base are classified, mostly to the Confidential level.

ARMY Communications Command Data Bases

DARTS

The Data Automation Requirements Transfer System is a data base used to identify candidates for AUTODIN II. It contains a listing of all digital telecommunications centers and the equipment (main frame, peripherals, FAX devices), some routing information needed for circuit installation, data processing at sites, and identification of hardware. DARTS contains information only for DCA non-voice communications and for non-tactical Army telecommunications data. Financial data are not included.

DARTS resides on the CDC 6500 at Fort Huachuca, Arizona; and it uses the System 2000 (MRI Systems Corporation) data base management system as the implementing program.

LCMIS

The Leased Communications Management Information System lists all communications resources leased through the Defense Commercial Communications (DECCO). The files received from DECCO are in two main sections: Army communications, and entire DOD communications. The file reports backbone cost, mileage, and cost of switching centers. Included in the data base are both base communications and long haul links. Base communications data are detailed as far as line number. Generally, base communications includes TWX and TELEX, neither of which is included in the long haul data.

Currently, LCMIS is being redesigned to be an interactive program that will be run on an Interdata 832 minicomputer.

LCMIS and DARTS comprise the main communications data base at Fort Huachuca.

URDB

The AUTODIN II User Requirements Data Base is a Defense Communications Agency data base that is used for planning and fiscal purposes. The information it contains consists of user locations, connectivity, interconnection technical requirements, and the amount of data transmitted between locations (traffic volume). The URDB will provide this information for the design of AUTODIN II.

Printouts of the URDB are distributed on a semiannual basis. Update information is submitted by the services and the agencies as it becomes available to Hq DCA.

SPECIAL PURPOSE AND OTHER DATA BASES

OPTIMIS

Essentially a history file, operated by TAG, this data base contains a record of all action items for each program of ACSAC. It also contains locators for the hard copy records of directives and other papers associated with the action items. Optimis runs on a computer at Battelle Institute, but is being transferred to a computer in the Pentagon.

DEVIS

This data base was developed within OACSAC for local use. It contains equipment and procurement data for the most active programs within OACSAC. Initial entries are made and updating is done for each program by the Action Officer in charge. DEVIS is still in the development stage. Currently, it is run on a Four Phase minicomputer located within the ACSAC area.

TAEDP

A management information system that integrates the data from a number of sources and data bases to provide an overall picture of equipment distribution within the ARMY. It is maintained and operated by Log Command. It provides support to Major Commands and to Material Readiness Commands.

APPENDIX B

Individuals Contacted

Persons contacted during this phase of the study and their organizations are listed. In some cases, the subject of discussion is implied by the data base or system identification.

PERSONNEL CONTACTED

LCMIS

Mr. Gerry Byrd, U. S. Army Communications Command

Army AUTOSEVOCOM Subscribers

LTC James White, DAAC - NIS

AAPPES

LTC Bryan Long, DAAC - RMA

PDB and RDTE

Major Howard Bullock, ACSAC-RD (USARDAISA)
Mr. Mervyn Copeland, ACSAC-RD (USARDAISA)

PROBEC

Mr. Gil Weeder, DAAC-RMC

DEVIS

LTC George King, DAAC-NIP

OPTIMIS

CAPT Coleman, DAAG-OPZ

AIDS and ADPMIS

Harvey Tzudiker, ACSC-TE
CAPT D. Cortese, ACSC-TE
Walter Ulica, ACSC-TE

DARTS and URDB

Mr. Woodall, U. S. Army Communications Command
Mr. Laren Young, U. S. Army Communications Command

USAMSSA Data Bank

Mr. Steve DeLaurier, DCS-DMI
COL D. Carmichael, USAMSSA
Mr. Charles King, USAMSSA
Mr. William Carroll, USAMSSA
Maj. Paul Grant, USAMSSA

Others:

COL William Bradley, DCS-DMI

LTC George Donovan, DAAG-OPZ-A

LTC E. O. Greenwood, DAAC-NIP

LTC G. King, DAAC-NIP

Mr. D. Leipertz, DAAC-NIP

Mr. L. Saunders, DAAC-TEV

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APPENDIX C

Documents Reviewed

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Some of the pertinent references reviewed during the study activity are listed.

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