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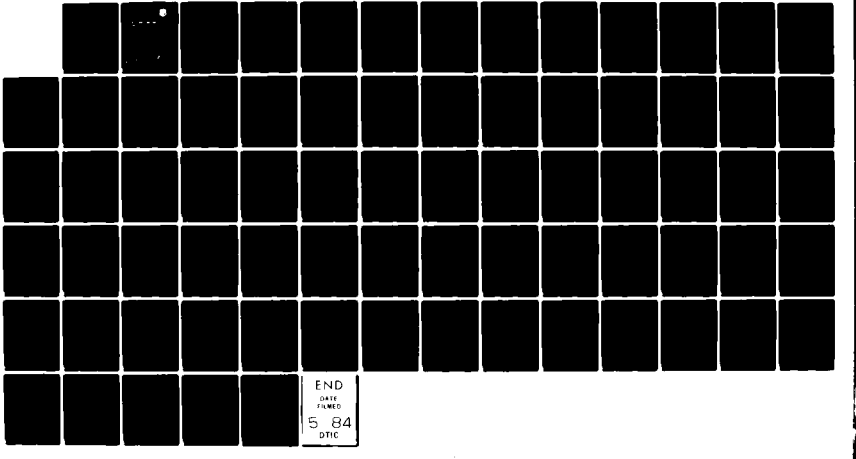

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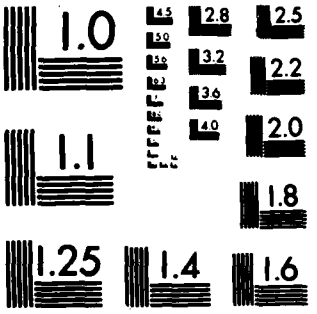

RADC-TM-82-7, Vol II
In-House Report
December 1983

SURVEY OF MODELS/SIMULATIONS AT RADC

Mary L. Doniz

ROME AIR DEVELOPMENT CENTER
Air Force Systems Command
Griffiss Air Force Base, NY 13441

This report has been reviewed by the RADC Public Affairs Office (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS it will be releasable to the general public, including foreign nations.

RADC-TM-82-7, Vol II has been reviewed and is approved for publication.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A survey was conducted to evaluate the current state of the art and technology of model/simulation capabilities at RADC, Griffiss AFB. This memo presents a tabulation of 35 such models/simulations. These models/simulations are being used within RADC in the development and evaluation of Command, Control, Communications and Intelligence (C^3I) technology. The results of this survey are incorporated in this technical memorandum.

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TABLE OF CONTENTS

SBRCOV - Spaced Based Radar Coverage
TAC CONTROLLER - Tactical Air Control Controller
TACOM II - Tactical Communication Simulation Model
TASRAN - Tactical Air Surveillance Radar Netting Simulator/Emulator
TRAFFIC SIMULATOR
TROPO ECM SIMULATOR - Troposcatter Electronic Counter Measures Simulator
TROPOSCATTER CHANNEL SIMULATOR
WIDEBAND LOS SIMULATOR - Wideband Line of Sight Simulator
WIRELINE SIMULATOR

SECTION I

INTRODUCTION

This memo presents the results of a survey conducted by the Distributed Systems Section (COTD) to identify and document existing/planned models and simulations being used in the development and evaluation of Command, Control, Communication and Intelligence (C3I) technology at RADC, Griffiss AFB and Hanscom AFB. Resource integration/sharing will be facilitated by the Fiber Optic/Local Area Network Communications being implemented within the RADC complex at Griffiss AFB.

Background:

The RADC mission as an AF C3I Laboratory, is directed at the development and integration of collection, processing, exploitation, decision, communication and control technologies. Exploitation of existing and planned, physically separated laboratory resources and the integration of the functional elements they represent is to be achieved through an instrumental fiber optic and Local Area Network (Broadband Bus) communications capability to form a MULTINET--a communication system made up of networks. To accomplish the above, the program has been structured to encompass the following efforts:

a. Fiber Optic Network: RADC installed a fiber optics communications network between Buildings 3, 106, and 240 at Griffiss AFB. The Fiber Optic network is used for wideband trunking between buildings and provides point-to-point communications for high and ultra high bandwidth users (greater than 1 Mbit).

b. C2 Facility Construction: A C2 Facility is currently being constructed to allow for simulating, testing, evaluating, and demonstrating C3I concepts, designs, hardware and software. The laboratory will contain a computer complex capable of running major, interactive, real-time simulation programs. The same complex will be used for data reduction and analysis. The laboratory design allows for maximum reconfigurability to emulate a variety of C2 nodes. The laboratory will allow users from operational commands to interact with design engineers in all stages of systems design and development.

c. Local Area Network (LAN) Implementation: The term Local Area Network refers to a communication distribution (BUS) system, which is used to facilitate connectivity among various users and devices (computers and terminals) within the RADC complex. A LAN has been installed in Buildings 3, 106, and 240 with the individual networks connected via fiber optic cable between buildings. The network is capable of handling simultaneous user requirements for transmitting digital data and voice as well as television over a single broadband 300 MHz CATV Cable.

Scope of Survey:

The survey focused on the identification of the models/simulations used by RADC engineers in the development and evaluation of C3I technology concepts, designs and systems. At this point, no attempt was made to extend the survey beyond the RADC organization. Models/Simulations covered in the survey include communications, surveillance, and tactical C3.

Purpose of Survey:

The purpose of the survey was to update RADC-TM-82-7, SURVEY OF MODELS/SIMULATIONS AT RADC. This technical memo contained information on the use of models/simulations at RADC in the development of C3I technologies. Due to the overwhelming, Air Force wide response to RADC-TM-82-7, it was necessary to update it.

Survey Methodology:

A survey questionnaire (Appendix I) was developed to gather information from RADC engineers who were implementing or using a model/simulation. The questionnaire focused upon the identification of the models and simulations used by RADC engineers in the development and evaluation of C3I concepts, designs, and systems. Additional technical information regarding hardware/software operation, interface, limitations/assumptions, documentation and status was also solicited in an attempt to provide a brief but comprehensive description of the model/simulation. The Office of Primary Responsibility (OPR) for each model/simulation along with the responsible person and corresponding telephone numbers are provided if additional information is desired by the reader.

Scope and Content of Report:

Section II contains the model/simulation abstracts. Section III is a summary of the results of the survey.

Terminology:

This section provides the reader with a general introduction into modeling and simulation as well as an aid in understanding the results of the survey.

Simulation:

Simulation consists of the construction of a state history of numerical results. A state history is a chronological succession of state descriptions, i.e., the state of the system at a specific instant of time. A simulation model is not a type of model, but merely a statement that the model is being used to produce a state history. The term computer simulation refers to the use of a digital computer to simulate the model. It does not mean a computer is being simulated.

Model:

For purposes of this survey, the term model will be limited to mean the symbolic representation of the system or subsystem being studied. In general, a model represents the most significant aspects of the system being studied. Models can be either analytical (mathematical) or numerical. Simulation models of mathematical expressions solvable by "hand" calculations or with the aid of a computer, are used extensively to evaluate computer communications systems and subsystems. Such models are precise because they consist of symbolic expressions. Numerical models operate on numerical values, not symbols, and use a brute force numerical approach that make solutions feasible only through the use of digital computers. Numerical models result in approximations that are only as precise as time and money will allow. Simulation models are numerical models as they are based on random event driven occurrences rather than on precise mathematical relationships.

Pure Models, Aggregate Models, and Wargaming Models:

Pure models are generally phenomenological models. They simulate a small piece of technology. These simulations are very fine in technological detail and should be left in the hands of the people with expertise in the phenomenology being modeled in order to keep the model accurate and up to date.

Aggregate models simulate technicological systems. They generally have less detail than the pure models. Models such as C3SAM (Command, Control, and Communications Systems Analysis Model) are aggregate-type models. Due to their lack of fine detail, aggregate models can be separated from the people with expertise in the subject, and so may be placed in a general purpose simulation library.

Wargaming models test technology and/or tactics against the backdrop of the battle field. Systems in a wargame are tested for effectiveness in a war time environment, as opposed to being tested for capability and efficiency.

Simulation Languages:

Special high-order language compilers have been developed for the implementation of simulation models. These compilers simplify the coding of models in the same way that general purpose compilers simplify the coding of other problems. Modeling languages are designed for the implementation of models, and hence have special features unique to modeling requirements. Some of the more commonly used simulation languages are SIMSCRIPT, GPSS, ECSS and GASP. SIMSCRIPT and ECSS have been used almost exclusively by the Federal Computer Performance Evaluation and Simulation Center (FEDSIM) in the implementation of models for ESD SPOs. FORTRAN, while not specifically designed as a simulation language, has been used extensively in the implementation of simulation models. It is also the basis of the GASP language.

SECTION II

SIMULATION SURVEY CATALOG

TITLE: ASE - Advanced Sensor Exploitation

DEVELOPER: RADC/IRRP: PAR Technology

STATUS: Under development. End of ASE Implementation contract is 31 Oct 83.

PURPOSE: To develop the capability for automated multisensor data correlation and subsequent analysis of correlated data. The laboratory configuration with DGTS and Sensor Simulators make ASE a general purpose system with applications in training, sensor capability analysis and wargaming analysis.

GENERAL DESCRIPTION: Current use includes correlation and analysis of sensor reports on enemy ground force activity. System is limited to enemy activity only through doctrinal considerations in analysis techniques. Minor modifications and analyst interactive capabilities would remove most limitations for ground war activity analysis. The inclusion of the Air Battle would require additional, more major modifications to ASE algorithms and data structures.

INPUT: Presently includes sensor and HUMINT messages including MTI (i.e. PAVE MOVER), Radio/Radar detection/location (i.e. PLSS, ELS), and Imagery (ASARS). Although in ASE specific message formats, inputs could expand to other sensor information.

OUTPUT: Some hardcopy of file contents is available. Most output is on the Ramtek graphics display with on-line interface to VT-100's to provide statistical data and assist with operator interaction.

MODEL LIMITATIONS: Currently limited cartographic area. Expansion to 120 km x 180 km will still leave gaps in attribute information such as foliage, road structure and cross country make up information.

HARDWARE:
Type computer: VAX 11/780
Operating system: VMS
Minimum Storage: 2.5 Megabytes (memory)
Peripherals: RAMTEK 9400, VT 100

SOFTWARE:
Programming language: Fortran
Documentation identification: ASE Final Report

OPERATION: Real Time/Interactive

POINT OF CONTACT: RADC/IRRP
Mr. Len Converse, AV 587-2217, 315-330-2217
Lt Mary Livingston, AV 587-2344, 315-330-2344
Griffiss AFB NY 13441

CLASSIFICATION: Presently Unclassified

TITLE: C^3SAM - Command, Control and Communications System Analysis Model

DEVELOPER: BETAC Corporation

STATUS: Operational at RADC

PURPOSE: The Command, Control and Communications Systems Analysis Model (C^3SAM) is an automated model to assist in tactical C^3 Systems development, operational enhancement, configuration, and/or reconfiguration. C^3SAM is a tool designed to enable individuals and groups to define, structure, and analyze tactical Air Force command and control. The basic structure and content of the C^3SAM data base is representative of a "generic" Tactical Air Control System (TACS) and its command and control relationships with Army, Navy and Marine structures. The operational design of the data base is "user friendly". It will allow non-computer experts the ability to operate the system with relative ease.

GENERAL DESCRIPTION: The C^3SAM data is a modified, user friendly, version of the Tactical Information Exchange (TIE) data base developed by the Tactical Air Force Interoperability Group (TAFIG) located at Langley AFB VA. The TIE data base was a three year effort designed to collect, document and organize a complete functional analysis of a generic TACS and its associated information exchanges. RADC's support of this effort resulted in the installation of a copy of the TIE data base on the Honeywell processing system at this location.

INPUT: C^2 organizations, functional structures, information products, exchanges between functions and organizations, scenario loading parameters.

OUTPUT: Computer Printout

MODEL LIMITATIONS: Information exchanges for all TACS elements in JTF model are not included. MAC model includes wartime only (CORE) function.

HARDWARE:
- Type computer: Honeywell DPS 8
- Operating system: GCOS
- Minimum storage: 35K
- Peripherals: High Speed Printer, Mag Tape, Terminal, Card Reader

SOFTWARE:
- Programming language: COBOL, JCL
- Documentation identification: C^3SAM User's Manual

OPERATION: Batch and Interactive

POINT OF CONTACT: RADC/COAD
Mr. Yale Smith
Griffiss AFB NY 13441
AV 587-7978, 315-330-7978

CLASSIFICATION: JTF & MAC Models - Unclassified
NATO Model (Central Europe) - U.S. Secret

TITLE: DATOMUT - Computer Simulation of the Detection and Tracking of Multiple Targets in Different Environments

DEVELOPER: RADC/EECT

STATUS: Operational

PURPOSE: To evaluate the performance of various ground-based radars in detecting and tracking multiple targets in different environments.

GENERAL DESCRIPTION: A computer model was developed to simulate the detection and tracking of multiple targets by ground-based, unattended radars. The model includes such effects as target fluctuations, log-normally distributed ground clutter receiver noise, multipath, surface roughness and finite dielectric constant of the earth's surface. The tracking performance of the radar may be evaluated for various targets in different environmental conditions.

INPUT: Target trajectories, environmental clutter cross sections, target cross sections, ground roughness, terrain dielectric constant, transmitter height, wave polarization, and frequency.

OUTPUT: Printout and plots

MODEL LIMITATIONS: Six targets, non-adaptive tracking filters, MTI radar

HARDWARE:
Type computer: CDC6600, CYBER 750
Minimum storage: 160K
Peripherals: Calcomp Plotter

SOFTWARE:
Programming language: FORTRAN
Documentation identification: RADC-TR-81-90

OPERATION: Batch

POINT OF CONTACT: RADC/EEC
Dr. R. Papa
Hanscom AFB MA 01731
AV 478-3735

CLASSIFICATION: Unclassified

TITLE: DDG - Dynamic Data Generator

DEVELOPER: PAR Technology Corp, New Hartford NY

STATUS: Under development

PURPOSE: The DDG is being designed to aid in the development of airborne moving target indicator (MTI) radar and weapon delivery systems. This tool will help with the analysis of these systems without the expense of flight testing.

GENERAL DESCRIPTION: DDG simulates the presence of an airborne MTI radar, accepting realistic uplink commands to steer and control the radar, and generating realistic downlink radar data. DDG also simulates the weapons deliveries that are initiated by the Target Acquisition and Weapon Delivery System (TAWDS), now known as Joint STARS (PAVE MOVER). DDG accepts actual commands from the TAWDS Data Processing Control System (DPCS). It is capable of generating plausible weapon flight profiles and responding accurately to TAWDS guidance commands. DDG has the capability to simulate all timing constraints in order to realistically test a TAWDS DPCS in all its functions. However, it is general enough to drive airborne moving target indicator processing systems other than the current DPCS.

INPUT: The Dynamic Ground Target Simulator (DGTS) is the scenario input for the DDG.

OUTPUT: Output of the DPCS is displayed on Ramtek RM-9400 graphics displays. Status of the DDG is displayed on a DEC VS-60 display and a DEC VT-100 terminal.

MODEL LIMITATIONS: Timing problems with the VAX system are preventing "real" real-time operation.

HARDWARE:
Type computer: VAX 11/780
Operation system: VMS (V3.4)
Minimum storage: 3.5 Mb of memory
Peripheral equipment: 4 RM-05 disk drives, 1 RP-06 disk drive, 2 TU-77 tape drives, 1 VS-60 display, 2 Ramtek 9400 displays

SOFTWARE:
Programming language: FORTRAN-77, Assembly
Documentation identification: N/A

OPERATION: Real time and interactive

POINT OF CONTACT: RADC/COAA
2Lt John A. Maziarz
Griffiss AFB NY 13441
AV 587-4494, 315-330-4494

CLASSIFICATION: Unclassified

TITLE: DGTS - Dynamic Ground Target Simulator

DEVELOPER: PAR Technology Corporation, New Hartford NY

STATUS: Operational

PURPOSE: DGTS is a software-based system for developing and generating battlefield scenarios to support the development and testing of battlefield management systems. Its purpose is to develop a means for generating data/streams and/or files describing the detailed behavior of military units and their associated equipment, along with the environment within which such units operate.

GENERAL DESCRIPTIONS: DGTS provides a flexible, on-line, interactive ground force simulation system which provides the capability to realistically model military unit activity within the tactical environment.

-- Event driven deterministic simulation capability
-- Generation of red force scenarios with work on-going to include blue forces
-- On-line interactive modification

INPUT: Unit, vehicle and emitter data files are utilized along with military doctrine to the required activities according to a written scenario script.

OUTPUT: Formatted messages giving second-by-second information of all the elements in the scenario. This information can be sent on-line to another system, stored on disk, or sent to a graphics system for display purposes.

MODEL LIMITATIONS: The size of the usable cartographic data base limits the size of scenarios. As the cartographic areas becomes larger so can the scenarios.

HARDWARE:
Type computer: DEC VAX 11/780
Operation system: VMS
Minimun storage: 42,000 blocks (2 mb memory)
Peripheral equipment: RAMTEK 9400 graphics display system

SOFTWARE:
Programming language: PASCAL
Documentation identification: BAS (Battlefield Activity Simulator DGTS)

OPERATION: Near real time, on-line, interactive

POINT OF CONTACT: RADC/IRRP
Mr. James Papagni
Griffiss AFB NY 13441
AV 587-2344, 315-330-2344

CLASSIFICATION: Unclassified

TITLE: DSS - Distributed System Simulator

DEVELOPER: General Electric Company

STATUS: DSS is operational on a VAX 11/780 VMS Computer System.

PURPOSE: DSS has been designed as a modeling tool to facilitate the performance analysis of computer networks through simulation. It is implemented in Simscript II.5 (an event oriented simulation language) and ECSS II - a special purpose simulation language designed to simulate computer systems. DSS models may use most of the statements from these two languages - its major function is to extend the capability of these languages in order to model computer networks.

GENERAL DESCRIPTION: The DSS addresses two broad problems in order to provide a tool for the simulation of computer networks. The first is the wide range of networks, architectures, and protocols that actually exist or have been proposed including message and circuit switched networks. The second major problem addressed by the DSS is the fact that building simulators of complex systems can be a time consuming and costly exercise.

The concept of the DSS model has evolved to meet these problems. A separate DSS model can simulate a single node in a computer network. If two or more nodes have similar characteristics, DSS can duplicate the model as many times as there are similar nodes. This capability greatly reduces the amount of code that has to be generated by the user. These DSS models are then combined to form a simulator of the entire network. DSS models are not limited to simulating a specific architecture or set of protocols since they have access to all of the high level constructs of ECSS II and Simscript II.5. In particular, any parameterized or structural model may be implemented by a DSS model. There are several advantages to having a separate model for each node. The first is that DSS provides the capability of debugging and verifying DSS models separately. In a network with fifty nodes there may be only two distinct DSS models, one for the switching computers and one for the host sites. Instead of trying to verify a fifty node network simulator, the problem is reduced to verifying two DSS models separately. The second advantage is that a library of DSS models may be created which can focus on particular problems in a network such as flow control or routing algorithms. These DSS models, whether parameterized or structural models, may be used again in other simulators so that, as the library grows, the time it takes to build a simulator can be reduced in some cases. In this sense, DSS is an extendable system.

The DSS has been used to develop three detailed models of computer networks using the ISO Reference Model as a framework. These detailed models include a communication protocol model, a reliability/availability model and a distributed data base model. These models follow the ISO architecture framework in that each succeeding model uses the services of the preceding model in a hierarchical fashion. The communication protocol model simulates the X.25 interface for packet switched networks. Adaptive routing procedures necessitated by nodal failures are simulated in the reliability/availability model. The distributed data base model was built using the DSS and the facilities provided by the communication protocol and reliability/availability model.

INPUT: There are four main input files to DSS that a user must supply. The first is the file which consists of the DSS models. These models may have been previously defined or created by the user. The second major input file is the topology file (TP.FILE). This file describes the inter-nodal paths connecting the nodes in the network. The third file (M.FILE) specifies for each node in the network the particular DSS model which will simulate it. The fourth file is the EXEC file which specifies whether the channels which connect one node with another are multiplexed or dedicated.

OUTPUT: Computer printout of network performance data and charts.

HARDWARE:
Type computer: VAX 11/780
Operating system: VMS
Minimum storage: 20,000 blocks
Peripheral equipment: VT100

SOFTWARE:
Programming language: ECSS II, SIMSCRIPT II
Documentation availability: DSS User's Manual, DSS Computer Operations Manual

OPERATION: Batch and/or interactive

POINT OF CONTACT: RADC/COTD
Ms. Patricia J. Baskinger
Griffiss AFB NY 13441
AV 587-2805, 315-330-2805

CLASSIFICATION: Unclassified

TITLE: EHF and SHF Link Analysis Program

DEVELOPER: RADC/DCCD

STATUS: Operational

PURPOSE: Analysis of radio propagation at EHF and HF frequencies

GENERAL DESCRIPTION: Deterministic air-air and air-ground-air propagation model for radio communication

INPUT: Frequencies of interest, altitude, rain rate, ranges of interest

OUTPUT: Plots and computer printouts

MODEL LIMITATIONS: EHF and SHF frequency bands

HARDWARE:
Type computer: Honeywell 6180
Operating system: MULTICS
Minimum storage: 600 lines of source code
Peripheral equipment: 4014 Tektronix terminal

SOFTWARE:
Programming langua[illegible] IV
Documentation identi[illegible]F and SHF Link Analysis Programs (RADC-TM-83-10)

OPERATION: N/A

POINT OF CONTACT: RADC/DCCD
Mr. Alan Akins
Griffiss AFB NY 13441
AV 587-3224, 315-330-3224

CLASSIFICATION: Unclassified

TITLE: FAP - Forward Area Processor

DEVELOPER: General Dynamics

STATUS: Operational on the Honeywell 8/44D and the SIGINT Support Facility (SSF) PDP 11/70

PURPOSE: The FAP was developed in the mid-seventies to demonstrate an architecture to support the interaction of simulators in an environment. The capability was demonstrated and evaluated using an ELINT platform in a RADAR environment with interactive users and communications. Currently, RADC is upgrading the capability from a batch process, integrating the Dynamic Ground Target Simulator program, expanding the environment, improving the sensor specification capability and interfacing to ASE.

GENERAL DESCRIPTION: The FAP architecture presently provides an ELINT simulation of up to 10 sensors, 100 emitters, 10 preprocessors, 1 processor, 25 communicators, 5 on-line users, a log of all transactions and timing to drive the simulation in an exactly repeatable fashion. This architecture is being expanded to handle SIGINT, create scenarios interactively and involve up to 25 sensors, 100,000 emitters, 100 processing configurations, 100 communications configurations, 20 on-line users with on-line reporting and monitoring. The expanded FAP will be compatible with ASE supporting both deterministic and stochastic scenarios.

INPUT: Initial conditions

OUTPUT: Transaction file computer outputs

MODEL LIMITATIONS: The FAP architecture is designed to permit the interface of simulated technology or where it exists, actual hardware. Therefore, the level of simulation is not constrained.

HARDWARE:
Type computer: Honeywell 8/44D, DEC PDP 11/70
Operating system: GCOS, RSX 11-M
Minimum storage: 52K, 64K
Peripheral equipment: Terminal, Terminal and RAMTEK 9400

SOFTWARE:
Programming language: FORTRAN, FORTRAN 77
Documentation identification: FAP

OPERATION: Batch with interactive and on-line modification

POINT OF CONTACT: RADC/IRDE
Mr. William S. Hartnett, AV 587-4517, 315-330-4517
Mr. Alex F. Sisti, AV 587-4517, 315-330-4517
Ms. Margot Risley, AV 587-3037, 315-330-3037
Griffiss AFB NY 13441

CLASSIFICATION: The model in its current form is unclassified.

TITLE: GEMACS - General Electromagnetic Model for the Analysis of Complex Systems

DEVELOPER: The BDM Corporation, Alburquerque NM

STATUS: Version Three under validation; estimated availability date is Jan 84

PURPOSE: GEMACS provides the external electromagnetic environment resulting from the radiation and scattering properties of a structure. Analysis is provided of the coupling among collocated antennas, the input impedance and radiation patterns of antennas located on the structure, and scattering of the external electromagnetic environment by the structure itself. Structures can be aircraft, helicopters, huts, etc. Antennas include blades, wires, phased arrays, parabolic dishes.

GENERAL DESCRIPTION: GEMACS utilizes a matrix approximation and solution to Maxwell's integral equations and requires knowledge of electromagnetic theory and physics. The analysis is performed at discrete frequencies and is valid for both electrically small and electrically large radiating and scattering systems.

INPUT: Using points, lines, surfaces and a cylinder the user describes the geometry of the structure, including all antennas. The input voltage to any radiating elements as well as a description of the environmental electromagnetic field at the frequency of interest is also provided by the analyst.

OUTPUT: A computer printout is provided detailing the structure model, the electrical parameters input, the calculated input impedance and power dissipated of any radiating elements. Tabular and plotted data are output describing radiation and scattered field distributions. In addition, optional extensive debug information can be requested.

MODEL LIMITATIONS: Phenomena interior to the structure skin cannot be predicted. Slot antennas cannot be modeled directly. Radar cross section can be manually calculated using available output (i.e. no provision for computer-generated RCS). The shape and size of the structure can be fairly arbitrary, although the skin must be, in general, perfectly conducting.

HARDWARE:
Type computer: Honeywell 6180 computer
Operating System: GCOS operating system
Minimum storage: 120K decimals words of storage
Peripheral equipment: Requires one tape handler or disk drive

Has also been installed on the following computers: CDC 6600, 7600, CYBER 203, DEC 20, VAX 11/780, IBM 370/3033 and 360/92, UNIVAC 1100-43

SOFTWARE:
Programming language: FORTRAN IV
Documentation identification: Technical Report

OPERATION: Batch processing

POINT OF CONTACT: RADC/RBCT
Mr. K. R. Siarkiewicz
Griffiss AFB NY 13441
AV 587-2465, 315-330-2465

CLASSIFICATION: Unclassified

TITLE: High Frequency (HF) Media Simulator

DEVELOPER: Signatron Inc.

STATUS: Operational

PURPOSE: Provides a controlled simulated HF media environment for test and evaluation of HF communication equipment.

GENERAL DESCRIPTION: The HF Media Simulator was developed based on the Watterson Model. It was designed to interface directly with modems in real time under test, provide the user a convenient means to specify the characteristics of the HF medium simulated.

INPUT: User specified HF medium model parameters via Tektronix 4025 terminal. Data signal input via IOP-16 and special A/D interface from modem.

OUTPUT: HF medium characteristics, test and analysis results (both text and graphics).

MODEL LIMITATIONS: Designed for a baseband of 0-4 KHz only.

HARDWARE:
Type computer: PDP 11/40
Operating system: RSX-11M Version 3.1
Minimum storage: *PDP 11/40: 40 K words*
AP 120B: 1K Prog Source, 16K Main Data
Peripheral equipment: AP-120B, IOP-16, A/D & D/A real time interface.

SOFTWARE:
Programming language: DEC FORTRAN IV (Host), AP Assembly (AP-120B)
Documentation identification: HF Channel Simulator Operation Handbook

OPERATION: Real time, interactive

POINT OF CONTACT: RADC/DCLF
Mr. J. Evanowsky
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: Unclassified

TITLE: IAM - Intelligence Analytical Methodology

DEVELOPER: Synectics Corporation

STATUS: Under development

PURPOSE: Situation assessment in an I&W environment.

GENERAL DESCRIPTION: *One-sided, deterministic, event store, air/ground*

INPUT: Scenario

OUTPUT: Color graphic displays

MODEL LIMITATIONS: To be determined

HARDWARE:
Type computer: PDP 11/70
Operating system: IAS
Minimum storage: 128 KW *memory (core)*
Peripheral equipment: Chromatics 7900

SOFTWARE:
Programming language: FORTRAN
Documentation identification: N/A

OPERATION: Real-time

POINT OF CONTACT: RADC/IRDT
Griffiss AFB NY 13441
AV 587-3638, 315-330-3638

CLASSIFICATION: Unclassified

TITLE: ICNAS - Intelligence Communications Network Analysis System

DEVELOPER: Rockwell International & INCO Inc.

STATUS: Under development. Expected delivery date - Dec 1983.

PURPOSE: To analyze performance of communications networks in support of dissemination of intelligence data/products.

GENERAL DESCRIPTION: ICNAS is an intelligence communications network analysis tool which, along with its data base, may be used to identify potential strengths and weaknesses in an existing or proposed imagery/signals intelligence (IMINT/SIGINT) communications network. ICNAS is rendered specific to IMINT/SIGINT networks by its data base. The data base (classified Secret) contains data describing existing IMINT/SIGINT communications networks, such as network nodes, circuits, equipment and messages (the data base may be expanded or changed to accommodate other types of communications networks).

ICNAS evaluates message switched store-and-forward telecommunications network based on performance, effectiveness, survivability and susceptability (to physical or electronic threats).

INPUT: Network configuration data and types and volumes of traffic via magnetic tape and key-board.

OUTPUT: Data from the data base, and anlaysis data/results from the analysis module, provided in tabular and graphics (color) forms.

MODEL LIMITATIONS: Designed to analyze via analytic models of store-and-forward networks (now), Packet Switching networks (now), Time Division Multiple Access (TDMA) networks (near future), and Packet Radio (near future) only.

HARDWARE:
Type computer: PDP 11/70 (or larger) CPU
Operating system: RSX11-M
Minimum storage: It needs at least 46,080K bytes of disk storage (this includes the data base and data base handling routines).
Peripheral equipment: Ramtek 9400

SOFTWARE:
Documentation identification: User's Manual, Program Maintenance Manual, Data Base Specification, System/Subsystem Specification, and Final Technical Report. None of these documents have been delivered in final form yet.

OPERATION: Interactive non-real-time

POINT OF CONTACT: RADC/DCLF
2Lt Mary E. Mortara
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: Secret

TITLE: ICS - Interactive Communications Simulator

DEVELOPER: Hazeltine Corp

STATUS: Operational

PURPOSE: To provide a high speed, high resolution specialized capability for the design and analysis of communication links modeling/simulation signal processing techniques.

GENERAL DESCRIPTION: The Intelligence Systems Laboratory (ISL) is proposed to support a variety of models, primarily digital software models. It is anticipated that these models will be more probabilistic and non-real-time. A desired feature of the models is the capability to rapidly and interactively change input variables to validate technology under a range of environmental conditions.

The purpose of the models supported by the ISL is primarily the demonstration, test, and evaluation of exploratory development (6.2) intelligence technology. The models may at times be used to enhance a single technique, for example an analyst aid for indications and warning. However, it will be used mainly to enhance an interrelated system of several techniques within an overall intelligence data collection, exploitation, processing, analysis, production, and dissemination context.

The purpose of the ISL is to evaluate intelligence technology under a range of expected workloads, data rates, time constraints, and to determine additional areas for advanced development. It will also perform sensitivity analysis on parameters of the technique that may be modified in advanced development.

OUTPUT: Graphics, visual, hard copy, help files

MODEL LIMITATIONS: Now, the ICS is for a single user. But even when implemented with the RSX-11M, more than one ICS job requiring concurrent use of the AP-120B would overload the system, if not unfeasible. However, for those portions of the ICS job handled by the PDP 11/40, multiple jobs may be accommodated at the same time.

HARDWARE:

Type computer: PDP 11/40
Operating system: RT-11, single user, RSX-11M-multiuser
Minimum storage: PDP 11/40: 28K required. System 80K available.
AP 120B: Program source memory 2.5K (64 bit word).
Main data memory 24K required (38 bit word) has 40K available in system.
Peripheral equipment: AP 120B, DEC VT-11 Graphics terminal and DEC Writer.

SOFTWARE:

Programming language: For Host (PDP 11/40): DEC FORTRAN IV
For Array Processor (AP 120B): AP Assembly Code

Documentation identification: Program listings, technical report, technical memos.

OPERATION: Interactive, usually to one user at a time, even though the host can be operated in a multi-user environment.

POINT OF CONTACT: RADC/DCLF
Mr. Peter K. Leong
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: The basic model is unclassified.

TITLE: ICSSM - Interactive Communication Systems Simulation Model

DEVELOPER: Hazeltine Corp.

STATUS: Operational

PURPOSE: To provide a general, flexible, computerized modeling and simulation structure to support design and analysis of various communication systems, links and equipment.

GENERAL DESCRIPTION: The Interactive Communications Systems Simulation Model (ICSSM) is a non-real-time digital-computer-based system intended for simulating point-to-point communication systems. The ICSSM has the capability of supporting simulation and modeling of a system which can be represented in terms of a network of multi-post functional blocks. Its applicability is restrained only by the modeler's ingenuity to decompose and represent algorithmically his system to these interconnected functional blocks. Therefore, the ICSSM has the capability to simulate multi-input, multi-output digital communication systems of practically any system.

There is an application library that is an integral part of ICSSM. This library is available to facilitate storage, and access of all application software whether it is modeling/simulation modules, analysis subroutines, or computer graphics subroutines.

Consequently, the user/analyst may benefit from the legacy of previous modeling efforts. The ICSSM also has a preconfigured programming structure which allows the user/analyst to concentrate on the model formulation itself. Thus, the construction of a special simulation framework or system for each simulation endeavor is avoided.

The ICSSM is a baseline simulation and modeling tool that can easily accommodate any conceivable future growths (i.e. both system and application related enhancements). Analysis requirements generated by new communication system development needs.

INPUT: via Tektronix 4014

OUTPUT: Graphics display & hardcopy

LIMITATIONS: Scope and fidelity of model and simulation are mainly dependent on the variety and fidelity of the simulation software, and analysis software residing in the library. The ICSSM system software is totally neutral.

HARDWARE:

Type computer: Honeywell 6180
Operating system: MULTICS
Minimum storage: 2000 pages of disc memory
Peripheral equipment: Tektronix 4014

SOFTWARE:
Programming language: ANSI standard FORTRAN
Documentation identification: Technical report, functional description, system/subsystem specifications

OPERATION: Interactive

POINT OF CONTACT: RADC/DCLF
Mr. Peter Leong
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: Unclassified

TITLE: IEMCAP - Intrasystem Electromagnetic Compatibility Analysis Program

DEVELOPER: McDonnell Douglas Corp

STATUS: Operational

PURPOSE/DESCRIPTION: The Intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP) is a deterministic model designed to provide the basic system-level intrasystem electromagnetic compatibility (EMC) analysis. Its output is in the form of a digitized EMC database. It performs four functions.

The first function is the baseline system EMC survey. The system is surveyed for interference. If the maximum of the electromagnetic interference margin over the frequency range for a coupled emitter-receptor port pair exceeds the user-specified printout limit, a summary of the interference is printed. Total received signal into each receptor from all emitters is also printed.

The second function is the trade-off analysis. This function compares the interference for a modified system to that stored from a previous specification generation or survey run. Thus, the effect on interference of antenna changes, filter changes, spectrum parameter changes, wire changes, etc. can be assessed.

The third function is specification waiver analysis. This function shifts portions of specific port spectra as specified and compares the resulting interference to that stored from previous analysis. Thus, the effect of granting waivers for specific ports can be assessed.

The final function is specification generation. The initial non-required emission and susceptibility spectrum is adjusted such that the system is compatible. The user-specified adjustment limit prevents too stringent adjustments. A summary of interference situations not controllable by EMC specifications is printed. The adjusted spectra are the maximum emission and minimum susceptibility specifications for use in EMC tests.

INPUT: Electromagnetic characteristics of the system

OUTPUT: Computer printout

MODEL LIMITATIONS: Designed to give a rough cull of the electromagnetic compatibility posture of a total system. There are limitations on the various numbers of components that can be analyzed in any one activity, although activities can be sequentially executed.

HARDWARE:
Type computer: Honeywell 6180
Operating system: GCOS
Minimum storage: Approximately 85K decimal
Peripheral equipment: Any standard computer terminal

SOFTWARE:
Programming language: FORTRAN IV
Documentation identification: Engineering Manual, User Manual

OPERATION: Batch

POINT OF CONTACT: RADC/RBCT
Dr. G. Capraro
Griffiss AFB NY 13441
AV 587-2465, 315-330-2465

CLASSIFICATION: Unclassified

TITLE: IN - Integrated Node

DEVELOPER: RCA Corporation

STATUS: Operational

PURPOSE: The Integrated Node was developed to demonstrate feasibility of integrated switching. It will be used to evaluate Integrated Services Digital Network (ISDN) Recommendations and other innovative integration techniques and their impact on the evolving Defense Communications System (DCS).

GENERAL DESCRIPTION: The Integrated Node is a versatile and modular communications switching node. It provides packet switching (resource sharing and host-to-host linking of a wide variety of computers) to handle asynchronous but near real-time data transactions to accommodate needs such as man/man, man/computer, and computer/computer communications as well as circuit switching for real-time voice. In order to functionally test the node, the signal Integrated Node was modified to emulate a three node subnetwork. Using this configuration, RCA successfully demonstrated integrated packet, message and voice switching functions as well as the operation of dynamic channel allocation.

INPUT: N/A

OUTPUT: N/A

MODEL LIMITATIONS: Limited to the number of ports. Currently limited to:
- Phones: 6 CVSD
- Message terminals: 6 MODE I, 8 MODE II
- Packet terminals: 6 HOST

HARDWARE:
- Type computer: Perkin-Elmer 8/32
- Operating system: OS32MT Rev 5.2
- Minimum storage: 451 KBS
- Peripheral equipment: Owl 1100 Console, 300 LPM Printer, 10 MB disk storage, (2) 800 BPI tape drives

SOFTWARE:
- Programming language: Perkin-Elmer assembly (CAL)
- Documentation identification: Operations manuals

OPERATION: Real-Time

POINT OF CONTACT: RADC/DCLD
Mr. John Salerno
Griffiss AFB NY 13441
AV 587-7751, 315-330-7751

CLASSIFICATION: Unclassified

TITLE: ISL - Intelligence Systems Laboratory

DEVELOPER: RADC/IRD

STATUS: Under development, anticipated FY86. Preliminary baseline configuration, the IIPL (Intelligence Information Processing Laboratory), is currently operational.

PURPOSE: To assist intelligence information system development and intelligence technology advanced development, both contractual and in-house.

GENERAL DESCRIPTION: Not a model or simulation per se, but a hardware/software configuration to support modeling and simulation. The configuration currently includes DEC VAX and PDP11 computers and peripherals including disk, tape, printers, textual and graphic terminals. A rapid prototyping capability is planned for development in FY84 and 85 as the first system development modeling aid residing in the IIPL.

INPUT: Intelligence information (messages, file updates, sensor data)

OUTPUT: Computer printout, plots, graphics, interactive terminal test and graphics, statistically analyzed data.

MODEL LIMITATIONS: Requires applications development

HARDWARE:
Type computer: PDP11, VAX 11/780
Operating system: IAS, VMS
Minimum storage: 512 Kw
Peripheral equipment: Tape, disk, line printer, Tektronix colorgraphics terminal, VT100 terminals, Imlac PDS4 graphics display system, SU1652 graphics terminal, Chromatics CGC 7900 graphics display system, Genesco CGT 3000 Graphic display processor, Summagraphics data tablet/digitizer

SOFTWARE:
Programming language: Fortran, Cobol
Documentation identification: Intelligence Information Processing Laboratory Plan, 1 Aug 83

OPERATION: Batch, interactive to be developed FY84/85

POINT OF CONTACT: RADC/IRDA
Griffiss AFB NY 13441
AV 587-3126, 315-330-3126

CLASSIFICATION: Currently limited to SECRET. Future plans for SCI operation, FY86.

TITLE: LOS ECM Simulator - Line of Sight Electronic Counter Measure Simulator

DEVELOPER: Signatron Inc.

STATUS: Operational

PURPOSE: To provide jamming sources combined with signals from line-of-sight simulator so to create an ECM environment for T&E of LOS radio equipment at 3 RF ranges and 4 IFs.

GENERAL DESCRIPTION: The Line of Sight (LOS) Electronic Counter Measures (ECM) Simulator operates in conjunction with a LOS communication simulator to simulate in a laboratory environment LOS communication with jamming. It provides jamming sources combined with signals from the LOS simulator creating an ECM environment for test and evaluation of LOS radio equipment at three radio frequencies (RF) and four intermediate frequencies (IF). The LOS ECM Simulator, can test modems at 70, 100, 300 and 700 MHz IF's and receivers at 1-1.5, 4.4-5.0, and 7.1-8.4 GHz RF's.

The ECM Simulator consists of four major sections. The first is the Single LOS/Dual Tropo Jammer source. This generates IF signals to simulate a jammer broadcasting to a LOS receiver. The second major section is the Jammer Delay-Combiner/AGC which combines the desired IF communications signals with appropriately delayed IF jammer signals for simulation of off-axis jamming. A 70 MHz AGC amplifier for testing modems requiring external AGC capability is also contained in this section. The IF/RF interface is the third major section. This section converts the previous mentioned IF signals to RF for testing of receiver front ends. The fourth major section is the power supply section.

INPUT: Analog in (IF)

OUTPUT: Analog out (IF/RF)

MODEL LIMITATIONS:

a. IF: 70 MHz, 100 MHz and 700 MHz
b. BW: + 12.5 MHz, +25 MHz, +25 MHz & +50 MHz respectively
c. RF: 1-1.5 GHz, 4.4-5.0 GHz & 7.1-8 GHz
d. One jammer type can be sued at a time
e. 70 MHz IF jammer module may be used to provide an additional direction of jamming when used with the tropo ECM simulator and tropo simulator for tropo applications.

HARDWARE:

Type computer: Unique dedicated hardware design
Operating system: N/A
Minimum storage: N/A
Peripheral equipment: N/A

SOFTWARE:
Programming language: N/A
Documentation identification: Technical Report, Operating/ Maintenance Manual with schematics and parts list. Quality is good.

OPERATION: Real time, direct connection to equipment undergoing test.

POINT OF CONTACT: RADC/DCLF
Mr. Peter K. Leong
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: Unclassified

TITLE: NCAP - Nonlinear Circuit Analysis Program

DEVELOPER: Original version: Signatron Inc.
Present version: RADC (In-House)

STATUS: Verified and available

PURPOSE: This program does a frequency domain analysis to calculate the nonlinear transfer functions of electronic circuits.

GENERAL DESCRIPTION: As originally configured, NCAP computed the nonlinear transfer functions of an electronic circuit, where the nonlinear transfer function of order n was the Fourier Transform of the nonlinear impulse response of order n. It has been shown that the nonlinear transfer functions which are based upon the Volterra series, are related to quantities of interest to EMC engineers (e.g. intermodulation, cross-modulation, demodulation, desensitization, etc.) The original NCAP, written in FORTRAN IV, directly analyzed networks containing up to 50 nodes, had a fixed field format for input data, and contained a small number of built-in electronic device models.

The NCAP Program solves the nonlinear network problem by forming both the nodal admittance matrix (Y matrix) for the entire network and the current vector for all orders of analysis. The circuit generators can be located between any nodes in the network, and can have any desired frequency, amplitude, and phase. At each excitation frequency, the admittance matrix and current vector are obtained and used to derive the transfer function vector, the elements of which are the transfer functions for the nodes in the network. Higher order transfer functions are solved iteratively.

Subsequent to the original development, RADC devoted an extensive amount of effort into NCAP to make it more user-oriented, to expand its capabilities, and to provide documentation for both EMC engineers and computer software specialists. Presently NCAP analyzes networks on the order of 500 nodes, has a free field format for input data, has capabilities to allow the user to build device models in addition to the several stored models and has a more user-oriented format.

INPUT: The only input required is a circuit description which is a file containing a collection of NCAP input descriptors. The descriptors are explained in the User's Manual RADC-TR-79-245, Vol II.

OUTPUT: Printouts

MODEL LIMITATION: The nonlinearities in the circuit must be weak nonlinearities (i.e., circuits with slowly varying excitation). The number of device/elements and the size of the circuit are limited only by the storage capacity of the computer. The present form is set to approximately 750 nodes.

HARDWARE:
Type computer: Honeywell 6180
Operating system: GCOS
Minimum storage: 50K
Peripheral equipment: Disk sotrage for seven intermediate working files.

SOFTWARE:
Programming language: FORTRAN IV
Documentation identification: RADC-TR-79-245, Vol III

OPERATION: Batch

POINT OF CONTACT: RADC/RBCT
Mr. Jon B. Valente
Griffiss AFB NY 13441
AV 587-3490, 315-330-3490

CLASSIFICATION: Unclassified

TITLE: PAAS - Parametric Antenna Analysis Software

DEVELOPER: RADC/OCSA

STATUS: Operational

PURPOSE/DESCRIPTION: This software was developed to perform parametric analysis of antennas. It has been used to support various OC programs and will be installed on the OC VAX 11/780. Several OC simulations will be integrated into the IRESM (Integrated Radar Environment Simulator). IRESM will be installed on the OC VAX 11/780. IRESM will be a general model applicable to a broad range of radar systems.

INPUT: Antenna parameters, number of bits in phase shifter, etc.

OUTPUT: Computer printouts, three dimensional plots, pattern cuts, histograms, numerical data.

MODEL LIMITATIONS: Any array which can be accurately modeled by an array of up to 1000 x 1000 sample points can be treated via this software package.

HARDWARE:
Type computer: Honeywell DP8/44D
Operating system: GCOS
Minimum storage: 1.9 million words
Peripheral equipment: Remote terminal

SOFTWARE:
Programming language: FORTRAN
Documentation identification: User's Manual, Program Maintenance Manual

POINT OF CONTACT: RADC/OCSA
Mr. John C. Cleary
Griffiss AFB NY 13441
AV 587-3573, 315-330-3573

CLASSIFICATION: Unclassified

TITLE: QM-1 Microprogrammable Computer

DEVELOPER: Nanodata Corporation

STATUS: Operational

PURPOSE: The Nanodata QM-1 minicomputer is designed to allow users to evaluate various computer architectures with the use of emulation technology.

GENERAL DESCRIPTION: The QM1 is microprogrammable on two levels (microcode and nanocode) and by properly utilizing this flexibility, maximum performance can be achieved. For ease of use, a Hardware Description Language (HDL) with high level language constructs called Smite is available. This language is used to describe the machine at the register transfer level (RTL) and compiles to QM1 microcode. There also exists a tool, the Meta Assembler which allows the user to create assembly language programs for his specific machine.

INPUT: Microcoded emulations of a specific computer architecture.

OUTPUT: The status of a machine at any given point in time (i.e., contents of PC, IR, memory location, etc.).

MODEL LIMITATIONS: All conventional computer architectures currently available can be created using the system (i.e., IBM 360, MIL-STD-1750A, MIL-STD-1862B, etc.).

HARDWARE:
Honeywell DPS-8 with the MULTICS operating system. DEC System-20 with the TOPS-20 operating system. The QM-1 microprogrammable computer is a TOPS-20 peripheral.

SOFTWARE:
Program language: The Smite compiler is written in PL1. The QM1 hosts several specific languages.
Documentation identification: Advanced Smite Reference Manual, RADC-TR-80-66. Meta Assembler, MDAC Meta Assembler User's Manual, Contract No. F09603-80-6-3987.

OPERATION: Smite Compiler is operated in on-line batch mode. The QM-1 is operated in real-time, interactively.

POINT OF CONTACT: RADC/COTC
Mr. Stephen M. Warzala
Griffiss AFB NY 13441
AV 587-2558, 2925; 315-330-2558, 2925

CLASSIFICATION: Unclassified

TITLE: QPRIM - QM-1 Programmer's Research Instrument System

DEVELOPER: USC/ISI

STATUS: Operational

PURPOSE: QPRIM is a facility which allows the interactive use of the RADC QM-1 microprogrammable computer by remote users via the ARPANET.

GENERAL DESCRIPTION: QPRIM provides an environment for running and debugging Smite-written emulators and their respective target software. QPRIM runs on a TOPS-20 operating system and uses the QM-1 microprogrammable computer as a backend emulator engine. QPRIM software allows users to examine and change all aspects of the target machine and many aspects of the QM1 host interactively.

INPUT: (1) A Smite compiled emulator, (2) a separate description of the emulator.

OUTPUT: The current state display of the target machine (i.e. contents of PC, IR, memory locations, etc.).

MODEL LIMITATIONS: N/A

HARDWARE: Dec System-20 with the TOPS-20 operating system. The QM-1 microprogrammable computer is a TOPS-20 peripheral.

SOFTWARE:
Programming language: BLISS
Documentation identification: Tool Builders' Manual

OPERATION: Interactive

POINT OF CONTACT: RADC/COTC
Mr. Stephen M. Warzala
Griffiss AFB NY 13441
AV 587-2558, 2925; 315-330-2558, 2925

CLASSIFICATION: Unclassified

TITLE: RADCLAM - Radar Clutter and Multipath Simulation Program

DEVELOPER: RADC/EECT

STATUS: Operational

PURPOSE: To predict the real time clutter power a radar will detect in a given terrain environment.

GENERAL DESCRIPTION: A computer program was developed to determine the amount of specular and diffuse multipath power reaching a monopulse receiver from a pulsed beacon and the associated boresight point error. Terrain inhomogeneities and multiple specular reflection points are included in the program.

The characteristics of electromagnetic signals scattered from rough terrain include contributions from clutter return and multipath return. These two aspects can be described by the theory of scattering from rough surfaces if properties of the terrain such as probability density function (PDF) for the surface height distribution, the covariance matrix, R, the variance in surface height, O, and the complex dielectric constant characterizing the surface are known. The numerous theoretical models of electromagnetic wave scattering from rough surfaces all relate the normalized cross section of terrain to the foregoing parameters characterizing the rough surface.

In this program the physical parameters of the rough surface are obtained from digitized terrain maps (furnished by the Electromagnetic Compatibility Analysis Center, ECAC, and the Defense Mapping Agency, DMA). Estimation theory is employed to specify the corresponding statistical parameters. A hypothesis testing procedure determines the PDF for the surface heights.

INPUT: Terrain data base as processed by ECAC computer programs, complex dielectric constants of terrain polarization of waves, wave frequency, height of receiver, trajectory of transmitter.

OUTPUT: Printout and plots

MODEL LIMITATIONS: Single scale of surface roughness.

HARDWARE:
Type computer: CDC6600, CYBER 750
Minimum storage: 60K
Peripheral equipment: Calcomp Plotter

SOFTWARE:
Programming language: FORTRAN
Documentation identification: RADC-TR-80-9, RADC-TR-80-300, RADC-TR-80-289

OPERATION: Batch or interactive

POINT OF CONTACT: RADC/EEC
Dr. R. Papa
Hanscom AFB MA 01731
AV 478-3735, 315-330-3735

CLASSIFICATION: Unclassified

TITLE: RADSIM - Radar Simulator

DEVELOPER: RADC/OCSA

STATUS: Operational

PURPOSE/DESCRIPTION: This model simulates waveforms and their interaction with chaff, targets, propagation effects and clutter. RADSIM will be installed on the OC VAX 11/780 and this will be integrated into IRESM.

INPUT: Waveform parameters, digital filter parameters, jammers, signal processing parameters.

OUTPUT: Computer printouts, three dimensional ambiguity plots, voltage and power plots.

MODEL LIMITATIONS: Fast Fourier Transform size of 512 by 512

HARDWARE:
Type computer: Honeywell DP8/44D
Operating system: GCOS
Minimum storage: 1.9 million words
Periperal equipment: Tektronix 4014 hooked to a HP-9820

SOFTWARE:
Programming language: FORTRAN
Documentation identification: User's Manual, Program Maintenance Manual

POINT OF CONTACT: RADC/OCTM
Mr. Stan Borek
Griffiss AFB NY 13441
AV 587-4431, 315-330-4431

RADC/OCSA
Mr. John C. Cleary
Griffiss AFB NY 13441
AV 587-3573, 315-330-3573

CLASSIFICATION: Unclassified

TITLE: RNET - Radar Network

DEVELOPER: Decision-Science Applications, Inc.

STATUS: Installation on VAX 11/780 is underway.

PURPOSE: Analysis of Tactical Sensor Networks to support evaluation of radar control algorithms.

GENERAL DESCRIPTION: One sided, deterministic, time step, LAND/AIR. Faster than real time.

INPUT: Radar and communications parameters and aircraft cross section and flight dynamics parameters.

OUTPUT: Graphics on TEK 4110 plus hardcopy of all displays and raw data.

MODEL LIMITATIONS: 100 aircraft, 20 radars, no geography.

HARDWARE:
Type computer: VAX 11/780
Operating system: VMS
Minimum storage: 256K
Peripheral equipment: TEK 4014 or equivalent

SOFTWARE:
Programming language: FORTRAN
Documentation identification: RNET User's Manual

OPERATION: Interactive, real time

POINT OF CONTACT: RADC/OCDS
Lt Swietek
Griffiss AFB NY 13441
AV 587-4441, 315-330-4441

CLASSIFICATION: Unclassified

TITLE: SARF - Spaced Array Radio Frequency

DEVELOPER: RADC/OCSA

STATUS: Operational

PURPOSE/DESCRIPTION: A computer model was developed for simulating the RF performance of large aperture Space Based Radar (SBR) systems. This software was based on the PAAS software. The antenna feed, quantitization effects, multipath and various errors are included in the model. Structural deformations can be simulated to determine the effects on RF performance. The model is very general and not limited to SBR systems. This will be integrated into IRESM.

INPUT: SBR aperture parameters, aperture deformation

OUTPUT: Computer printouts, three dimensional plots, pattern cuts, histograms, numerical data

MODEL LIMITATIONS: Any array which can be accurately modeled by an array of up to 1000 x 1000 sample points can be treated via this software package.

HARDWARE:
Type computer: VAX 11/780
Operating System: VMS 3.3
Minimum storage: 2.1 million words
Peripheral equipment: Remote terminal

SOFTWARE:
Programming language: Fortran (1 MACRO subroutine)
Documentation identification: User's Manual

POINT OF CONTACT: RADC/OCSA
Mr. John C. Cleary
Griffiss AFB NY 13441
AV 587-3573, 315-330-3573

CLASSIFICATION: Unclassified

TITLE: SBRCOV - Spaced Based Radar Coverage

DEVELOPER: RADC/OCSA

STATUS: Operational

PURPOSE/DESCRIPTION: A computer model was developed to determine the detection coverage of targets from a Space Based Radar. The coverage is plotted on a map of the world. The software for plotting on the map of the world is separate and can be used for other applications.

INPUT: Number of orbits, orbital parameters, map parameters, number targets and locations.

OUTPUT: Target tracks and detection on a global map.

MODEL LIMITATIONS: 10 targets, 60 satellites

HARDWARE:
Type computer: VAX 11/780
Operating system: VMS 3.3
Minimum storage: 2.8 million words
Peripheral equipment: Tektronix 4014 Terminal and Tektronix 4631 Hardcopier.

SOFTWARE:
Programming language: FORTRAN
Documentation identification: N/A

POINT OF CONTACT: RADC/OCSA
Mr. John C. Cleary
Griffiss AFB NY 13441
AV 587-3573, 315-330-3573

CLASSIFICATION: Unclassified

TITLE: TAC Controller

DEVELOPER: Westinghouse Corporation

STATUS: Operational

PURPOSE: A digital computer simulation of complete C^3 system operating in user-specified battle scenario.

GENERAL DESCRIPTION: The TAC Controller is a large scale software simulation model directed towards providing an assessment of meaningful mass air raids as applied to the TAC 407L/412/E-3A configuration missions and vulnerability as developed in USAF. Predefined threat scenarios as they affect air defense, system detection, capability and ECCM are exercisable options. Input parameters consist of friendly/hostile force structures, radars, air bases, E-3A, AAA, SAMS, communication network data and the ECM/ECCM environments. Output parameters consist of system survivability, network communication data, radar track statistics, track handover data, missile site data, resource statistics and second day battle resources and allocation data files.

To expedite performance assessment of an operational scenario(s), the Tektronix (TK) 4054 interactive graphic computer facility model provides a user interactive operation capability to conduct detailed analyses from a system to subsystem level on an interactive graphics display. User friendly, the graphics routines provide insight for the system analyst to determine measures of effectiveness (MOE's), system requirements and recommend solutions.

The TAC Controller, executable on the RADC/HI 6180, is supported (on-Center) by FORTRAN, under the GCOS operating system. The TK 4054, equipped with Option 30 interactive graphics board, is supported by Extended-Basic Plots 10 and 50. The graphics display is capable of interfacing with the TAC Controller post-processed data, to provide:

a. flight paths of friendly/hostile aircraft;

b. radar detection coverage diagrams for clear and jamming environments;

c. time snapshots battle statics such as; number and spatial density distribution of a/c, number engaged, destroyed, reached objective(s).

INPUT: Components of major systems (407L, 485L, 412L and E-3A) are communication FACPs, CRP, CRC, SAMS and ECM tactics.

OUTPUT: C^3 vulnerability, enhanced survivability, intercept efficiency red tactics and system responses.

MODEL LIMITATIONS: None.

HARDWARE:
Type computer: HI 6180
Operating system: GCOS
Minimum storage: 89K Bytes

SOFTWARE:
Programming language: FORTRAN IV
Documentation: User's Manual, Documented Sample Cases

POINT OF CONTACT: RADC/OCTM
Mr. George Ellis
Griffiss AFB NY 13441
AV 587-4433, 315-330-4433

CLASSIFICATION: Unclassified

TITLE: TACOM II - Tactical Communication Simulation Model II

DEVELOPER: Hazeltine Corp, original version. Modifications performed in-house.

STATUS: Operational

PURPOSE: Analysis of communication system effectiveness in a tactical environment and mission effectiveness as a function of communication link performance.

GENERAL DESCRIPTION: The TACOM II model is a free play, dynamic, event keyed model of the tactical ultra high frequency (UHF) communication air/air, air/ground/air environment. The model employs spread spectrum modem and adaptive array antenna signal processors on a tactical aircraft in a dynamic tactical electronic warfare environment. Unit types which are modeled include friendly and hostile fighters, close air support aircraft, surface to air missiles, jammers, forward observers, forward air controllers, tactical air control party, command and reconnaissance posts and tanks. The TACOM II simulation models factors such as: ground multipath, obstacles, diffraction over obstacles, airframe scattering, signal propagation losses, radar, and visual sensors (the pilot's field of vision). The graphic outputs of the model are used to evaluate system performance in a given tactical environment. These include, areas of usable communication throughout the aircraft flight profiles, adaptive antenna pattern plots, jammer to signal ratio (J/S) plots of the effectiveness of the adaptive antenna with respect to an omni antenna along the flight profile. Other ways of evaluating system effectiveness are the number of enemy targets destroyed and the number of returning friendly aircraft.

INPUT: A close air support or air interdiction scenario including TACP, CRP, FAC, SAM, tanks, A-10 aircraft, F-15 aircraft, forward observers, CRC, and air to air missiles.

OUTPUT: Computer printout, plots, raw data, statistically analyzed data.

MODEL LIMITATIONS: Maximum number of units is 41, frequency range of communication systems is VHF to UHF.

HARDWARE:
Type computer: Honeywell 6180
Operating system: MULTICS
Minimum storage: 20K lines of source code
Peripheral equipment: 4014 Tektronix Terminal

SOFTWARE:
Programming language: FORTRAN IV
Documentation identification: Computer Operational Manual For Tactical Communication Model II (RADC-TR-80-264), and Tactical Communications System Analysis II (RADC-TR-80-321).

OPERATION: Real time and/or interactive.

POINT OF CONTACT: RADC/DCCD
Mr. R. Hinman
Griffiss AFB NY 13441
AV 587-3225, 315-330-3225

CLASSIFICATION: Unclassified

TITLE: TASRAN - Tactical Air Surveillance Radar Netting

DEVELOPER: General Research Corporation

STATUS: Completed, Debugged, Full Verification & Validation Done.

PURPOSE: Evaluate netted tactical air surveillance configurations with arbitrary types and number of radars, aircraft and communication links.

GENERAL DESCRIPTION: TASRAN is a computer simulation for evaluating netted tactical air surveillance systems. The system can acquire and track friendly and hostile aircraft in a realistic threat environment. Networks of arbitrary configurations can be designed and examined against threat scenarios that include aircraft, jammers, and ground targets. TASRAN can also act as an emulator. It will accept actual radar measurements or radar track messages in standard formats and process these along with simulated measurements and simulated tracks. Tactical air operations which this system is designed to implement includes close air support, air interdiction, counter air, air reconnaissance, and tactical air lift.

The data processing functions of radar detection, track initiation and correlation, and automatic target tracking are performed, not just simulated, on the simulated measurements from the network of radars. Communication from site to site can be modeled in various levels of detail. There can be simple message routing to resource sharing or delays to detailed calculations of propagation and jamming degradation. Simulation output can be summarized in printed tables or in interactive displays at a tektronix graphics terminal.

A contractual study is currently underway to enhance the existing in-house TASRAN software simulation/emulation facility by including the following new or modified modules, to feature; the E-3A Radar Performance, Network Self-Registration, Scenario, Engagement, Crosstell and Identification, Jammer Location, ESM, Display, Tracking and Navigation and Communication; and Advanced Airborne Surveillance Radar (AASR) including AASR platforms and conformal arrays; and the Ballistic Missile Early Warning (BMEWS) detection and tracking radars, threat scenario (missile/satellite) detection and tracking algorithms and a display capability.

The TASRAN enhancement model will reside on the RADC/OC/VAX 11/780 computer facility.

INPUT: Radars, radar data processors, control module data processor, scenario communication network.

OUTPUT: Radar track data, radar data file, system data file, specific radar netting configurations.

MODEL LIMITATIONS: None

HARDWARE:
Type computer: HI 6180
Operating system: MULTICS
Minimum storage: 1500 words
Peripheral equipment: Tektronix 4054

SOFTWARE:
Programming language: CIFTRAN/FORTRAN
Documentation identification: Technical Memoranda, User's Manual, Analyst's Manual, Mangement Summary, Technical/Programming Manual, Documented Sample Cases, Test/Verification/Validation Reports.

OPERATION: Interactive

POINT OF CONTACT: RADC/OCTM
Mr. George Ellis
Griffiss AFB NY 13441
AV 587-4433, 315-330-4433

CLASSIFICATION: Unclassified

TITLE: Traffic Simulator (replaces TSE Traffic Simulator for Experimental Integrated Satellite Network (EISN))

DEVELOPER: Western Union

STATUS: In-Test (A/O Nov 83)

PURPOSE: The Traffic Simulator was designed as a generalized means for generating, in real time, communications events such as telephone calls, telex and host transmissions. As delivered it is equipped with the required electrical and protocol interfaces so that it ties directly into the Integrated Node located in the Communications Division Switching Laboratory. It is intended to provide the means to experiment with multi-user systems where it is desirable to emulate many independent sources which are driving some communications device under test. It generates these communications events with a statistical distribution determined by the user. It produces statistics as the user sees the system, i.e. in terms of delays, traffic throughput, etc.

GENERAL DESCRIPTION: The Traffic Simulator is made up of two major hardware subsystems: a Host PDP 11/44 and several UMC Z80 Microprocessors. The Host serves several functions and is the heart of the simulator. It interacts with the user in defining; the line configuration, the call/message/packet generation statistics, desired data, test run length and similar test definition functions. It will initiate the test at the time requested and for the length specified. At the times calculated, based upon the initial inputs, it will generate "tickets" that completely determine a call, its length, etc., which are then passed to the microprocessors which have the required interface software previously loaded by the host processor. The microprocessors act as the "user" and for all practical purposes it is a real user to the system under test.

INPUT: Operator interface is accomplished via a VT 100 Terminal.

OUTPUT: System is presently configured to operate full duplex with the following interfaces:

a. DCS AUTODIN MODES I and II (75 - 9600 baud)
b. HDLC
c. X.25
d. SDLC
e. ADCCP
f. EISN ADCCP
g. BISYNC
   (2-7 above can operate 1200 - 64000 baud)
h. CVSD Voice at 19.2 or 38.4 BPS (unique signalling used)

MODEL LIMITATIONS: Comes equipped with twelve UMC-Z80s which can be configured as desired.

HARDWARE:
Type computer: PDP 11/44
Operating System: RSX-11M
Minimum storage: 256K Bytes
Peripheral equipment: Line Printer, Disk Storage, Tape Drives, Cassette Drive, Operator Terminal

SOFTWARE:
Programming language: FORTRAN, Z80 Assembly Language
Documentation identification: User's Manual, Operator's Manual, Design Specifications, Final Technical Report

OPERATION: Via the VT 100 Operator's Terminal

POINT OF CONTACT: RADC/DCLF
Mr. John Salerno
Griffiss AFB NY 13441
AV 587-7751, 315-330-7751

CLASSIFICATION: Unclassified

TITLE: Tropo ECM Simulator - Troposcatter Electronic Counter Measures Simulator

DEVELOPER: Signatron, Inc.

STATUS: Operational

PURPOSE: To provide jamming sources, combined with signals from the tropo simulator, so to create an ECM environment for T&E of tropo radio equipment at 70 MHz IF, and/or 4.4-5.0 GHz RF.

GENERAL DESCRIPTION: The Tropo Electronic Counter Measures (ECM) Simulator operates in conjunction with a Troposcatter channel simulator to simulate in a laboratory environment Troposcatter communication with jamming. The jamming source module of the Line of Sight (LOS) ECM Simulator may be used to provide an additional direction of jamming. The Tropo ECM Simulator creates an ECM environment for test and evaluation of tropo radio equipment at a 70 MHz intermediate frequency (IF) and receivers at a 4.4-5.0 GHz radio frequency (RF).

Four major components make up the Tropo ECM Simulator. First, there is the Dual Tropo Jammer Source which generates IF signals to simulate a jammer broadcasting to a Troposcatter receiver. The Jammer Delay-Combiner is the second major section. This section combines the IF communication signals with appropriately delayed IF jammer signals for simulation of off-axis jamming. The third major section is the IF/RF interface which converts the previously mentioned combined IF signals to RF for testing of receiver front ends. The fourth major section is the power supply section.

INPUT: Analog in

OUTPUT: Analog out

MODEL LIMITATIONS:

a. IF: 70 MHz
b. BW: + 12.5 MHz
c. RF: 4.4-5.0 GHz
d. Only one jammer type can be used at a time, unless the jamming source module of the LOS ECM simulator is used to provide an additional direction of jamming.
e. Given three jamming source modules a total of three directions of jamming can be accommodated.

HARDWARE:

Type computer: Unique dedicated hardware design
Operating system: N/A
Minimum storage: N/A
Peripheral equipment: N/A

SOFTWARE:
Programming language: N/A
Documentation identification: Technical Report, Operating/ Maintenance Manual.

OPERATION: Real time, direct connection to equipment undergoing test.

POINT OF CONTACT: RADC/DCLF
Mr. Peter K. Leong
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: Unclassified.

TITLE: Troposcatter Channel Simulator

DEVELOPER: Signatron, Inc.

STATUS: Operational

PURPOSE: To provide synthetic medium simulation of the troposcatter channel for direct connection T&E of tropo modems at IF of 70 MHz with 10 MHz BW. UP to eight diversities can be provided.

GENERAL DESCRIPTION: The Troposcatter Channel Simulator was developed in 1973. It is a versatile laboratory quality instrument which will provide accurate and repeatable simulation of multipath effects typical of troposcatter communication links. The Troposcatter Channel Simulator is designed to be used between modem equipment operating at an intermediate frequency of 70 MHz and with a signal bandwidth of up to 10 MHz. It was updated to provide simulation of up to three tandem links, input-output linearization for AM-like modems, correlations of diversity outputs, and up to eight diversities. The completion date of the modifications was in June 1981. Previously, it was used for test and evaluation of tropo modems/terminal equipment.

INPUT: Analog signals in

OUTPUT: Analog signals out

MODEL LIMITATIONS: Model: wide sense stationary uncorrelated scattering (Bello) model implemented as tapped delay line model.

HARDWARE:
Type computer: Unique dedicated hardware design
Operating system: N/A
Minimum storage: N/A
Peripheral equipment: N/A

SOFTWARE:
Programming language: N/A
Documentation identification: Technical Report, Operating/ Maintenance Manual with detailed schematics.

OPERATION: Real time

POINT OF CONTACT: RADC/DCLF
Mr. Peter K. Leong
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: Unclassified

TITLE: Wideband Line-of-Sight (LOS) Channel Simulator

DEVELOPER: CNR

STATUS: Operational

PURPOSE: T&E of modems designed to operate over LOS (line-of-sight) channels, i.e. point-to-point microwave, satellite, UHF and microwave aircraft channels.

GENERAL DESCRIPTION: The Wideband Line-of-Sight (LOS) Channel Simulator is a means for evaluating wideband digital modems designed to operate over LOS channels. The types of LOS channels handled by the system include: airplane-airplane, ground-airplane, ground-ground, and airplane-satellite. In addition, the simulator allows the introduction of controlled amounts of nonlinearity, phase jitter, and frequency offset. The simulator operates at selectable intermediate frequencies (IF) of 70, 300, or 700 MHz. Signal bandwidths up to 100 MHz may be accommodated at the two higher IF frequencies, while at 70 MHz, bandwidths up to 25 MHz may be handled.

INPUT: Via VT 50 CRT

OUTPUT: Magnetic tape

MODEL LIMITATIONS: Simple operation only.

HARDWARE:
Type computer: PDP 11/40
Operating system: RSX-11M
Minimum storage: 8K by 16 bit internal memory
Peripheral equipment: VT 50 CRT

SOFTWARE:
Programming language: Assembly and FORTRAN
Documentation identification: Operator's Manual, Technical Report

OPERATION: Real time

POINT OF CONTACT: RADC/DCLF
Mr. John Evanowsky
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: Unclassified

TITLE: Wireline Simulator

DEVELOPER: Dynatron, Inc.

STATUS: Operational

PURPOSE: T&E of telephone channel modems or other VF devices. Any amplitude and delay characteristic may be programmed. Simulator then is capable of introducing impairments such as phase jitter, noise, harmonic distortion, etc.

GENERAL DESCRIPTION: The Wireline Simulator is a real-time hardware/software simulation consisting of digital and special purpose processor components. It accepts analog input from wireline modems or other voice frequency (VF) devices. The Wireline is used for test and evaluation of telephone channel modems or other VF devices. Any amplitude and delay characteristic may be programmed. Thus, the simulator is capable of introducing impairments such as phase jitter, noise, and harmonic distortion.

The digital hardware portion was built in 1969 implementing about half the telephone channel parameters presently available. A second contract in 1976 incorporated the special purpose processor for the remaining parameters. The Wireline Simulation has been actively used since 1969 in DICEF evaluation.

OUTPUT: DECWRITER Hard Copy echo of simulator characteristics requested by operator. Technical data on modem performance manually collected and recorded by operator.

MODEL LIMITATIONS: Simplex operation only; two wires, balanced 600 ohm in, two wires balanced 600 ohm out.

HARDWARE:
Type computer: DEC PDP 8A
Operating system: Possesses its own self-contained, tailored operating system internal to the simulator.
Minimum storage: 8K by 12 bit internal memory
Peripheral equipment: DECWRITER Hard Copy

SOFTWARE:
Programming language: FORTRAN
Documentation identification: Complete documentation available in DICEF

OPERATION: Real time

POINT OF CONTACT: RADC/DCLF
Mr. James J. McEvoy
Griffiss AFB NY 13441
AV 587-4567, 315-330-4567

CLASSIFICATION: Unclassified

SECTION III

SURVEY RESULTS SUMMARY TABLE

RADC
SIMULATION SURVEY RESULTS

Simulation/Model Name	Office Symbol and (OPR)	Application Area	Language and (Machine)	Documentation	Operating System	Status
ASE	IRRP (Converse)	Sensor Correlation Analysis	FORTRAN (VAX 11/780)	ASE Final Report	VMS	Operational
C^3SAM	COAD (Smith)	Functional Analysis of TACS	COBOL (H8/44D)	User's Manual	GCOS	Operational
DATOMUT	EECT (Papa)	Ground Based Unattended Radars	FORTRAN (CDC 6600)	Report	CDC 6600	Operational
DDG	COAA (Maziarz)	Airborne PAVE MOVER Radar	FORTRAN-77 ASSEMBLY (VAX 11/780)	None yet	VMS	Under Development
DGTS	IRRP (Papagni)	Battlefield Scenarios	PASCAL (VAX 11/780)	BAS DGTS, Final TR	VMS	Operational
DSS	COTD (Baskinger)	Performance Analysis of Computer Networks	ECSS II SIMSCRIPT II.5 (VAX 11/780)	User's Manual, Computer Operations Manual	VMS	Operational

RADC
SIMULATION SURVEY RESULTS

Simulation/Model Name	Office Symbol and (OPR)	Application Area	Language and (Machine)	Documentation	Operating System	Status
EHF and SHF Link Analysis Program	DCCD (Akins)	Radio Propagation	FORTRAN (H6180)	EHF and SHF Link Analysis Programs (RADC-TM-83-10)	MULTICS	Operational
FAP	IRAE (Hartnett)	Architecture to Support ELINT Simulations in an ELINT Environment	FORTRAN (H8/44D, PDP 11/70)	FAP	GCOS, RSX-M	Operational
GEMACS	RBCT (Siarkiewicz)	Electromagnetic Model	FORTRAN (H6180)	Technical Report	GCOS	Version 3 Under Validation
HF Media Simulator	DCLF (Evanowsky)	HF Comm Equipment Design & Analysis	FORTRAN (DEC PDP 11/40)	HF Channel Simulator Operation Handbook	V3.1	Operational
IAM	IRDT	Situation assessment in an I&W Environment	FORTRAN (PDP 11/70)	N/A	IAS	Under Development

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SIMULATION SURVEY RESULTS

Simulation/Model Name	Office Symbol and (OPR)	Application Area	Language and (Machine)	Documentation	Operating System	Status
ICNAS	DCLF (Mortara)	Communication Networks Performance Analysis	FORTRAN IV and DEC Datatrieve (PDP 11/70)	User's Manual, Program Maintenance Manual, Database Spec, System/Subsystem Spec, Final TR	RSX 11-M	Under Development, Expected delivery date Dec 83
ICS	DCLF (Leong)	Comm Links/ Processing	FORTRAN ASSEMBLY (PDP 11/40, Array Processor 120B)	Program Listings, TR, TMs	RT-11, RSX 11-M	Operational
ICSSM	DCLF (Leong)	Comm System Design & Analysis	FORTRAN (H6180)	TR, Functional Description, System/ Subsystem Specs	MULTICS	Operational
IEMCAP	RBCT (Capraro)	Electromagnetic Compatibility Analysis	FORTRAN (H6180)	Engineering Manual, User Manual	GCOS	Operational

RADC
SIMULATION SURVEY RESULTS

Simulation/Model Name	Office Symbol and (OPR)	Application Area	Language and (Machine)	Documentation	Operating System	Status
IN	DCLF (Salerno)	Switching Techniques Analysis	ASSEMBLY (PERKIN-ELMER 8/32)	Operations Manual	OS32MT, Rev. 5.2	Operational
ISL	IRDA (Weber)	Intelligence Information System	FORTRAN, COBOL (PDP 11, VAX 11/780)	Intelligence Info Processing Lab Plan, 1 Aug 83	IAS, VMS	Under Development, Anticipated FY86
LOS ECM SIMULATOR	DCLF (Leong)	LOS Comm Design & Analysis	N/A	TR, Operating/ Maintenance Manual with Schematics and Parts List	N/A	Operational
NCAP	RBCT (Valente)	Frequency Domain Analysis of Electronic Circuits	FORTRAN IV (H6180)	RADC-TR-79-245, Vol II	GCOS	Verified and Available

RADC
SIMULATION SURVEY RESULTS

Simulation/Model Name	Office Symbol and (OPR)	Application Area	Language and (Machine)	Documentation	Operating System	Status
PAAS	OCSA (Cleary)	Parametric Analysis of Antennas	FORTRAN (H6180)	Reports	GCOS	Operational
QM1 MICROPROGRAMMABLE COMPUTER	COTC (Warzala)	Microprocessor Analysis	PL1 (HDPS-8, DEC System 20)	MDAC Meta Assembler, User's Manual	MULTICS, TOPS-20	Operational
QM1 PROGRAMMER'S RESEARCH INSTRUMENT SYSTEM	COTC (Warzala)	Emulation of Digital Computer Architectures	DEC System 20	Tool Builder's Manual	TOPS-20	Operational
RADCLAM	EEC (Papa)	Electromagnetic Signals	FORTRAN (CDC 6600, CYBER 750)	Reports	CDC 6600	Operational
RADSIM	OCSA (Borek, Cleary)	Waveform Simulation	FORTRAN (HDP8/44D)	Reports	GCOS	Operational

RADC
SIMULATION SURVEY RESULTS

Simulation/Model Name	Office Symbol and (OPR)	Application Area	Language and (Machine)	Documentation	Operating System	Status
RNET	OCDS (Swietek)	Tactical Sensor Networks Analysis	FORTRAN (VAX 11/780)	RNET User's Manual	VMS	Installation on VAX 11/780 is Underway
SARF	OCSA (Cleary)	Simulates RF Performance of Space Radar Systems	FORTRAN (VAX 11/780)	Reports	VMS 3.3	Operational
SBRCOV	OCSA (Cleary)	Detection Coverage of Targets from a Space Based Radar	FORTRAN (VAX 11/780)	Reports	VMS 3.3	Operational
TAC CONTROLLER	OCTM (Ellis)	Tactical Surveillance Systems Analysis	FORTRAN IV (H6180)	User's Manual, Documented Sample Cases	GCOS	Operational

RADC
SIMULATION SURVEY RESULTS

Simulation/Model Name	Office Symbol and (OPR)	Application Area	Language and (Machine)	Documentation	Operating System	Status
TACOM II	DCCD (Hinman)	Tactical Comm System Effectiveness Analysis	FORTRAN IV (H6180)	Operational Manual for TACOM II, Tactical Comm System Analysis II	MULTICS	Operational
TASRAN	OCTM (Ellis)	Tactical Surveillance Systems Netting Analysis	CIFTRAN/ FORTRAN (H6180)	TM, User's Manual, Analysts Manual, Management Summary, Technical/Programming Manual, Documented Sample Cases, Test/ Verification/Validation Reports	MULTICS	Completed, Debugged, Full Verification and Validation Done
TRAFFIC SIMULATOR	DCLF (Salerno)	Communications Traffic Loading Analysis	(PDP 11/44, UMC Z80 Micros)	Unknown	RSX 11-M	In-Test (a/o Dec 83)
TROPO ECM SIMULATOR	DCLF (Leong)	*Tropo* Analysis within ECM Environment	N/A	Operations/Maintenance Manual & TR	N/A	Operational

RADC
SIMULATION SURVEY RESULTS

Simulation/Model Name	Office Symbol and (OPR)	Application Area	Language and (Machine)	Documentation	Operating System	Status
TROPOSCATTER CHANNEL SIMULATOR	DCLF (Leong)	Tropo Comm Design and Analysis	N/A	TR, Operating/ Maintenance Manual	N/A	Operational
WIDEBAND LOS SIMULATOR	DCLF (Evanowsky)	LOS Modem Analysis	FORTRAN ASSEMBLY (PDP 11/40)	Operations Manual/TR	RSX 11-M	Operational
WIRELINE SIMULATOR	DCLF (McEvoy)	Telephone Channel Modem Analysis	FORTRAN (PDP 8A)	Operations Manual	Possesses Own Self-Contained, Tailored OS	Operational

APPENDIX I

QUESTIONNAIRE

SURVEY OF MODELS/SIMULATIONS AT RADC

TITLE: (Acronym followed by full name)

DEVELOPER: (Organization/Corporation which developed current version of the model)

STATUS: (State whether operational, under development, under validation or specify expected delivery date)

PURPOSE: (Anaysis/training), (Manual/computerized/computer assisted), (General or limited war/politico-military/logistics/damage assessment)

(This section should contain a brief narrative covering the above, the role the model plays and the primary and secondary problem the model addressed)

GENERAL DESCRIPTION: (One/two sided), (Deterministic/stochastic/mixed), (Time step/ event store), (Land/air/sea/paramilitary/civilian/etc.)

(This section is a brief narrative covering the above, level of unit/personnel/ equipment/target aggregation, level of exercise, ratio of game time to real time and primary solution techniques)

INPUT: (For example, scenario, weapons, characteristics, troop unit size, arrival dates)

OUTPUT: (Computer printout, plots, raw data, statistically analyzed data)

MODEL LIMITATIONS: (e.g., number of targets, no geography)

HARDWARE:

- Type computer:
- Operating system:
- Minimum storage:
- Peripheral equipment:

SOFTWARE:

- Programming language:
- Documentation identification:
- Documentation availability:

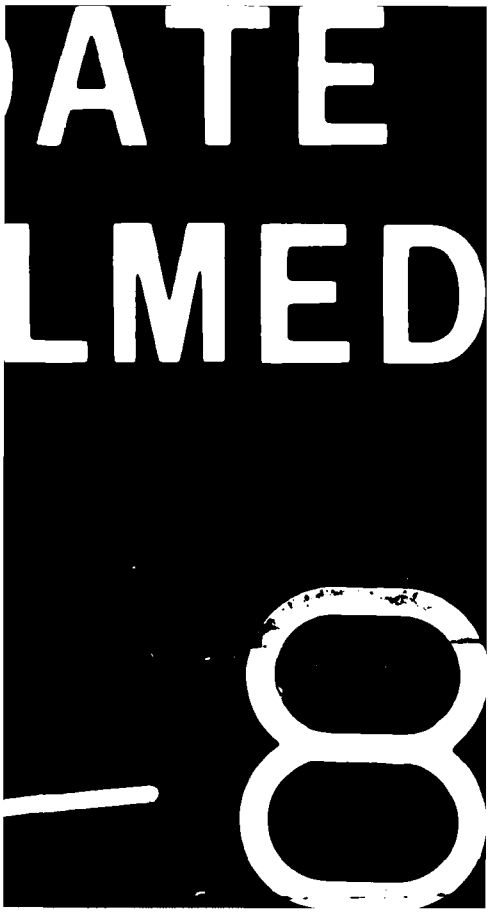
OPERATION: (Identify the type of operation required, i.e. batch, real time, and/or interactive)

POINT OF CONTACT: (List organization, address, and telephone number from which additional information can be obtained. Office symbols where applicable should be included.)

SECURITY CLASSIFICATION: (Identify the security classification level of the model/simulation i.e. Unclassified, Confidential, Secret, etc.)

MISSION
of
Rome Air Development Center

RADC plans and executes research, development, test and selected acquisition programs in support of Command, Control Communications and Intelligence (C^3I) activities. Technical and engineering support within areas of technical competence is provided to ESD Program Offices (POs) and other ESD elements. The principal technical mission areas are communications, electromagnetic guidance and control, surveillance of ground and aerospace objects, intelligence data collection and handling, information system technology, ionospheric propagation, solid state sciences, microwave physics and electronic reliability, maintainability and compatibility.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