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AD-A268 624



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U.S. ARMY INSTITUTE FOR RESEARCH
IN MANAGEMENT INFORMATION,
COMMUNICATIONS, AND COMPUTER SCIENCES

AIRMICS

RESEARCH

OVERVIEW

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October 1989 - September 1990

ASQB-GB-91-004

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**U. S. ARMY INSTITUTE FOR RESEARCH
IN MANAGEMENT INFORMATION,
COMMUNICATIONS, AND COMPUTER SCIENCES
(AIRMICS)**

RESEARCH OVERVIEW

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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

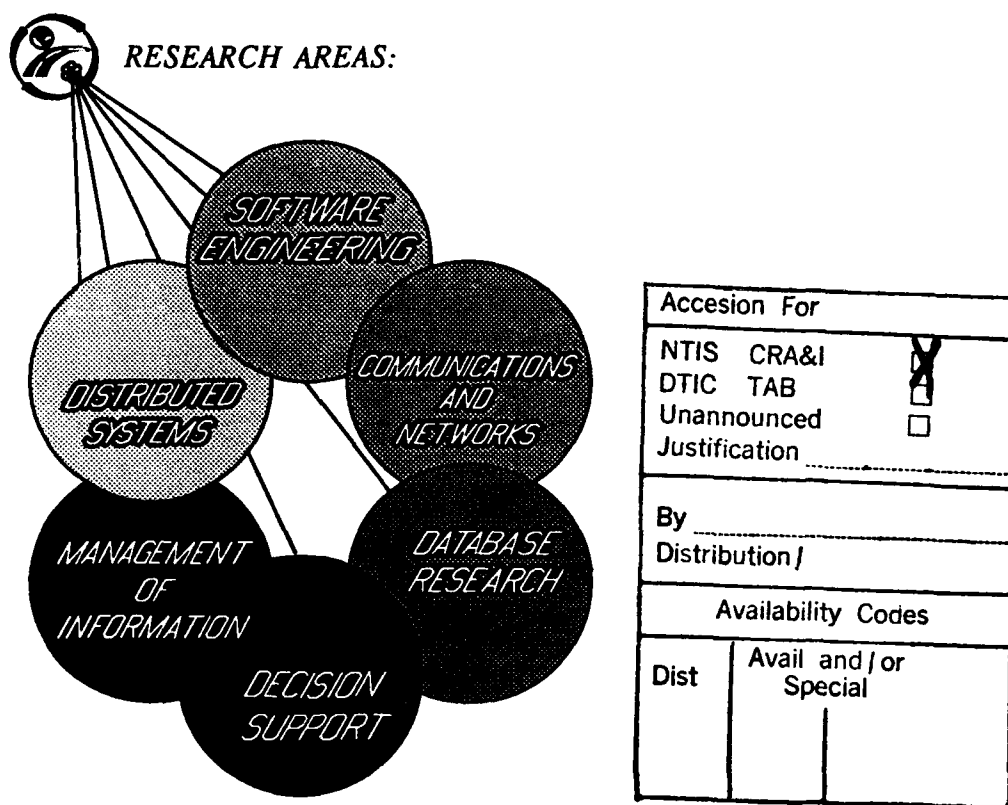
Form Approved
OMB No. 0704-0188
Exp. Date: Jun 30, 1986

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS NONE	
2a. SECURITY CLASSIFICATION AUTHORITY N/A			3. DISTRIBUTION/AVAILABILITY OF REPORT N/A	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A				
4. PERFORMING ORGANIZATION REPORT NUMBER(S) ASQB-CB-91-004			5. MONITORING ORGANIZATION REPORT NUMBER(S) N/A	
6a. NAME OF PERFORMING ORGANIZATION AIRMICS		6b. OFFICE SYMBOL (If applicable) ASQB-GT	7a. NAME OF MONITORING ORGANIZATION N/A	
6c. ADDRESS (City, State, and Zip Code) 115 O'Keefe Bldg. Georgia Institute of Technology Atlanta, GA 30332-0800			7b. ADDRESS (City, State, and ZIP Code) N/A	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION AIRMICS		8b. OFFICE SYMBOL (If applicable) ASQB-GT	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N/A	
8c. ADDRESS (City, State, and ZIP Code) 115 O'Keefe Bldg. Georgia Institute of Technology Atlanta, GA 30332-0800			10. SOURCE OF FUNDING NUMBERS	
			PROGRAM ELEMENT NO. 62783A	PROJECT NO. DY10
11. TITLE (Include Security Classification) AIRMICS Research Overview: October 1989 - September 1990 (UNCLASSIFIED)				
12. PERSONAL AUTHOR(S) Daniel E. Hocking, (Editor)				
13a. TYPE OF REPORT		13b. TIME COVERED FROM Oct 1989 TO Sep 1990	14. DATE OF REPORT (Year, Month, Day) 1990, December, 13	15. PAGE COUNT 26
16. SUPPLEMENTARY NOTATION				
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) Software Engineering, Communications and Networks, Decision Support, Database, Distributed Systems, Management Information, Information Mission Area, Technology Transfer	
FIELD	GROUP	SUBGROUP		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) This Research Overview summarizes ongoing research tasks, technology transfer efforts, and technical support activities performed by the US Army Institute for Research in Management Information, Communications, and Computer Sciences (AIRMICS) during Fiscal Year 1990.				
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL Daniel E. Hocking			22b. TELEPHONE (Include Area Code) (404) 894-3110	22c. OFFICE SYMBOL ASQB-GT

A. INTRODUCTION

This Research Overview summarizes ongoing research tasks, technology transfer efforts, and technical support activities performed by the US Army Institute for Research in Management Information, Communications, and Computer Sciences (AIRMICS) during the past year.

AIRMICS is subordinate to the US Army Information Systems Engineering Command (ISEC) and serves as the research arm of the US Army Information Systems Command (ISC). In consonance with this relationship, AIRMICS provides direct support to the ISEC technical staff, ISC headquarters and subordinate commands, and to Program Executive Officers (PEOs) and Project Managers (PMs) in the Information Mission Area (IMA).



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Research in the IMA that AIRMICS both sponsors and conducts is important since in an era of increasingly tight budgets, meticulous attention must be paid to obtaining the largest return on the Army's investments. The rapidly changing, sophisticated high-technology areas are sources of particular scrutiny since funding must be concentrated on those developing technologies which have the greatest impact on enhancing the military's capabilities. In addition,

duplication of previous research must be avoided, and great care must be taken to avoid simultaneously funding multiple efforts which are similar in scope and goal.

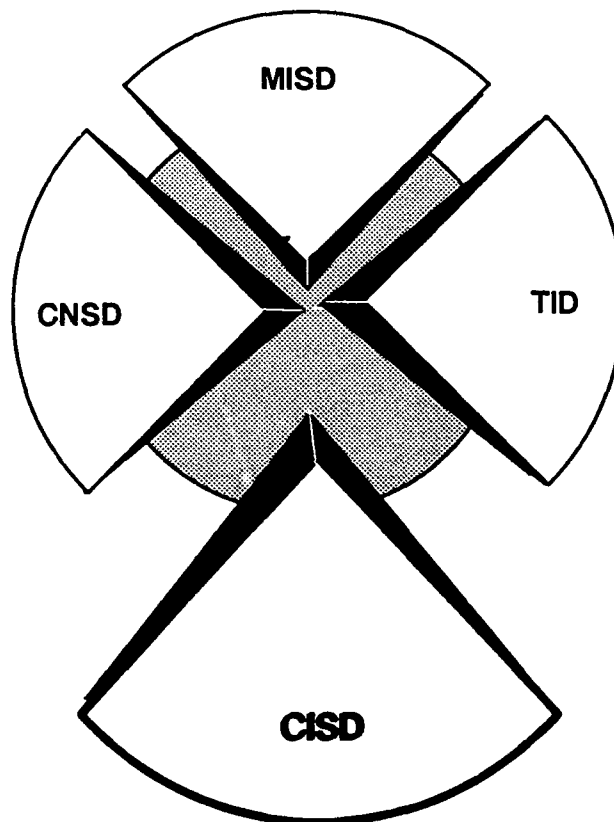
Some of the research activities performed by AIRMICS include: literature searches; state-of-the-art studies; technology feasibility studies; technology assessments; and planning, conducting, and evaluating pilot projects. The first four of these activities are necessary prerequisites to the development of any system and are applicable to non-developmental item (NDI) acquisitions.

Four functional divisions comprise AIRMICS — Management Information Systems Division (MISD); Computer and Information Systems Division (CISD); Communications and Network Systems Division (CNSD); and Technology Insertion Division (TID). Sections B, C, D and E are organized to provide information about the ongoing research tasks in each division. Section F presents the qualifications of AIRMICS personnel and the Facilities available to support the research mission. The final section lists the FY90 reports published by AIRMICS.

B. COMPUTER AND INFORMATION SYSTEMS DIVISION (CISD)

CISD performs research in the areas of Software Engineering and Very Large Database Systems.

In the Software Engineering area, CISD works to reduce software life cycle costs, increase the productivity of software development and support organizations, and increase the quality of the components, systems, and products delivered. CISD conducts research in software quality and productivity measurements, software requirements, software reusability, software maintenance, management of software development, Ada transition, and modernization of the Army's installed base of application programs.



In the Very Large Database area, CISD works to develop the capability to effectively design, implement, operate, and manage large heterogeneous geographically dispersed databases. CISD investigates methods, practices, and tools to aid in this endeavor.

CISD conducted several projects in the software engineering area and one large project - ANSWER - in the database area.

The Ada transition task is a joint AIRMICS-SDC Atlanta effort to look at the process of moving an existing STAMIS (Standard Army Management Information System) written in COBOL to Ada. We specifically address the topics of reverse engineering, object-oriented design versus functional decomposition design, the use of CASE tools, the degree of training required, and the use of Ada.

The Ada Reuse project closed with all work completed in December. Tasks performed in this effort looked at metrics for Ada reuse, incentives for reuse, reuse-oriented cost modeling, and an assessment of software engineering tools. We held the last IPR for this project at Fort Belvoir in September and produced a guidelines document for reuse and metrics early this year. We distributed the document to several government organizations, and it is available to anyone who wants a copy. Please contact CISD for a copy.

CISD also executed, at the request of ISSC (TSD), a short-term task to harmonize the products from DOD-STD-2167A (Defense Systems Software Development) and DOD-STD-7935A (DOD Automated Information Systems Documentation Standard). We produced a guidelines document that takes advantage of the software engineering and management approaches embodied in 2167A while maintaining the use of documentation items associated with 7935A. We delivered the draft report in December and the final version in May. Copies have been sent to ISSC and ISEC.

A task to evaluate the Distributed Computing Design System (DCDS) to determine its appropriateness in meeting the requirements of a software support environment for the MIS community is being conducted. DISC4 sponsored this task and the first IPR was held at AIRMICS in November. TRW in Huntsville developed DCDS for the Strategic Defense Command and DCDS specifically supports large, complex, real-time distributed systems.

DISC4 also sponsored the development of a method to determine the quality of software products and the effectiveness of software development and support organizations. The results will be used to improve the management of both software development and software support and reduce the need for frequent modifications and corrections to fielded software systems.

In September 1990, AIRMICS initiated development of a method to predict software reliability in the operational phase of a system and to determine operational readiness at major reviews. The expectation is a prototype tool

which implements this new method. The Operational Test and Evaluation Agency (OTEA) sponsored this work.

AIRMICS is also defining one or more Ada Programming Support Environments (APSE) based on the development, enhancement, and maintenance characteristics of Management Information Systems (MIS).

CISD works with two research centers: The Software Engineering Institute (SEI) of which we are an affiliate member representing ISEC, and the National Science Foundation's Software Engineering Research Center (SERC) located at Purdue University and the University of Florida. The SERC Industrial Advisory Board meetings were held in November 1989 at the University of Florida and in May 1990 at Purdue University. The SEI annual affiliates conference was held in September 1990.

A final note in the software engineering area, CISD also participated in the Requirements Engineering and Rapid Prototyping Workshop held at CECOM in November 1989. Based on the recommendations of the workshop, CECOM initiated several efforts in requirements engineering. AIRMICS will monitor these efforts and provide pertinent results to ISC/ISEC.

In the database area, the ANSWER (Army's Non-Programmer System for Working Encyclopedia Requests) project progressed with an IPR for Phase 2 conducted at AIRMICS on 13 December 1989. Representatives from DISC4, ISEC-SID, ISSC-DMD, Mitre, and PRC attended. ANSWER will function as an encyclopedic facility by allowing users to access, query, register, and remove databases from the encyclopedia's catalog. ANSWER includes a data management toolset integrated under X-Windows, an AI-based standard data element naming tool, and an Information Resource Dictionary System (IRDS) component. In September, CISD held an IPR at Fort Lee for Phase 3A in conjunction with PM-ISM's workshop on the Installation Integrated Database. Representatives from many different commands attended. The two main functions demonstrated were a query formulation tool and two distributed query processing algorithms.

In addition to the research tasks in the software engineering and database areas, CISD provided consultant work both within the Army and to DOD for the Software Master Plan and Project Reliance.

Within the Army, CISD provided support to the PEO/PM structure. COL Byrd, PM Installation Support Modules (ISM), visited AIRMICS for

discussions and a CISC representative participated in the October 1989 matrix support IPR hosted by PM-ISM at Fort Belvoir to gather information on the type of support AIRMICS could provide based on the issues discussed at the IPR. CISC representatives have also participated in several of PM-ISM's workshops that focused on the Installation Level Integrated Database. ANSWER is being considered for possible use in the prototype system.

CISC provided input to the DOD Software Master Plan. This document was prepared by the Defense Acquisition Board Science and Technology Committee Software Technology Working Group, with input from DOD elements. The working group produced a DOD-wide plan to define a program for DOD to provide increasing capabilities for emerging and existing systems, while reducing the costs and logistics burden associated with development and life cycle maintenance of software. The plan is being staffed through DOD. As a follow-on effort, a DOD Software Technology Plan is being prepared and CISC is participating in this effort.

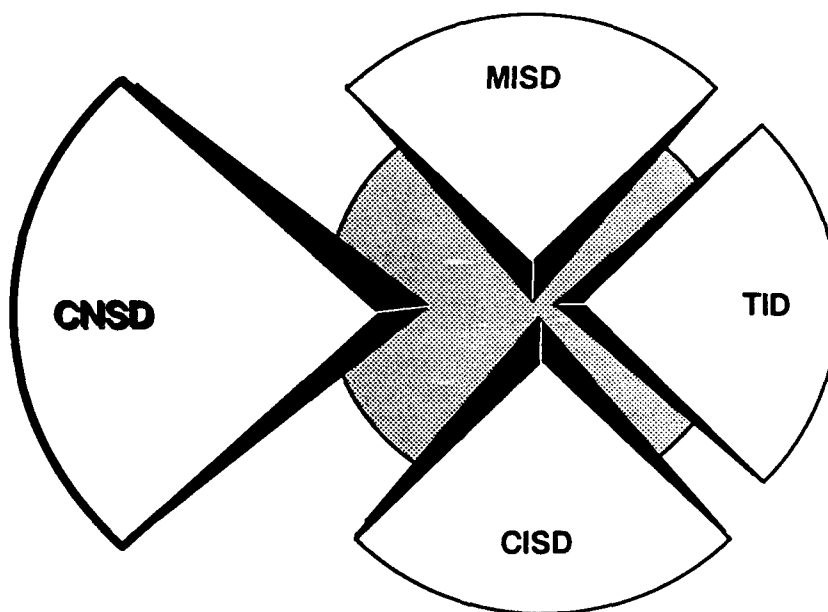
CISC represents the IMA Research, Development, Test, and Evaluation (RDTE) interests in Project Reliance. Project Reliance is a Tri-service initiative by the Under Secretary of Defense (Acquisition) to reduce costs and increase productivity of Science and Technology (S&T) programs through greater inter-service cooperation and consolidation. A Tri-service strategy is to be completed by January 1991.

If you are interested in any of the above areas discussed in this report, or have questions relating to CISC, please contact Mr. Glenn Racine, e-mail address racine%airmics@gatech.edu, phone (404) 894-3110.

C. COMMUNICATIONS AND NETWORK SYSTEMS DIVISION (CNSD)

CNSD does research in Distributed Systems, and Communications and Network Technology.

CNSD conducts research in communications and distributed systems in support of the Information Mission Area (IMA) and transfers the results of this research to the Army. CNSD research and technology transfer projects directly support the ISA 97 Architecture developed by ISEC. In addition, much of the research agenda can be directly applied to ISEC matrix support for the PEO/PM acquisition structure.



The research projects conducted by CNSD develop tools, techniques, and prototypes for the design, implementation, transition and maintenance activities of various technologies of importance to the Army. In communications, CNSD conducts research in ISDN, FDDI, and LAN/WAN. In distributed systems, CNSD actively pursues projects in distributed architectures that support ISA 97, various PMs and the Army architecture in an open systems environment. Projects include distributed databases, communications, and interoperability among heterogeneous databases.

The first major group of research projects are on ISDN. CNSD strongly pursues projects in the Integrated Services Digital Network (ISDN), a key technology in the ISA 97 Architecture. The Army has committed to introducing this technology in the next ten years. It is vitally important for the Army to understand the implications of this commitment. CNSD conducts applied exploratory development research to prepare for the future telephone system in the Army. Work done in this area will also be completely applicable to the ISEC matrix support of the PEO acquisition structure.

CNSD is a major experimenter on the Advanced Communications Technology Satellite (ACTS) under development by NASA for launch in the 1992 time frame. As ISDN is deployed throughout the Army, the lack of ISDN signaling infrastructure interconnecting Army installations will prevent the use of ISDN services inter-installation. AIRMICS is designing a terrestrial-satellite ISDN interface that will be capable of interconnecting future ISDN Army installations by satellite and that will be capable of extending ISDN services to remote/mobile end users. This work is under the sponsorship of NASA. CNSD was selected to perform this work on the basis of a competitive proposal process which solicited experiment proposals from all services. In support of this work, CNSD also participated in several ACTS ISDN Working Group meetings and discussed the AIRMICS-CNSD experiment projected to be on board when the satellite is launched in 1992.

CNSD actively participated in the Army's ISDN experiment at Redstone Arsenal during FY90. CNSD visited Redstone Arsenal several times during the reporting period to coordinate ISDN activities. These visits enable AIRMICS to keep pace with the progress of the Army's only full scale ISDN implementation. Numerous discussions were held relative to the assistance AIRMICS can provide to Redstone in this important work and led to the planned implementation of an ISDN help desk in the Redstone Arsenal Information Center for FY91.

CNSD assists PERSINSCOM (USAISC-Hoffman) in providing improved personnel management support using the Integrated Services Digital Network (ISDN). ISDN technology provides more effective and efficient personnel services to soldiers in the field. Soon, soldiers will call their personnel managers and be automatically routed to the appropriate personnel manager,

while the personnel manager will simultaneously be presented with the soldier's telephone call and a picture of the soldier's file on the manager's PC screen. AIRMICS assisted in this effort by collaborating on the development of a PC board capable of transmitting voice and images simultaneously. So far, this collaboration has resulted in a generalized statement of work (SOW) which can be used by other Army units for procuring similar devices, and the standardization of this ISDN application by coordinating with national standards organizations.

CNSD studies the technical issues facing the Army in the next decade in evolving to ISDN to effectively support ISC in transitioning to the objective communications architecture. This project researches installation, analysis, and evaluation of various ISDN services to support the Army's information transfer requirement. As a result of our research, several ISDN project status reports were sent to various commands throughout ISC, ISEC, and DOD. These reports updated our research findings and notified them of lessons learned during the research. Also stemming from this project is an advanced application research facility which consists of three different nodes interconnected with fiber optic cables. For next year, this facility will be used to investigate data access issues in ISDN which are prime interests to ISMA, ISC, ISEC, and DOD.

In the second major group of research projects, CNSD is conducting projects in local area networks (LAN), metropolitan area networks (MAN), wide area networks (WAN) and distributed systems. This work is directly applicable to numerous areas in the ISA 97 Architecture and the PEO structure as the Army transitions to an open systems environment.

In early 1990, CNSD completed Phase I of a project to develop an environment for simulation modeling of distributed systems. The final IPR of Phase I was conducted at Fort Huachuca with numerous ISEC attendees. There was considerable enthusiasm for the project in ISEC. This enthusiasm was translated into a decision to request continuation of the project into Phase II of the Small Business Innovation Research (SBIR) program. The SBIR selection panel approved the Phase II proposal and recommended full funding (\$500,000). The Phase II effort is funded in two, one-year increments beginning in FY91. ISEC-SED and ISEC-SAO will be the users

when the product is completed. The final software product will be used as a development and support environment in designing and modeling Distributed Systems.

CNSD's project on Distributed Database Management Systems (DDBMS) is making a significant contribution to the understanding of adaptable and reliable distributed database systems. This effort supports the Army objective to share heterogeneous data, software, and hardware. It will help ISEC in engineering a unified distributed database system implementation. ISEC-SED, ISEC-SID, and ISEC-SAO have all indicated the research will make a major contribution to both standards development and IMA architecture decision processes. The project is also developing the principles necessary to build high performance, reliable, and reconfigurable distributed database systems to give users access to a multi-database network from distributed geographic locations. The current software version of a prototype system called RAID has been delivered to AIRMICS for evaluation and further implementation.

AIRMICS is a member of the Center for Telecommunications Research (CTR) located at Columbia University. The Center supports faculty research in all areas of telecommunications and networking. The Center is considered one of the pioneers in telecommunications research. The small fee paid by AIRMICS to join the Center is, therefore, multiplied into several million dollars of high quality research. Numerous projects are in progress at all times. Two projects important to ISC/ISEC are the MAGNET II network testbed and the NEST simulation software. The goal of MAGNET II is to build a network with an aggregate capacity of terabits/sec (trillion bits per second) serving thousands of users at gigabits/sec (billion bits per second). At this time, the Center has achieved network capacity of 2.5 gigabits/sec. The network can be used as a testbed for studies of advanced, distributed, knowledge-based network control, performance, and management. We obtain information from the Center in the form of research reports for further distribution throughout the Army. The Network Simulation Testbed (NEST) is a software package that simulates complex networks. NEST has the capability of testing actual communications code by embedding the code into the simulation through a function call in the simulation. The simulation

permits graphic definition of the network interactively on the screen. Nodes in the simulation can also be loaded with simulated loads representative of applications running on the nodes. The software runs in the Sun workstation environment. AIRMICS has the software running on its network and will evaluate the package by simulating various aspects of the ISA 97 Architecture. Results of this work will be applicable to work done by ISEC-SID and PM-SBIS.

Technology transfer is also an important area of work conducted by CNSD. Technology transfer projects include a wide variety of efforts ranging from specific projects for customers to general projects to participation in working groups.

CNSD has revised the Numerical Electromagnetics Code (NEC) FORTRAN program used by the Spectrum Engineering Branch, Transmission Systems Division, ISEC-SED. This project will implement a previously mainframe dependent antenna modeling and analysis program (NEC) on a Sun workstation and an IBM RS/6000 RISC based computer using the X-Window graphical interface environment. Currently, a prototype version of the code has been implemented on the SUN Sparcstation 1+ using the Sunview window environment. This version will now be rewritten for IBM RS/6000 using X-windows. This project shows a cost/time savings in the use of the NEC application program on a workstation with a "user-friendly" graphical interface in comparison to using a mainframe computer. This research will show the benefits of shifting mainframe dependent programs to the workstation (X-Window) environment and the savings of both time and money associated with this migration.

In May 1990, AIRMICS was tasked by ISEC to estimate the total number of Dynamic Random Access Memory (DRAM) chips deployed in the Army sustaining base computers, to include all telecommunications switches. This request was generated by the Defense Technology Security Administration, Office of the Under Secretary of Defense with a very short suspense. Using a sample of data from the ARPMIS database, a statistical analysis showed a correlation between the number of DRAMs and the cost for a given system. A measure, DRAM/dollar cost was created to provide an estimate of the number of DRAMs based on the cost of the system. Computation of this

measure provided a way to estimate the total number of DRAMs by multiplying the DRAM/dollar by the total dollar value of each system. This method could also be used to estimate the impact of future purchases by multiplying the measure by projected future expenditures. This project was completed in a very short time and the results were forwarded through the ISEC Technical Director to the Office of the Under Secretary of Defense.

CNSD initiated several projects to support PM-ISM and PEO-STAMIS. The objectives of the project are to add the capability of performing rapid prototype development by becoming proficient in the use of ACE Technology software then transferring this knowledge to other areas of the Army. This will be accomplished by implementing a system to support PM-ISM. PM-ISM funds this work which will continue throughout FY91.

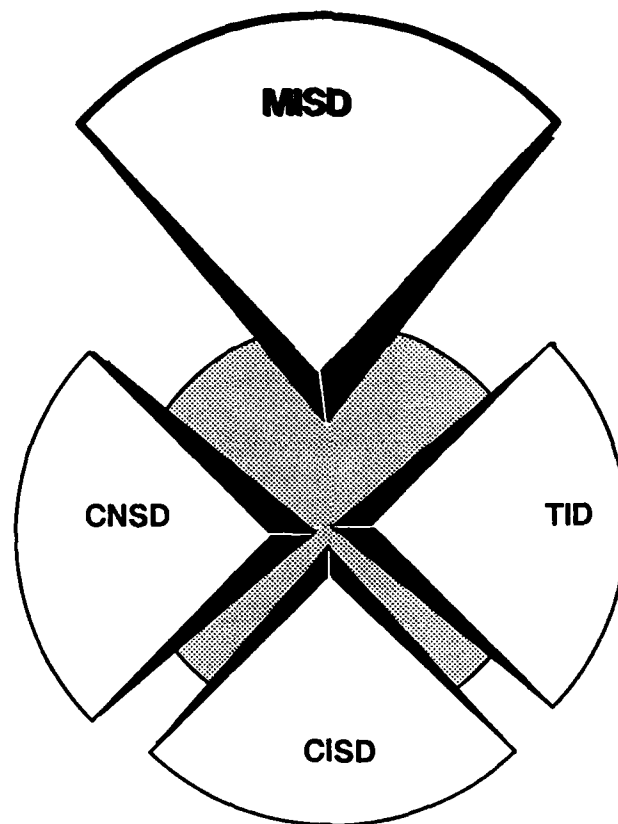
CNSD participates in DCA Working Group meetings on various topics of interest to ISC/ISEC. These meetings include briefings by the attendees, including CNSD, on issues important to the Army. Attendance at these meetings enables CNSD to maintain liason with attendees representing ISC, ISEC, ISMA, DOD (including other services), DCA, DCEC, JITC, JTC3A, AT&T, Computer Science Corporation (CSC), NSA, and other commercial companies.

If you are interested in any of the above areas discussed in this report, or have questions relating to CNSD, please contact Dr. Jay Gowens, e-mail address gowens%airmics@gatech.edu, phone (404) 894-3106 or 894-3110.

D. MANAGEMENT INFORMATION SYSTEMS DIVISION (MISD)

MISD performs research in Decision Support and Management of Information.

In the Decision Support area, MISD develops techniques and methods to improve the quantity and quality of information to support decision making. We group MISD's current efforts in four general categories: Individual Support, Group Support, Executive Support, and Expert Support. This research closely relates to the target architectures developed by ISC where ISC lists Decision and Executive support as basic services to be supported by command-developed information systems. This research supports work performed by PMs, engineers and architects of Army information systems.



In the Management of Information area, MISD develops concepts to support the use of technology in the management and operations of information intensive segments of the Army. This research area brings together several diverse projects. These projects include research on the evolution of Information Centers (IC) to support the entire Information Mission Area (IMA), membership in the Center for Information Management Research at the Georgia Institute of Technology and the University of Arizona, and a video

teleconferencing network to support communication between Historically Black Colleges and Universities (HBCUs) and the Army. This research supports actions in ISC-DCSPLANS, ISEC-PID, ISEC-SID, and the 7th Signal Command.

The Army Acquisition Management System (AAMS) project supports PM-AIM/DAIN for ASA(RDA) by expansion of earlier work on the AAMS prototype. This effort has extended the prototype to over 30 PM shops and 10 PEOs. This project supports AIRMICS research efforts in Executive Information Systems and is coordinated with ISEC-SED.

MISD completed a research project for integrating total IMA support into the functioning of Information Centers (ICs). The final product, "The Integrated IMA IC Guide," was delivered in June 1990 and was used as the basis for a new Army Regulation which will be distributed Army-wide. MISD also started a new IC project to explore automated tools to support the IC. The first phase of this research developed a prototype automated "Help Desk" function to assist the IC in answering routine questions about the IMA.

The AIRMICS pilot video teleconferencing (VTC) network, being installed as part of the CARTS project with Clark Atlanta University, was demonstrated to, and used by, a wide variety of people during the year. The ASA(RDA), PERSINSCOM, and the Navy funded this project. It is supported by the DA SADB, DISC4, ISC-DCSPLANS, and ISEC-PID. The effort examines the uses and the economics of low cost VTC. Additionally, the project establishes closer links between the Army and Historically Black Colleges and Universities (HBCUs). Network sites operate at Fort Huachuca, Fort Belvoir, PERSINSCOM, AIRMICS, the U.S. Naval Surface Weapons Center, Clark Atlanta University, and Prairie View A&M.

The expansion of the AIRMICS research mission to include the entire Information Mission Area, created the need to cover many new technology areas. The Center for Information Management Research (CIMR) links the Information Management program at the University of Arizona with the Information Engineering program at the Georgia Institute of Technology. The center focuses on: (1) ways to enhance information systems support of organizational goals, objectives, and strategies, (2) promoting the development of information systems designs which focus on the resources and needs of diverse organizational environments, (3) promoting the integration of advanced information technologies with traditional information systems, (4) developing a

framework for management of information systems resources which is consistent with the organization's management system, and (5) encouraging the identification and development of a portfolio of information products and services. The CIMR is a joint University-Industry-Government research center, sponsored by the National Science Foundation (NSF) and the Army. Members of the center pool limited amounts of money to execute a significant research program. CIMR research results have been used by PM-ISM, the Director of Management at HQDA, and ISEC-SID.

Four new projects were initiated during the year to support PM-ISM: (1) Electronic Meeting research results were applied to the development of functional descriptions for ISM modules. Requirements Analysis Processing (RAP) was supplemented with the electronic meeting support to produce high quality products in significantly reduced time periods. It was estimated that the meetings supported by the electronic meeting tools reduced the meeting durations by up to 75%. (2) Computer based instruction/training techniques are being applied to ISM modules. This project will identify ways to make occasional users more proficient with a variety of software modules. Two software modules will be modified to incorporate computer based instruction and a guidebook for future developments will be produced. (3) The Economic Justification of Information Systems project will develop a baseline work profile study of two or more offices prior to the implementation of an information system, do a follow-up study once the systems are functioning smoothly, determine the economic value of the systems, and finally generalize the results so that cost justifications can be done without detailed economic studies in each and every case. (4) The CAD for Information Management project will identify ways to improve decision making at multiple levels, dealing with data about automation and communications resources. This includes identification of the decisions, data needed to support the decisions, and ways to present the data. It also addresses the combination of graphical and non-graphical data into one environment. The project will demonstrate the ability to collect data at a local level, using commercial PC-based software, and up-load the data to update a mainframe database. In addition, it will demonstrate the ability to populate a local database from a mainframe database. In addition to the PM-ISM, this project is supported by 7th Signal Command DCSOPS and the DOIM at Fort McPherson.

A new project was started to develop a rapid prototyping and development capability at Historically Black Colleges and Universities (HBCUs). In the long

run, we hope to have several schools trained to use AT&Ts Application Connectivity Environment (ACE) for rapid development of Army data processing systems, but at first we will concentrate on two schools which will then train several others. This project has two specific goals: to prototype a useful application for TRADOC, and to establish at Morris Brown College and Clark Atlanta University the capability to respond to the Army's need for rapid prototyping using ACE. The Army needs the ability to quickly create systems which integrate information from otherwise incompatible systems. ISC headquarters has received many requests from the user community for this type system. However, the traditional method for developing systems is too slow and too costly to meet this need. Moreover, much of the burden of traditional methods is justified by the need to insure accurate data collection. This need does not exist in the systems being discussed. They seek to use data that has already been collected, edited, and stored by larger systems. The first application chosen for prototyping is a TRADOC application called TRADOC Resource Manager's Information and Decision System - Test (TRMIDS-T). TRMIDS-T is designed to collect resource data from several different databases and to allow decision makers and their analysts to view, analyze and manage the data. This project is being done in cooperation with ISC-DCSOPS and TRADOC.

MISD continued efforts in the Small Business Innovation Research (SBIR) program. A new project, started at the end of the year, will develop the ability to characterize, extract, and exploit knowledge contained within databases using neural network techniques. Development of this capability will give military decision-makers a powerful tool for the analysis of data found in large databases. Conventional technology does not easily allow the extraction or distillation of the knowledge contained within these databases. As a consequence, the true power of this information is inefficiently utilized. Another SBIR project completed Phase I during the year. The objective of this research was to create Group Decision Support System (GDSS) software that permits groups of decision makers to make decisions quickly, even when the decision makers are located around the world. The specific objectives were to define the features that the GDSS model should include such as: (1) easy-to-use word processing, graphics, calendar, and databases; (2) state-of-the-art communications so that Army decision makers can be informed via fax, electronic mail, and paper mail; and (3) ability to collect comments, tabulate and rank votes and report the results to all of the decision makers. A decision on Phase II funding is pending at DA. This project was

supported by PM-ISM, ISEC-SED, and FORSCOM who served as a testbed for the software.

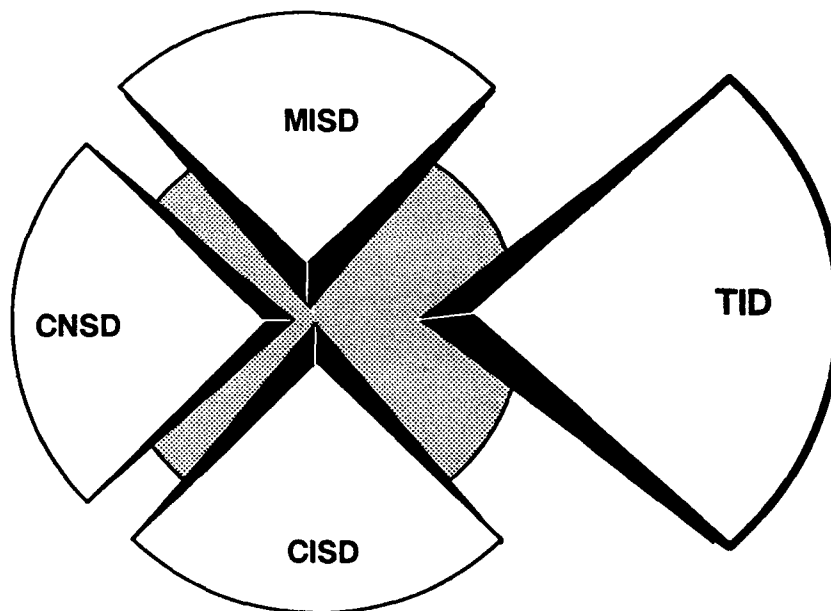
MISD continued providing support to a variety of other Army organizations. The Army Management Staff College requested that a class be developed and taught on Decision Support Systems and Expert Systems. This class was taught three times during this year. LABCOM was supported with two efforts. The first effort investigated methods of knowledge representation and elicitation to improve computer manipulation and presentation of visual knowledge. This research will produce a prototype interface that facilitates direct pictorial communication between user and machine. The second LABCOM funded project supports the automated input, editing and maintenance of Work Unit Information Summaries into the Defense Technical Information Center database for the entire Army R&D community. The Army Artificial Intelligence Center supported a project to develop and demonstrate a design methodology for developing Expert Decision Support Systems for solving problems under conditions of uncertainty. FORSCOM has been supported by MISD on the FORSCOM Automated Intelligence Support System (FAISS) which looks at support tools and connectivity with numerous data sources. Work was completed on a project for the Defense Systems Management College (DSMC). The Scheduling and Resource Allocation software will be incorporated into an integration system being developed by DSMC for PM-AIM.

If you are interested in any of the above areas that are discussed in this report, or have questions relating to MISD, please contact Dr. Jim Gantt, e-mail address gantt%airmics@gatech.edu, phone (404) 894-3107.

E. TECHNOLOGY INSERTION DIVISION (TID)

The Technology Insertion Division is AIRMICS' newest element. It provides a conduit for improving the flow of technology between the Army and industry, academia, and other government agencies.

AIRMICS reviews industry independent research and development projects (IR&D) and participates in jointly funded research centers. Last year, AIRMICS reviewed over 1650 project plans from forty companies. In these reviews, over 140 IMA-related projects were identified. These results are summarized in the annual IR&D Summary Report.



TID initiated and funded the use of the SEI's Software Engineering Self-Assessment Process at the Software Development Centers (SDCs) (Washington, Lee, Ben Harrison, and Huachuca) of the Information Systems Software Center (ISSC) throughout the past year. This project continues into the new fiscal year with the development of an ISSC corporate assessment based on the combination of the individual SDC assessments.

TID also represents ISC and ISEC on the Advisory Board for the Annual Conference on Ada Technology (ANCOAT). The 9th ANCOAT will be held in Washington, DC in March 1991. This year, of the 48 abstracts accepted for presentation, six were from ISEC or contractors doing work for ISEC.

TID has been heavily involved in the Software Test and Evaluation Panel sponsored by CTEA. This project is an outgrowth of a 1983-1987 DOD project of the same purpose in which AIRMICS was a significant contributor. The current project has resulted in initiatives to streamline the regulations involved in the production and test of software and the establishment of a preliminary set of measures to be taken in software projects throughout the Army. AIRMICS personnel participated in the development of the initiatives along with representatives from ISSC, AMC, OTEA, DISC4 and others.

TID's main effort is bringing technology to the Army from industry and academia. A new task is "Domestic Technology Transfer" involving the transfer of technology to private industry and the co-development of technology with industry through Cooperative Research and Development Agreements. This task is mandated by the Stevenson-Wydler Act of 1986 for all federal laboratories. AIRMICS was designated as a Federal Laboratory during FY90 and began this work by joining the Federal Laboratory Consortium. With this opportunity, TID will develop win-win situations between the Army and industry. The government will get unlimited use of new products and our industry partners will commercially exploit these developments.

If you are interested in any of the above areas discussed in this report, or have questions relating to TID, please contact LTC Blake or Mr. Hocking, e-mail address blake%airmics@gatech.edu or hocking%airmics@gatech.edu, phone (404) 894-3104 or 894-3110, respectively.

F. PEOPLE, CAPABILITIES, AND FACILITIES

AIRMICS has an exceptional staff consisting of 18 full-time technical people and three administrative people. Of the 18 technical people, 6 hold doctorates and 8 have Masters Degrees. One more is working on a PhD and the remaining three are working on Masters Degrees. In addition, we have two DA interns (both working on Masters degrees in EE) and 3 half-time ROTC Coop students. We frequently use Intergovernmental Personnel Act (IPA) employees to augment our staff. Our civilian employees are computer and electronics engineers, computer scientists, and operations research analysts. Our military officers are communications-electronics engineers or computer scientists. All officer positions require PhD-level education and are designated Army Acquisition Corps development positions.

The AIRMICS staff possesses a tremendous inventory of expertise with capabilities in Artificial Intelligence, Communications Technology, Data Modeling, Decision Support Systems, Distributed Processing, Entity-Relationship Modeling, Executive Information, Expert Systems, Information Security, Modeling and Simulation, Multiprocessor Hardware, Network Technology, Printing and Publishing, Programming Languages, Records Management Systems, Software Engineering, Software Development, Software Metrics, User Interfaces, and Very Large Databases.

AIRMICS possesses diverse and powerful automation facilities that support the research tasks. Figure 1 shows our current configuration. Included are various hardware platforms (SUN 3/280, 3/50, 386i, SPARC+, and SLC; 80286 and 80386 based PCs; IBM PS/2; Zenith 248; MacIntosh II; Apple Laser Writers; and a Xerox Telecopier), operating systems (UNIX—SUN/OS 4.2BSD, MS-DOS), graphics environments (Meta WINDOW/PLUS, Suntools, X, and MacDrawII), a distributed operating system (RAID), communications software, languages (including Ada, C, and FORTRAN), database management systems (INFORMIX, ORACLE, dBase, and XDB), development environments, and office automation tools (Interleaf, Word Perfect, Word, Wordstar, FrameMaker, TEX, LATEX, and ccplus).

AIRMICS is available to help answer questions about today's research and operational issues. If you are interested in obtaining information on any of the above capabilities or facilities, please call Mr. Hocking at (404) 894-3110, e-mail address [hocking%airmics @gatech.edu](mailto:hocking%airmics@gatech.edu).

AIRMICS Facilities

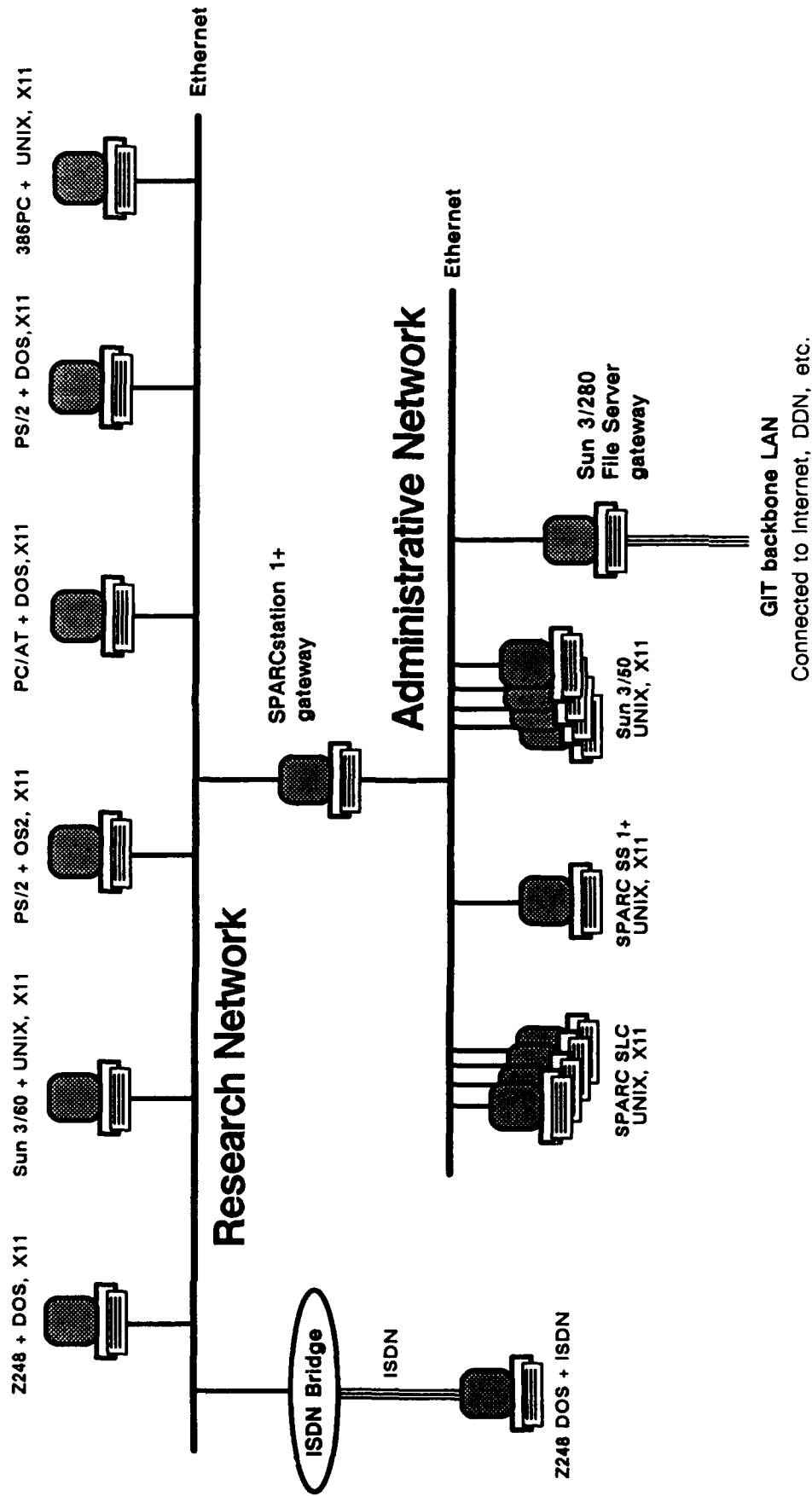


Figure 1

AIRMICS Publications – FY90

NUMBER	TITLE	DATE	AUTHORS
ASQBG-A-90-001	Army Standard Information Management (ASIMS) Preliminary Analysis	10-89	DeFluri & Harbison
ASQBG-C-90-002	Multimedia Network Design Study: First Year Final Report	11-89	Doner
ASQBG-C-90-003	Message Handling System in the Post 2000 Era	11-89	Browning & Wicker
ASQBG-A-90-004	Information Technologies for Army Libraries	12-89	Fesseha, et. al.
ASQBG-I-90-005	Answer Phase II Final Report	12-89	Ryan
ASQBG-I-90-006	Answer Tool Manual	12-89	Ryan
ASQB-GB-90-007	Annual Historical Report	1-90	Blake
ASQB-GI-90-008	Ada Reuse Guide	12-89	Hooper & Chester
ASQB-GI-90-009	Harmonization & Tailoring Guide for DOD-STD-2167A	2-90	Martin
ASQB-GM-90-010	Peer Review Process and Accreditation of Models	2-90	Banks & Holmes
ASQB-GC-90-011	Specification and Analysis of Parallel Machine Architectures	2-90	Ramamoorthy
ASQB-GC-90-012	Distributed Systems Architecture Modeling Tools	2-90	Yee
ASQB-GC-90-013	Message Handling System in the Post 2000 Era: Executive Summary	11-89	Browning & Wicker
ASQB-GC-90-014	An Environment for Simulation of Distributed Systems	2-90	Pazirandeh
ASQB-GI-90-015	Assessment and Development of Software Engineering Tools	3-90	Gagliano, et. al.
ASQB-GM-90-016	Final Report - Distributed Computer Supported Team Work: A Research Paradigm	12-89	Parsons & Nagao
ASQB-GC-90-018	ISDN: State-of-the-Art	6-90	Hanratty
ASQB-GC-90-019	Performance Analysis of Hybrid ARQ Protocols in a Slotted Code Division Multiple Access Network: Jamming Analysis	11-89	Hanratty
ASQB-GC-90-020	Asymptotic Performance Analysis of Hybrid ARQ Protocols in Slotted Code Division Multiple Access Networks	03-90	Hanratty

AIRMICS Publications - FY90

NUMBER	TITLE	DATE	AUTHORS
ASQB-GC-90-021	Project Initiation and Estimation for Expert Systems	03-90	Gowens
ASQB-GI-90-022	Evaluation of Slot Allocation Strategies for TDMA Protocols in Packet Radio Networks	09-90	Stevens
ASQB-GA-90-023	IOIS Summary Report: Automated Session Manager Analysis, Design, and Implementation	07-90	Nunamaker
ASQB-GA-90-024	IOIS Summary Report: An Object Oriented SEM Design/Maintenance Methodology for an Integrated Knowledge Base/Database	07-90	Nunamaker
ASQB-GA-90-025	IOIS Summary Report: Integration Strategy for Distributed Environment	07-90	Nunamaker
ASQB-GA-90-026	Visual Knowledge in Tactical Planning: Preliminary Knowledge Acquisition	12-89	Lancaster
ASQB-GA-90-027	Knowledge Worker Services for AIRMICS	02-90	Putnam
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