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.

Because of the size of this document, it has been divided into three volumes. Volume I contains pages 1 - 303, Volume II contains pages 305 - 541, and Volume III contains pages 543 - 791.

RADC-TR-80-195, Volume III (of three) has been reviewed and is approved for publication.

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This report is a compilation of presentation materials used during the 2-day "Industry Looks at RADC" briefings given on 3 - 4 June 1980. Projected RADC areas of contractual opportunity for FY 81 - 82 are given.
DIRECT DIGITAL TARGETING

PRESENTED BY: MAJ. A. C. CRANE, JR.

RADC/IRR
DIRECT DIGITAL TARGETING

PROGRAM GOALS: DEVELOP AND DEMONSTRATE A CAPABILITY TO PERFORM AUTO AND SEMI-AUTO
TARGET CUING, DETECTION, IDENTIFICATION, PRECISE LOCATION AND
REPORTING FROM NEAR-REAL-TIME DIGITAL IMAGERY SENSORS.

TECHNICAL AREAS: - DIGITAL IMAGE EXPLOITATION
                    - MASS STORAGE AND RETRIEVAL
                    - PRECISE TARGET LOCATION

PROGRAMS:                 FUNDING FY81 - FY86
                          (IN MILLIONS)

6.2                      $ 4.43
6.3                      $19.95
TECH BASE FOR DIRECT DIGITAL TARGETING (DDT)

OBJECTIVE: PULL EXISTING TECH BASE TOGETHER AND FOCUS ON THE CAPABILITY TO
ACCOMPLISH NEAR REAL TIME DIGITAL IMAGERY EXPLOITATION IN 5 MIN WITH
< 50 FT TARGET LOCATION ACCURACY.

RATIONALE: A USAF CAPABILITY TO PERFORM TARGET DETECTION, IDENTIFICATION,
PRECISE LOCATION, AND REPORTING IN A NEAR-REAL-TIME OPERATIONAL
SCENARIO DOES NOT EXIST.

PAYOFF:
- TECHNOLOGY TO DETECT, ID, LOCATE, REPORT ON TARGETS IN NRT IN ALL
WEATHER.

- PROVIDE TECHNOLOGY FOR A COMMON SYSTEM, (I.E., NOT SENSOR/MISSION
UNIQUE GROUND EXPLOITATION SYSTEMS) TO SUPPORT TACTICAL AND
STRATEGIC FORCES.
TECH BASE FOR DIRECT DIGITAL TARGETING

TECHNICAL APPROACH:

INTEGRATE DEVELOPMENTS IN
- PATTERN RECOGNITION
- TARGET DETECTION/IDENTIFICATION
- MASS STORAGE & RETRIEVAL
- PRECISE TARGET LOCATION
- NRT REPORTING
- C³I INTERFACE

LABS/FIELD DEMONSTRATION
- MODULAR
- USER INTERACTION
- EXPLOITATION OF ALL DIGITAL IMAGERY SENSORS

ALTERNATIVES
- CONTINUE WITH CURRENT SYSTEM TO DEVELOP UNIQUE END ITEMS
- SURVIVABILITY (REDUNDANCY), MAINTENANCES, TRAINING PROBLEMS.

WHY DDT
- THE COMMON SYSTEM APPROACH PROVIDES A MORE COST EFFECTIVE,
  RESPONSIVE AND SUPPORTABLE OPERATIONAL CAPABILITY.
DIRECT DIGITAL TARGETING

BLOCK TITLE: DDT IMPLEMENTATION

OBJECTIVE: PROVIDE SUITABLE ENVIRONMENT AND FUNCTIONAL ARCHITECTURE TO PERMIT DEVELOPMENT AND DEMONSTRATION OF DDT AND C² NODE INTERFACES AND INTEROPERABILITY.

TECHNICAL APPROACH:
- EMPLOY MODULAR APPROACH
- START WITH AVAILABLE DIGITAL TECHNOLOGY
- INCORPORATE TECHNICAL IMPROVEMENTS
- PERFORM FUNCTIONAL TESTS USING ALL SOURCE IMAGE INPUTS

PAYOFF: HIGH
DIRECT DIGITAL TARGETING

BLOCK TITLE: DDT CONFIGURATION DESIGN

OBJECTIVE: DEFINE DDT FLOW PROCESSES AND FUNCTIONS; DEVELOP A CONFIGURATION CONCEPT TO PERMIT DEMONSTRATION. SIMULATION AND/OR EVALUATION OF THE USE OF NRT DIGITAL IMAGE DATA FROM THE SOURCE TO THE BATTLE COMMANDER.

TECHNICAL APPROACH: 
- PERFORM SCENARIO ANALYSES - NATIONAL AND TACTICAL SENSORS
- DEVELOP OVERALL PROCESS FLOWS
- TIMING OF OPERATIONS ANALYSIS
- ESTABLISH DEVELOPMENT NEEDS

PAYOFF: HIGH - WILL PERMIT ESTABLISHMENT OF WORK FUNCTIONS REFLECTING BEST ANALYSES OF USER REQUIREMENTS.
DIRECT DIGITAL TARGETING

BLOCK TITLE: AUTOMATIC DETECTION DEMONSTRATION AND TEST

OBJECTIVE: DEVELOP AND TEST TECHNIQUES AND EQUIPMENT TO ALLOW REAL TIME TARGET DETECTION WITHIN MINUTES OF OVERFLIGHT, FROM ALL SOURCE DIGITAL IMAGE DATA.

TECHNICAL APPROACH:
- DEVELOP AUTOMATIC TARGET DETECTION ALGORITHMS
- DEVELOP MANAGEMENT TECHNIQUES
- TEST AND IMPLEMENT
- FABRICATE CONSOLE - DEMONSTRATE R-T TARGET DETECTION
- WORK IN DYNAMIC ENVIRONMENT - MULTIPLE SOURCE INPUTS

PAYOFF:
- SENSOR INDEPENDENT R-T EXPLOITATION
- SUPPORT MOBILE TARGET STRIKES
DATA BASE DEPENDENT

WEAPON SYSTEM

IMAGE INTERPRETATION

DEPLOYABLE PHOTOGRAMMETRIC DATA BASE

C³I

XYZ
DIRECT DIGITAL TARGETING

**BLOCK TITLE:** DIGITAL IMAGE DATA BASE STORAGE AND RETRIEVAL (DIDB S&R)

**OBJECTIVE:**
- ESTABLISH S&R DEVICE DESIGN Specs
- DEVELOP S&R ALGORITHMS

**TECHNICAL APPROACH:**
- DETERMINE AND EVALUATE DATA FLOWS
- TRADE-OFF ANALYSES
- SELECT OPTIMUM PARAMETERS
- INCLUDE OPTICAL DISK AND HIGH DENSITY MAGNETIC TAPE

**PAY OFF:** HIGH - EFFORT WILL LOWER RISK OF S&R DEVICE DEVELOPMENT
DIRECT DIGITAL TARGETING

BLOCK TITLE: STORAGE AND RETRIEVAL DEVELOPMENT

OBJECTIVE: PROVIDE A MASS STORAGE AND RETRIEVAL MEDIUM TO ACCOMMODATE A DIGITAL IMAGE DATA BASE FOR THE TARGET LOCATION FUNCTION.

TECHNICAL APPROACH: PERFORM DETAIL DESIGN, FABRICATE AND INTEGRATE INTO THE DDT SYSTEM.

PAY OFF: HIGH. DDT OBJECTIVES DEPEND UPON THE AVAILABILITY OF HIGH DENSITY RAPID AND RANDOM ACCESS, RELIABLE DATA STORAGE AND RETRIEVAL MECHANISMS.
DIRECT DIGITAL TARGETING

**BLOCK TITLE:** DIGITAL POINT POSITIONING DATA BASE (PPDB) DEVELOPMENT

**OBJECTIVE:**
DEVELOP AN EXPERIMENTAL ALL DIGITAL POINT POSITIONING DATA BASE TO PROVIDE NRT PRECISE TARGET LOCATIONS FROM MULTI SENSOR RECCE IMAGERY.

**TECHNICAL APPROACH:**
- CONVERT WORKING SEGMENTS OF AVAILABLE HARDCOPY IMAGERY
- DEFINE DIGITAL FORMAT AND GENERATE DIGITAL PPDB
- STORE ON MASS STORAGE DEVICE
- RETRIEVE AND EXPLOIT - PERFORM EXPERIMENTS
- GENERATE SPECS FOR OPERATIONAL DIGITAL PPDB

**PAYOFF:**
- RAPID TARGET LOCATION OPERATIONS
- EXPERIMENTALLY ESTABLISHED DIGITAL PPDB REQUIREMENTS
- CONFIDENCE IN DESIGN PARAMETERS
DIRECT DIGITAL TARGETING

**BLOCK TITLE:** DIGITAL TARGET LOCATION DEVELOPMENT

**OBJECTIVE:** TO PROVIDE THE DESIGN, FABRICATION, AND TEST AND EVALUATION IN THE DDT ENVIRONMENT OF A CAPABILITY TO DERIVE PRECISE TARGET LOCATION INFORMATION IN NEAR-REAL-TIME.

**TECHNICAL APPROACH:**
- EMPLOY MODULAR APPROACH
  PERFORM SYSTEM DESIGN THAT INCLUDES DIGITAL IMAGE VIEWING, MENSURATION, POINT TRANSFER, PPDB STORAGE & RETRIEVAL
- FABRICATION OF SYSTEM
- TEST AND DEMONSTRATION

**PAY-OFF:**
- HIGH. PROVIDES NRT PRECISE TARGET LOCATION CAPABILITY
DIRECT DIGITAL TARGETING

BLOCK TITLE:  ADVANCED SENSOR MATH MODEL AND POSITION

OBJECTIVE:  IN CONJUNCTION WITH THE APPROPRIATE PROGRAM OFFICES DETERMINE THE AVAILABILITY, USABILITY, ACCURACY OF SENSOR ATTITUDE AND POSITION INFORMATION OF ADVANCED DATA LINKED IMAGING SYSTEMS IN REAL-TIME.

TECHNICAL APPROACH:
- DEVELOP ADVANCED IMAGING SENSORS GEOMETRIC MATH MODEL(S)
- PERFORM ERROR PROPAGATION ANALYSIS - ESTABLISH POINT POSITION ACCURACIES
- PERFORM SCENARIO ANALYSES WITH SENSOR POSITION AND ATTITUDE DATA

PAY OFF:  HIGH
DIRECT DIGITAL TARGETING

BLOCK TITLE: DIRECT LOCATION DESIGN

OBJECTIVE: TO DESIGN A POINT POSITIONING DATA BASE INDEPENDENT TARGET LOCATION CAPABILITY.

TECHNICAL APPROACH:
- BUILD ON ADV. SENSOR MATH MODEL AND POSITION STUDY
- BUILD ON DIGITAL SOFT COPY MENSURATION AND ANALYTICAL STUDIES
- DEVELOP DESIGN TO INTEGRATE TECHNOLOGIES
- DEVELOP SPECIFICATION FOR DIRECT TARGET LOCATION SYSTEM

PAY OFF:
- HIGH. WILL PROVIDE DIRECT TARGET LOCATION DESIGN PARAMETERS
- WILL REDUCE RISK OF FOLLOW-ON DEVELOPMENT
DIRECT DIGITAL TARGETING

OBJECTIVE: DDT APPLICATIONS TO MATO TO PROVIDE METRO REUSABLE TECHNOLOGY TO SATISFY THE REQUIREMENTS OF NAF AG SUBGROUP 6 IMAGERY INTELLIGENCE INITIATIVE TO DEVELOP A COMMON GROUND STATION TO SUPPORT IMAGERY RECONNAISSANCE EXPLOITATION.

TARGET LOCATION AND REPORTING.

TECHNICAL APPROACH: A LOW COST, MODULAR APPROACH THAT UTILIZES AVAILABLE DIGITAL TECHNOLOGY WILL BE UTILIZED. HARDWARE AND SOFTWARE TECHNOLOGY UPGRADES WILL BE INCORPORATED AS THEY BECOME AVAILABLE.

PAY-OFF: PROVIDE MATO WITH A COMMON TECHNOLOGY TO BE INCORPORATED INTO THE DESIGN AND PRODUCTION OF IMAGERY RECONNAISSANCE GROUND STATION. THIS WILL ASSURE SURVIVABILITY THROUGH FLEXIBILITY AND REDUNDANT CAPABILITIES IN TIME OF WAR.
DIRECT DIGITAL TARGETING
KEY PEOPLE

PROGRAM MANAGER - MAJOR ALFRED C. CRANE, JR./IRRA/X7024

DDT IMPLEMENTATION - MR. KEITH A. BUTTERS/IRRA/X6270
& CONFIGURATION DESIGN - MR. DONALD MOE/IRRA/X2476

AUTOMATIC DETECTION - MR. DONALD BUSH/IRRE/X3095
DEMONSTRATION & TEST

DIGITAL IMAGE DATA - MR. DONALD HALL/IRRA/X2476
BASE STORAGE & RETRIEVAL

STORAGE & RETRIEVAL - MR. ALBERT JAMBERDINO/IRAP/X4581
DEVELOPMENT

DIGITAL POINT POSITIONING - MR. DONALD HALL/IRRA/X2476
DATA BASE (PPDB) DEVELOPMENT/
DIGITAL TARGET LOCATION DEVELOPMENT

ADVANCED SENSOR MATH MODEL & POSITION - MR. DONALD MOE/IRRA/X2476

DDT APPLICATIONS TO NATO - MAJOR ALFRED C. CRANE, JR./IRRA/ 7024
TITLE: PRECISION GUIDANCE AND STRIKE PRODUCTS

PROGRAM GOALS: DEVELOP AUTOMATED CAPABILITY TO PROCESS, STORE, MAINTAIN AND FORMAT EARTH SURFACE DATA (TERRAIN, CULTURE, HYDROGRAPHY, POLITICAL, ETC.) IN SUPPORT OF WEAPON SYSTEM REQUIREMENTS FOR PLANNING, NAV/GUIDANCE, SENSOR SIMULATION/PREDICTION AND TARGETING.

TECHNICAL AREAS: . PHOTOGRAMMETRIC EXPLOITATION
. CARTOGRAPHIC EXPLOITATION
. SENSOR SCENE SYNTHESIS
. CARTO PROCESSING/DATA BASE/ARCHITECTURE

FUNDING (APPROXIMATE): FY81 THROUGH FY86
C.2 $12,500K
E.3 $31,500K
E.4 $26,000K
PRECISION GUIDANCE AND STRIKE PRODUCTS
(PHOTOGRAMMETRY)

AREA TITLE: HARD COPY PHOTOGRAMMETRY

OBJECTIVE: IMPROVEMENT OF IN-PLACE DNA PRODUCTION SYSTEMS VIA ENHANCEMENT
OF MENSURATION AND PROCESSING ACCURACIES AND INCORPORATION
OF ADDITIONAL SENSOR FORMATS.

EFFORTS: FY81 TA3 PJ RETROFITS
FY82 ACE IMPROVEMENTS

POC: RADG/IRMA/F. SCARANO 315-330-4203
PRECISION GUIDANCE AND STRIKE PRODUCTS
(PHOTOGRAMMETRY)

AREA TITLE: ANALYTICAL SOFTWARE

OBJECTIVE: PROVIDE PROCESSING TO SUPPORT THE INTEGRATION OF PHOTOGRAMMETRIC EQUIPMENT INTO A MORE EFFICIENT PRODUCTION POSTURE. DEVELOP ANALYTICAL MODELS TO INCORPORATE ADDITIONAL SENSORS INTO THE PRODUCTION PROCESS.

EFFORTS:

FY81 POTTS OPTIMIZATION
SAR COMPILATION
FY82 DISCONTINUOUS SURFACE FUNCTION ANALYSIS

POC: RADC/IKRA/F. SCARANO 315-330-4203
PRECISION GUIDANCE AND STRIKE PRODUCTS
(PHOTOGRAPIETY)

AREA_TITLE: SOFTCOPY PHOTOGRAMMETRY

OBJECTIVE: TECH BASE DEVELOPMENT IN DIGITAL STEREO IMAGE EXPLOITATION
METHODS INCLUDING IMAGE VIEWING CONCEPTS, GEOMETRIC DEFINITIONS,
AND Image MATCHING PROCESSES IMPLEMENTATION OF PRODUCTION
SOFTCOPY PHOTOGRAMMETRIC SYSTEMS.

EFFORTS:
FY81 POINT INFORMATION MAINTENANCE SYSTEM
UNIVERSAL RECTIFIER DEVELOPMENT.
FY82 PPDB ALTERNATIVE STUDY
AERONAUTICAL PHOTO INTERPRETATION STATION
DIGITAL STEREO COMPARATOR/COMPILER SYSTEM
ADVANCED COMPILATION STUDIES

POC: RADC/IRA/F. SCARANO 315-330-4203
PREDISION GUIDANCE AND STRIKE PRODUCTS
(CARTOGRAPHIC EXPLOITATION)

AREA TITLE: CARTOGRAPHY

OBJECTIVE: PROVIDE SYSTEMS AND TECHNIQUES (HARDWARE AND SOFTWARE) TO: ASSESS CURRENT PRODUCTS AND SOURCES. DIGITALLY EXTRACT DATA FROM AN ANALOG CHART SOURCE, MANIPULATE AND PROCESS DIGITAL DATA FOR PRODUCT GENERATION AND/OR INCLUSION INTO THE DIA CARTOGRAPHIC DATA BASE.

EFFECTS: FY81
SCANNING CURSOR
SOURCE ASSESSMENT SYSTEM
RASER PLOTTER
IN COCKPIT DISPLAY ANALYSIS

FY82
AUTO CARTO FEATURE I.D.
RASER SCAN CHARACTER RECOGNITION
CARTO COMPILEATION/REVISION SYSTEM
RASER AUTOMATIC CARTO SYSTEM

POC: NADC/INRP/J. PALEKHO 315-330-7090
PRECISION GUIDANCE AND STRIKE PRODUCTS
(CARTOGRAPHIC EXPLOITATION)

AREA TITLE: TACTICAL DIGITAL MAPPING

OBJECTIVE: IDENTIFY TERRAIN ANALYSIS DATA AND APPLICATIONS IN SUPPORT
OF ADVANCED AF TACTICAL SENSOR/STRIKE AND CORRELATION
FUSION ACTIVITIES.
DEVELOP METHODS TO DETERMINE EFFECTS OF DATA BASE CHANGES
AND METHODS TO VALIDATE DATA BASE CONTENT AND ACCURACY
FOR ADVANCED WEAPON SYSTEMS.

EFFORTS: FY81 TACTICAL DIGITAL MAPPING
FY82 DATA BASE & FORMAT VALIDATION

POC: RADC/IRRP/MAJ E. NEEL 315-330-6272
MISSION PLANNING - SIMULATION

MISSION PLANNING

- Target List & Locations
- Delimited Restricted Areas
- Cartographic Data Base
- Vehicle Performance Envelope (Carrier & Weapon)
- Analysis & Penetration Algorithms

MISSION PLAN

- Digital Terrain Data Base
- Digital Radar Coded Data Base
- Primary & Alternate Flight Paths
- Altitude Profiles & NAV-Fixes

MISSION SIMULATION

Simulator

Computer
PRECISION GUIDANCE AND STRIKE PRODUCTS
(SENSOR SCENE SYNTHESIS)

AREA TITLE: SENSOR IMAGE SIMULATION

OBJECTIVE: DETERMINATION OF UNIQUE AND TIME VARIANT DESCRIPTORS TO PERMIT THE DFAD DATA BASE TO SUPPORT A WIDE CLASS OF SENSOR SIMULATIONS.
DETERMINE DATA CHARACTERISTICS TO SUPPORT THE 15F12 NAV TRAINER (RADAR) AND VISUAL SIMULATION REQUIREMENTS.

EFFORT: FY81
ADVANCED WEAPONS SIMULATION (TASK A)
ADVANCED WEAPONS SIMULATION (TASK B)

POC: RADC/IRRP/R. HOFFMANN 315-330-2217
PRECISION GUIDANCE AND STRIKE PRODUCTS
(CARTO PROCESS/DATA BASE/ARCHITECTURE)

AREA TITLE: CARTO PROCESSING SYSTEM

OBJECTIVE: PROVIDE TECHNIQUE DEVELOPMENT AND PRODUCTION IMPLEMENTATION TO ALLEVIATE D'A DIGITAL DATA PRODUCTION PROCESS PROBLEMS. PROVIDE ON-LINE CENTRALIZED CONTROL AND POST-PROCESSING FOR EXISTING AND PLANNED DHAAC DIGITAL CARTOGRAPHIC PRODUCTION SYSTEMS.

EFFORTS: FY81 DIGITAL ELEVATION MATRIX PROCESSING

POC: KAUC/ISCA/O. REINHANN  315-330-4728
PRECISION GUIDANCE AND STRIKE PRODUCTS
(CARTO PROCESS/DATA BASE/ARCHITECTURE)

AREA TITLE: SYSTEM ARCHITECTURE EVALUATION

OBJECTIVE: DEVELOP A BASE FOR EXPERIMENTATION WITH COMPUTER ARCHITECTURES AND PROCESSING CONFIGURATION EVALUATION. EMPLOY TO MODEL PDOP PROCESSING STRUCTURE TO OBTAIN PROBLEMS.

EFFORTS: FY81 SYSTEM ARCHITECTURE EVALUATION

POL: HADC/ISCA/O. REINHARD 315-330-4728
PRECISION GUIDANCE AND STRIKE PRODUCTS
(CARTO PROCESS/DATA BASE/ARCHITECTURE)

AREA TITLE: RESOURCE INTEGRATION

OBJECTIVE: DETERMINE FEASIBILITY, UTILITY AND COST EFFECTIVENESS
OF DIA INTRA-CENTER RESOURCE SHARING.
DESIGN AND IMPLEMENTATION OF A NETWORK OF EXISTING DIGITAL
IMAGE PROCESSING/AUTOMATED FEATURE EXTRACTION SYSTEMS
AT THE DIA CENTERS.

EFFORTS: FY81 SHAHTC P.S.I. ANALYSIS
          EXPERIMENTAL INTEGRATION IMPLEMENTATION

POC: RADC/ISCA/O. REIMANN 315-330-4728
TPO/THRUST: 9F/RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: 1/SOLID STATE DEVICE RELIABILITY
PROGRAM GOAL: ASSURE THE AVAILABILITY OF RELIABLE SOLID STATE DEVICES
FOR AIR FORCE AND DOD ELECTRONIC SYSTEMS

TECHNICAL AREAS:
- SOLID STATE DEVICE ANALYSIS TOOLS AND TECHNIQUES
- EMERGING TECHNOLOGY QUALITY ASSESSMENT
- ELECTRICAL CHARACTERIZATION OF SOLID STATE MICROCIRCUITS
- VHSIC TEST TECHNOLOGY
- QUALITY AND RELIABILITY ASSURANCE AND DESIGN CONCEPTS
- RELIABILITY PHYSICS TECHNOLOGY
- ACCELERATED LIFE TESTING AND FAULT DETECTION FOR LSI/VLSI
- RELIABILITY ASSESSMENT OF SOLID STATE MICROCIRCUITS
TPO/THRUST:  RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: 1/SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: SOLID STATE DEVICE ANALYSIS TOOLS AND TECHNIQUES
OBJECTIVE: DEVELOP AND MAINTAIN LABORATORY TOOLS TO EXAMINE SOLID STATE DEVICES ELECTRICALLY, MECHANICALLY, AND CHEMICALLY AT THE MICROSCOPIC LEVEL

APPROACH:
- INCREASE SENSITIVITY OF LABORATORY INSTRUMENTS OF PROVEN VALUE (SEM, SCANNING AUGER, MASS SPECTROMETER, ...)
- ADD FEATURES TO INCREASE THROUGHPUT, ACCURACY, AND CAPABILITY (X-RAY SPECTROMETER, AUTOMATIC SAMPLE CHANGER, INSTRUMENT SOFTWARE)
- DEVELOP NEW CAPABILITY (FLUORESCENCE MICROSCOPE, SUBMICRON AUGER SYSTEM, MICRON PROBE)
- DEVELOP STANDARDS FOR CONTROL/ELIM. OF FOREIGN MATERIAL AND POOR PACKAGING

PAY OFF:
- RELIABLE, LONG-LIFE SOLID STATE DEVICES THROUGH APPLICATION OF EFFECTIVE PACKAGING QUALITY STANDARDS
TOP THRUST: RF/RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: I/SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: EMERGING TECHNOLOGY QUALITY ASSESSMENT 2
OBJECTIVE: DETERMINE STRENGTHS AND WEAKNESSES IN STATE-OF-THE-ART SOLID STATE DEVICE TECHNOLOGY

APPROACH:
- SELECT STATE-OF-THE-ART LINEAR MICROPROCESSORS, SINGLE CHIP COMPUTERS, INTELLIGENT PERIPHERAL CHIPS, AND DENSE MEMORIES
- DETERMINE ELECTRICAL DESIGN OF NEW DEVICES
- EVALUATE MECHANICAL STRENGTH AND HERMETIC INTEGRITY OF DEVICES
- DETERMINE CHEMICAL CONTENT OF SOLID STATE DEVICE SURFACE AND PACKAGE AMBIENT
- EVALUATE MILITARY RUGGEDNESS/APPLICABILITY

PAY-OFF:
- EARLY EVALUATION OF NEW DEVICES OF HIGH POTENTIAL TO MILITARY SYSTEMS
- EARLIEST GO/NO GO DATA FOR USAGE IN MILITARY SYSTEMS
- HARD DATA ON THE DIRECTION OF SOLID STATE TECHNOLOGY
- DATA FOR ELECTRICAL CHARACTERIZATION AND RELIABILITY ASSESSMENTS
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QUALITY & RELIABILITY ASSURANCE FOR VLSI AND MICROWAVE SOLID STATE SUBSYSTEMS 6.2
TPO/THRUST: 4F/RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: 1/SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: ELECTRICAL CHARACTERIZATION OF ANALOG MICROCIRCUITS 3
OBJECTIVE: DETERMINE THE PERFORMANCE, INTERCHANGEABILITY, DESIGN INTEGRITY AND COMPATIBILITY NEEDED TO ASSURE MIL-QUALITY DEVICES
APPROACH:
- USE VENDOR DATA, ELECTRICAL SCHEMATICS AND SUPPLEMENTAL TESTS TO DEVELOP TEST PROCEDURES, TRANSFER FUNCTIONS AND ALGORITHMS
- DETERMINE ALLOWABLE RESPONSES AND LIMITS TO ELECTRICAL, THERMAL AND MECHANICAL STRESSES
- PROVIDE ELECTRICAL PARAMETERS FOR MIL-M-38510 SLASH SHEETS COVERING ANALOG MICROPROCESSOR, DATA ACQUISITION AND INTERFACE MICROCIRCUITS
PAY-OFF:
- RELIABLE ANALOG ICs FOR THE MILITARY ENVIRONMENT
TPO/THRUST: RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: ELECTRICAL CHARACTERIZATION OF VLSI MEMORIES
OBJECTIVE: DETERMINE THE PERFORMANCE, INTERCHANGEABILITY, DESIGN INTEGRITY AND COMPATIBILITY NEEDED TO ASSURE MIL-QUALITY DEVICES

APPROACH:
- USE VENDOR DATA, ELECTRICAL SCHEMATICS AND SUPPLEMENTAL TESTING TO DEVELOP INPUT AND CORRESPONDING OUTPUT PATTERNS AND ALGORITHMS
- DETERMINE ALLOWABLE RESPONSES AND LIMITS TO ELECTRICAL, THERMAL AND MECHANICAL STRESSES
- PROVIDE DATA FOR MIL-M-38510 SLASH SHEETS FOR RAM, ROM, PROM, EAROM AND BUBBLE MEMORIES

PAY-OFF:
- RELIABLE HIGH DENSITY SOLID STATE MEMORIES FOR THE MILITARY ENVIRONMENT
TPO/THRUST: RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: ELECTRICAL CHARACTERIZATION OF VLSI MICROCIRCUITS
OBJECTIVE: DETERMINE THE PERFORMANCE, INTERCHANGEABILITY, DESIGN INTEGRITY AND COMPATIBILITY NEEDED TO ASSURE MIL-QUALITY DEVICES

APPROACH:
- USE VENDOR DATA, ELECTRICAL SCHEMATICS AND SUPPLEMENTAL TESTING TO DEVELOP INPUT AND CORRESPONDING OUTPUT PATTERNS
- DEVELOP NEW TEST GENERATION/FAULT ISOLATION METHODS FOR VLSICs
- DETERMINE FUNCTIONAL AND PARAMETRIC TESTS AND LIMITS
- PROVIDE DATA FOR MIL-M-38510 SLASH SHEETS FOR SUPER SCHOTTKY LOGIC, ADVANCED MICROPROCESSORS, MICROCOMPUTERS, PERIPHERAL SUPPORT CHIPS AND OTHER VLSI MICROCIRCUITS

PAY OFF:
- RELIABLE ICs FOR THE MILITARY ENVIRONMENT. MORE COST-EFFECTIVE TESTING AND CRITERIA FOR DESIGNING MORE TESTABLE ICs
TPO/THRUST: 4E/RELIABILITY, MAINTAINABILITY AND COMPATIBILITY

SUB-THRUST: 1/SOLID STATE DEVICE RELIABILITY

BLOCK TITLE: QUALITY AND RELIABILITY ASSURANCE AND DESIGN CONCEPTS 7

OBJECTIVE: DEVELOP QRA CONCEPTS, EVALUATE COST/BENEFIT AND PRODUCE A COMPREHENSIVE RELIABILITY DESIGN GUIDE

APPROACH:

• DEVELOP QA PROCEDURES FOR LSICS, HYBRID ICs AND MICROWAVE TRANSISTORS
• EVALUATE THE COST AND BENEFITS OF MICROCIRCUITS PROCURED TO DIFFERENT QUALITY AND RELIABILITY LEVELS USED IN AIR FORCE EQUIPMENTS
• CORRELATE FIELD FAILURE RATE RESULTS WITH SPECIFIED DEVICE QUALITY LEVELS AND MIL-HDBK-217 MICROCIRCUIT MODELS
• REVISE MIL-STD-883, MIL-M-38510 AND MIL-HDBK-217 IN ACCORD WITH STUDY RESULTS
• MAINTAIN QUALIFIED PARTS LIST AND STATUS OF NEW PARTS; QUAL FOR USERS
• DEVELOP COMPREHENSIVE RELIABILITY DESIGN PROCEDURES

PAY OFF:

• NEEDED QRA CONCEPTS AND STANDARDS
• COST/BENEFIT ASSESSMENT OF QA PROCEDURES
• MORE RELIABLE AIR FORCE EQUIPMENT BY DESIGN
LIQUID CRYSTAL TESTING OF MICROPROCESSOR

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IPO/THRUST: 4F/RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: 1/SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: RELIABILITY PHYSICS TECHNOLOGY 8
OBJECTIVE: DEVELOP AN UNDERSTANDING OF AND QUANTIFY THE FACTORS WHICH CAUSE FAILURES IN SOLID STATE DEVICES

APPROACH:
- INVESTIGATE FACTORS KNOWN TO BE RELIABILITY PROBLEMS
  - ELECTROMIGRATION
  - LOW YIELD AND POOR RELIABILITY OF SILICON ON SAPPHIRE TECHNOLOGY
- DEVELOP LABORATORY CAPABILITY TO EXAMINE SOLID STATE DEVICES AND MEASURE ELECTRICAL AND CHEMICAL PROPERTIES AT THE MICROSCOPIC LEVEL
- DEVELOP A COMBINED ELECTRICAL TEST/E-BEAM PROBE TECHNIQUE FOR DETECTING, LOCATING AND EXAMINING FAULTS ON ICs
- FURTHER REFINES AND APPLY THE LIQUID CRYSTAL TECHNIQUES (LOW VOLTAGE LIQUID CRYSTAL, PATTERN RECOGNITION)

PAY OFF:
- IMPROVED UNDERSTANDING OF FAILURE MECHANISMS: INNOVATIVE FAULT IDENTIFICATION METHODS
TOP/THREAT: ME/RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THREAT: 1/SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: ACCELERATED LIFE TESTING AND FAULT DETECTION FOR LSI/VLSI 10
OBJECTIVE: DEVELOP AND VALIDATE COMPREHENSIVE AND EFFECTIVE MICROCIRCUIT RELIABILITY TEST TECHNIQUES

APPROACH:
- DEVELOP AUTOMATIC TEST METHODS FOR LINEAR ICs
- IDENTIFY ELECTRICAL INDICATORS OF INTERNAL IC QUALITY
- DEVELOP TESTS TO UTILIZE EXPANDED TEKTRONICS 3270 TESTER CAPABILITY
- REFINE PARALLEL TEST METHOD
- EXPLORE OTHER ACCELERATED TEST AND FAULT DETECTION TECHNIQUES

PAY OFF:
- FASTER, HIGHER CONFIDENCE IC SCREENING TEST METHODS
- RAPID ACCELERATED LIFE TEST METHODS FOR NEW TECHNOLOGIES
- MORE ACCURATE MIL SPEC TEST REQUIREMENTS
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TPO/THRUST: RF/RELIABILITY, MAINTAINABILITY, AND COMPATIBILITY
SUB-THRUST: I/SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: MICROWAVE DEVICE FAILURE RATES AND MODES II
OBJECTIVE: DETERMINE FAILURE RATE AND CAUSE OF FAILURE IN STATE-OF-THE-ART MICROWAVE DEVICES

APPROACH:
- SELECT REPRESENTATIVE POWER GaAs FETs AND ADVANCED POWER SWITCHING DEVICES
- APPLY ACCELERATED LIFE TESTS
- EXAMINE FAILED DEVICES AND DETERMINE CAUSE
- TRANSFER RESULTS AND CONCLUSIONS TO VENDORS AND SYSTEM DESIGNERS

PAY-OFF:
- FEEDBACK TO DEVICE VENDORS TO CORRECT PROBLEMS
- DEFINITION OF DEVICE TOLERANCE PARAMETERS
- RELIABLE, SUPPORTABLE SYSTEM DESIGN
TPO/THrust: 4E/RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: 1/SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: NEW TECHNOLOGY RELIABILITY ASSESSMENT 12
OBJECTIVE: DETERMINE FAILURE RATE AND CAUSE OF FAILURE IN NEW SOLID STATE TECHNOLOGIES
APPROACH:
- SELECT DEVICES REPRESENTATIVE OF SUPER SCHOTTKY, 12, AND HIGH SPEED BIPOLAR
- APPLY ACCELERATED LIFE TESTS
- APPLY MIL SPEC SCREEN TESTS WHERE AVAILABLE TO DETECT FAULTS
PAY-OFF:
- EARLY FAILURE RATE DATA FOR SYSTEM DESIGNERS
- FEEDBACK TO MIL SPECS IMPROVES ACCURACY
- FEEDBACK TO DEVICE VENDOR TO CORRECT PROBLEMS
TP0/THRUST: 4E/RELIABILITY, MAINTAINABILITY AND COMPATIBILITY
SUB-THRUST: 1/SOLID STATE DEVICE RELIABILITY
BLOCK TITLE: HIGH DENSITY MEMORY RELIABILITY ASSESSMENT 13
OBJECTIVE: DETERMINE FAILURE RATE AND CAUSE OF FAILURE IN NEW SOLID STATE MEMORY TECHNOLOGIES

APPROACH:
- SELECT DEVICES REPRESENTATIVE OF 64_KBIT_DYNAMIC, 1GK_BIT_STATIC, AND NONVOLATILE_REPROGRAMMABLE_ROMS
- APPLY ACCELERATED LIFE TESTS
- APPLY MIL SPEC SCREEN TESTS WHERE AVAILABLE TO DETECT FAULTS
- EXAMINE FAILED DEVICES AND DETERMINE CAUSE

PAY OFF:
- EARLY FAILURE RATE DATA FOR SYSTEM DESIGNERS
- FEEDBACK TO MIL SPECS IMPROVES ACCURACY
- FEEDBACK TO DEVICE VENDOR TO CORRECT PROBLEMS
INTEGRATED C² FOR TAF

OPERATIONS SHELTER
COMPUTER SHELTER
MODULAR TACC

PLANS SHELTER
COMM SHELTER

OTHER TACC'S OR HEADQUARTERS

COMBAT REPORTING CENTER
AIR SUPPORT OPERATIONS CENTER
TACTICAL AIR CONTROL PARTIES

WING OPERATIONS CENTER
INTEGRATED C² FOR TAF

OBJECTIVES:

• ELIMINATE CHOKEPOINTS THRU DECISION AIDS
  - DATA AGGREGATION & DISPLAY
  - REAL TIME OPTION GENERATION

• DEVELOP GENERALIZED DATA SHARING FOR DECENTRALIZED OPERATIONS

• DEVELOP CAPABILITY TO ESTABLISH BACK-UP OPERATION

• DEMONSTRATE CAPABILITIES IN REALISTIC USER ENVIRONMENT
  - OPERATIONAL COMPUTERS
  - EXPANDABLE ARCHITECTURE
INTEGRATED C² FOR TAF

APPROACH:

- ESTABLISH COMPARABLE C² COMPUTER ENVIRONMENT
- DEMONSTRATE BUSS ORIENTED C² CENTER
- DEMONSTRATE C² CENTER INTERNETTING
- DEMONSTRATE SOFTWARE IMPLEMENTATIONS OF DECISION AIDS
### System Sophistication

#### Applications Levels Interact
- Homogeneous/Heterogeneous
- Global Task Scheduling
- Process Migration
- Dispersion DMS
- Concurrency Control
- Synchronization
- Distributed Operating Systems
- Shared Resources

#### Operating Systems Interact
- Topology
- Transport Protocol (X.25, HDLC)
- Inter Process Communication
- Structured File Transfer
- Network Operating System
- Task Allocation
- Common Command Language
- Functional Allocation

#### Systems Exchange Bit Streams
- Topology
- Transport Protocol (X.25, HDLC)
- Inter Process Communication
- Structured File Transfer
- Network Operating System
- Task Allocation
- Common Command Language
- Functional Allocation

#### Stand Alone Systems
- Verbal Record Comm.
- Centralized Data
- Autonomous Interface to Other Systems
- Manual Interface to Other Systems
- Simple File Transfer

#### Examples
- 485L
- WIN
- MSG
- 487L
- AIRLINE RESERVATION
- RJE SYSTEMS
- ARPANET
- XNOS
- SDD-1
- SNA
- DAIS
- ADAPT
- AXSIT
- WWICS/IDHS

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![Image of the page](image-url)
**Distributed System Structures**

**Bus Coupled Distributed OS**
- High Speed Bus (Flex Intra)
- CPU
- Memory
- Term

**Dispersed Network Distributed**
- Low Bandwidth
- Loose Coupling
- Cooperative Processes
- Slow Response
- Geographically Dispersed

- ARPANET
- AUTOCIN II
- Process Node
- Term Node
DISTRIBUTED SYSTEM ARCHITECTURE AND CONTROL

CURRENT TECHNOLOGY ISSUES

LEVEL OF CONTROL CENTRALIZATION
CENTRALIZED/DETERMINISTIC
DECENTRALIZED/NON-DETERMINISTIC

LOCAL OPERATING SYSTEM AUTONOMY

INTERPROCESS COMMUNICATION

TRANSPARENCY - USER LEVEL

ERROR CONTROL

RESOURCE SHARING
TPO/THRUST #TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #TITLE: 461 C3I SYSTEM STRUCTURES

BLOCK TITLE: DISTRIBUTED SYSTEM RESOURCE SHARING

OBJECTIVE: • TO PROVIDE SOFTWARE CONTROL MANAGEMENT WHICH MUST PRESENT TO THE USER THE WHOLE SET OF DISTRIBUTED RESOURCES AS BELONGING TO A SINGLE MACHINE

TECHNICAL APPROACH: • DEVELOP ALGORITHMS AND DEMONSTRATION SOFTWARE
  • DISTRIBUTED TASK EXECUTION
  • DISTRIBUTED SYSTEM EXECUTIVE CONTROL
  • SYSTEM PRIMITIVES TO STRUCTURE AND MODIFY CONFIGURATION

PAY-OFF: • INCREASED PROCESSING EFFICIENCY
  • LOAD LEVELING
  • RECONFIGURABILITY
TPO/THRUST TITLE: 4G INFORMATION PROCESSING

THRUST/SUB-THRUST/SUB-SUB-THRUST TITLE: 4G1 C³I SYSTEM STRUCTURES

BLOCK TITLE: ERROR CONTROL/RECOVERY TECHNIQUES

OBJECTIVE: • ESTABLISH FEASIBILITY OF ERROR DETECTION, ISOLATION AND RECOVERY TECHNIQUES
• DEVELOP METHODOLOGY FOR ALGORITHM VERIFICATION

TECHNICAL APPROACH: DEVELOPMENT OF TECHNIQUES, TOOLS, MODELS AND SOFTWARE TO ADDRESS:

• EFFECTS OF SYSTEM PARTITIONING
• TASK PERSISTENCE/REINITIATION
• SYSTEM RECONFIGURATION

PAY-OFF: THIS WORK IS FUNDAMENTAL TO THE ACHIEVEMENT OF SURVIVABILITY IN A DISTRIBUTED SYSTEM THROUGH RESOURCE REALLOCATION.
**RADC TPQ 4 TECHNOLOGY**
THRUST: 461 C³I SYSTEM STRUCTURES

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1. **DISTRIBUTED SYS MODELING/SIMULATION 6.2/6.3**

2. **INTELLIGENCE INFORMATION SYSTEM CONCEPTS 6.2**

3. **INTEL SYST FUNC REQ (1990) 6.2**

4. **UTAIS IDMS 80**

   - **DISTRIBUTED SYS DESIGN TOOLS**
   - **DISTRIBUTED SYSTEM DESIGN METHODOLOGY 6.2/6.3**
   - **COMPUTER INTEROPERABILITY STANDARDS**
   - **EVALUATION OF ALTERNATIVE SYSTEM ARCHITECTURES 6.2/6.3**
TPO/THRUST TITLE: 46 INFORMATION PROCESSING

SUB-THRUST TITLE: 461 C^3I SYSTEM STRUCTURES

BLOCK TITLE: DISTRIBUTED SYSTEM MODELING/SIMULATION

OBJECTIVE: TO DEVELOP A COMPREHENSIVE MODELING AND SIMULATION CAPABILITY TO ALLOW EVALUATION OF THE PERFORMANCE, ROBUSTNESS AND SURVIVABILITY OF DISTRIBUTED SYSTEMS.

TECHNICAL APPROACH: ADAPT EXISTING CAPABILITIES FOR PERFORMANCE MODELS TO INCORPORATE DISTRIBUTION OF FUNCTIONS. DEVELOP CAPABILITY TO MODEL RELIABILITY AND ERROR CONDITIONS OF A DISTRIBUTED ADP SYSTEM.

PAY OFF: HIGH
TPO/THRUST TITLE: 4G INFORMATION PROCESSING
SUB-THRUST TITLE: 4G1 C³I SYSTEM STRUCTURES

BLOCK TITLE: INTELLIGENCE INFORMATION SYSTEM CONCEPTS

OBJECTIVE: TO EXPLORE POTENTIAL INFORMATION SYSTEM CONCEPTS FOR SATISFYING/SOLVING THE THROUGHPUT, CAPACITY, AND RESPONSIVENESS REQUIREMENTS IMPOSED ON INTELLIGENCE PROCESSING SYSTEMS.

TECHNICAL APPROACH: HIGH TECHNOLOGY INFORMATION PROCESSING TECHNIQUES (HARDWARE & SOFTWARE EMERGING FROM GOVERNMENT 6.1, COMMERCIAL INDUSTRY AND UNIVERSITY RESEARCH) WILL BE ANALYZED FOR POTENTIAL CONTRIBUTION TO THE REQUIREMENT STATED IN THE ABOVE OBJECTIVE.

PAY-OFF: THE PAY-OFF IS IN THE POTENTIAL TO ACHIEVE THE PROCESSING CAPACITIES TO EFFECTIVELY UTILIZE AND SUPPLY ESSENTIAL DATA TO THE INTELLIGENCE COLLECTION AND STRIKE SYSTEMS OF THE 1990 TIMEFRAME.
DISTRIBUTED DATA BASE PROBLEM

DATA PROCESSOR

DATA PROCESSOR

DATA PROCESSOR

DATA PROCESSOR

DATA PROCESSOR

DATA BASE no.1

DATA BASE no. N

TERMINAL

TERMINAL

TERMINAL

TERMINAL

TERMINAL

TERMINAL
NETWORKED DATA SYSTEM

DATA FUNCTIONS
- QUERY
- TRANSLATION
- CONTROL
- UPDATE

COMPUTER NETWORK

HOST #3
DMS

HOST #2
DMS

HOST #1
DMS

DISTRIBUTED DATA SYSTEM

INTEGRATED DATA SYSTEM

DATA CONTROL

HOST #3
DATA

HOST #1
DATA

HOST #2
DATA

DATA QUERY/
UPDATE

- INTEGRATED DATA STRUCTURE
- GLOBAL CONTROL
- UNIFIED QUERY/UPDATE CAPABILITIES
- PARTITIONING/ALLOCATION
- SYNCHRONIZATION/CONCURRENCY

- AUTONOMOUS DMS'S
- TRANSPARENT ACCESS
- NETWORK OVERHEAD
- SYNCHRONIZATION/CONCURRENCY
DISTRIBUTED DATABASES

CURRENT TECHNOLOGY ISSUES

DATABASE INTEROPERABILITY

MULTIUSER ACCESS

DISTRIBUTED DATABASE DESIGN

CONCURRENCY CONTROL/SYNCHRONIZATION

USER INTERFACE
TPO/THRUST TITLE: INFORMATION PROCESSING
SUB-THRUST TITLE: C^3I DATABASE SYSTEMS
BLOCK TITLE: DATABASE DESIGN/ANALYSIS
OBJECTIVE: DEVELOP AND EVALUATE DATABASE DESIGN TOOLS FOR SINGLE AND MULTINODE
SYSTEMS. ANALYZE AND DESIGN A STRUCTURE FOR INTEGRATING THESE TOOLS.
TECHNICAL APPROACH: INSTALL AND EVALUATE TOOLS DEVELOPED AND COLLECTED UNDER PREVIOUS EFFORT:
- IDENTIFY FORMATS AND INTERFACE PARAMETERS.
- DESIGN A STRUCTURE TO TIE THE TOOLS TOGETHER.
PAY OFF: SUPPORTS RAPID AND EFFECTIVE DEVELOPMENT AND EVALUATION OF DATABASE SYSTEMS.
TPQ/THRUST TITLE: 46 INFORMATION PROCESSING
SUB-THRUST TITLE: 462 C3I DATA BASE SYSTEMS

BLOCK TITLE: ACTIVE DATA BASE TECHNOLOGY

OBJECTIVE: PERMIT COMPONENTS OF DATA STRUCTURE TO ACTIVELY PROCESS INCOMING DATA:
  • TRACK INTERNALLY DERIVED INFORMATION GOALS
  • PERFORM INDUCTION AND DEDUCTION
  • ALERT WHEN CONDITIONS SATISFIED

TECHNICAL APPROACH: • DEVELOP ALGORITHMS TO ORGANIZE AND ADAPT INCOMING DATA
  • ARTIFICIAL INTELLIGENCE
  • COMPUTATIONAL LINGUISTICS

PAY-OFF: • EXTEND EXPERT ANALYST CAPABILITY
  • DECREASE ANALYSIS TIME
  • SIMPLIFY INTERROGATION TASKS
THREAT: 4G2 C3I DATABASE SYSTEMS

FY80  FY81  FY82  FY83  FY84  FY85  FY86

NETWORK FILE ACCESS

MULTIUSER DIST. DB ACCESS TECH 6.2/6.3

SYSTEM FOR DISTRIBUTED DATABASES (SDD-1) ARPAN

DATABASE INTEGRITY METHODOLOGY 6.2

ARPA DDP TECHNOLOGY

ADVANCED DB QUERY TECH 6.2/6.3

AUTOMATIC DATA BASE UPDATE (FORMATTED/UNFORMATTED) 6.2

AUTOMATIC DATA BASE GENERATION (CONTENT) 6.2

NETWORKED DATA SYSTEM 6.4

INTEGRATED DATA SYSTEM

PROTOTYPE AND STANDARDS

PROTOTYPE AND STANDARDS
TPO/THRUST #TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #TITLE: 462 C3I DATABASE SYSTEMS

BLOCK TITLE: MULTI USER DISTRIBUTED DATABASE ACCESS TECHNOLOGY

OBJECTIVE: TO INVESTIGATE THE ISSUES INVOLVED IN PROVIDING ACCESS TO DISSIMILAR DATABASES AND DATA MANIPULATION CAPABILITIES IN NETWORKS OF HETERGENEOUS HARDWARE AND SOFTWARE SYSTEMS.

TECHNICAL APPROACH: DEVELOP TECHNOLOGY TO PROVIDE:

- DATA ELEMENT LEVEL INTERCHANGE BETWEEN DISSIMILAR DBMS'S.
- DEVELOP A NETWORK DATA MANAGER TO PROVIDE QUERY TRANSLATION, DATA TRANSFORMATION AND DATA INTEGRITY IN A NETWORKED SYSTEM.
- INVESTIGATE ISSUES OF USER INTERFACE, AND EVALUATE DEVELOPED TECHNIQUES IN THE NETWORK INTERFACE FACILITY.

PAYOFF: HIGH. THE ABILITY TO EFFECTIVELY ACCESS AND MIGRATE DATA IN A DISTRIBUTED SYSTEM IS CRITICAL TO SYSTEM SURVIVABILITY.
TPO/THRUST #TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #TITLE: 462 C3I DATABASE SYSTEMS

BLOCK TITLE: ADVANCED DATABASE QUERY TECHNIQUES

OBJECTIVE:  
- ANALYZE USER DATA MANIPULATION CAPABILITY
- DEVELOP DATA QUERY/MANIPULATION
  - NETWORKED SYSTEM
  - HETEROGENEOUS HARDWARE
  - DISSIMILAR DATABASE SYSTEMS

TECHNICAL APPROACH: DEVELOP AND DEMONSTRATE ALGORITHMS TO SUPPORT:
- ACCESS PLANNING
- NATURAL LANGUAGE USER INTERFACE
- COMMON QUERY ACROSS MULTIPLE HETEROGENEOUS SYSTEMS

PAY-OFF: THE ABILITY TO PROVIDE COMMON ACCESS TO HETEROGENEOUS DBMS THROUGH COMMON SYNTAX AND SEMANTICS OF QUERY LANGUAGE.
COMPONENTS OF AN EXPERIMENTAL MESSAGE EXPLOITATION SYSTEM

(1) SELECTION

(2) GENERATION

(3) EXPLOITATION

AIS

AIS DATA BASE

AUTOMATED DATA BASE GENERATION

INTERACTIVE DATA BASE GENERATION

MESSAGE DISSEMINATION & RETRIEVAL

MESSAGE STORAGE

FOCUS OF EXPLORATORY DEVELOPMENT PROGRAMS

AIS RELATED MESSAGES...
TPQ/THRUST TITLE: 46 INFORMATION PROCESSING

SUB-THRUST TITLE: 4G2 C3I DATABASE SYSTEMS

BLOCK TITLE: AUTOMATIC DATABASE UPDATE

OBJECTIVE: DEVELOP LINGUISTIC TECHNIQUES:
- EXTRACT DATA ELEMENTS FROM MESSAGES
- AUTOMATICALLY UPDATE DATABASE

TECHNICAL APPROACH: ALGORITHM DEVELOPMENT AND DEMONSTRATION FOR:
- SEMANTIC AND SYNTACTIC PROCESS OF MESSAGES
- EXTRACTION OF DATA ELEMENTS
- CORRELATION TO AND INSERTION INTO DATABASE

PAY-OFF: • MORE TIMELY AND COMPLETE DATABASE
- LOWER OVERHEAD IN DATA MAINTENANCE
NATIONAL SOFTWARE WORKS

SITE A
- DOCUMENTATION
- ADMINISTRATIVE SUPPORT
- COBOL

TOOL BEARING HOST NO. 1
- FORTRAN
- TEXT EDITORS
- PREPROCESSOR

SITE B
- SCIENTIFIC ANALYSIS
- FORTRAN

TOOL BEARING HOST NO. 2
- JOVIAL
- DEBUGGER
- VALIDATOR
### RAIDE TP4 Technology

**Thrust:** 4G1 C3I System Structures (National Software Works)

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- **NSW Core Enhancement**: 6.3
- NSW Technology Demonstration (AFLC & Others): 6.4

### Operational Prototype

- Phase I
- Phase II
- Phase III

- NSW Tool Support: 6.3/6.4
  - CM Tools
  - ADA Tools
  - AFLC Tools

- ECS Support Study I (AFLC)
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS NBS-4
TPO/THRUST #TITLE: 4G INFORMATION PROCESSING

THRUST/SUB-THRUST/SUB-SUB-THRUST #TITLE: 4G1 C3I SYSTEM STRUCTURES

BLOCK TITLE: NSW TECHNOLOGY DEMONSTRATION

OBJECTIVE: THE OBJECTIVE OF THIS EFFORT IS TO CONDUCT AN NSW TECHNOLOGY DEMONSTRATION FOR THREE AIR LOGISTICS CENTERS (ALC) WITHIN THE AIR FORCE LOGISTICS COMMAND (AFLC).

TECHNICAL APPROACH: THE EFFORT WILL BE CONDUCTED IN THREE PHASES:
   o PHASE I - ESTABLISH WARNER ROBINS ALC AS AN ARPA NET NODE
     - COMPLETE PLANNING FOR OTHER SITE AND SCENERIOS
   o PHASE II - ESTABLISH OKLAHOMA CITY ALC AND SACRAMENTO ALC AS HOST
     - INTRODUCE NSW
   o PHASE III - EXECUTE FOUR APPLICATIONS SCENERIOS

PAYOFF: MODERATE TO HIGH THROUGH:
   o SHARED RESOURCES
   o ACCESS TO NEW TOOLS
   o CONFIGURATION CONTROL OF LANGUAGES AND TOOLS
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<td>MAJ T. DARR</td>
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MAJOR GOALS OF $C^2$ DECISION AIDS

DEVELOP INTERACTIVE DECISION AIDS USING ADVANCED COMPUTER INFORMATION PROCESSING AND DISPLAY WHICH WILL ASSIST THE DECISION MAKER TO:

- ASSESS WHAT WILL HAPPEN IN UNCERTAIN ENVIRONMENTS
- USE AND COMBINE INFORMATION
- APPLY INFERENCE, PREDICTION AND DIAGNOSIS
- EVALUATE WORTH OF OBJECTS
- WEIGH RISKS AGAINST BENEFITS
TECHNOLOGY BASE FOR C² DECISION-MAKING

- AUTOMATED DECISION AIDS
- KNOWLEDGE-BASED SYSTEMS
- NATURAL LANGUAGES
- MODELLING
- HUMAN PROCESSES IN DECISION-MAKING
STUDY OF BATTLE STAFF REQUIREMENTS FOR DECISION AIDS

DATA COLLECTION

• INTERVIEWS WITH KEY STAFF PEOPLE
• DOCUMENTATION REVIEW
• OBSERVATIONS

ANALYSIS

• IDENTIFICATION OF DECISION-MAKING PROCESS
• CHARACTERIZATION OF DECISION-MAKING PROCESS

EVALUATION

• DETERMINATION OF OPPORTUNITIES FOR IMPROVEMENT
• DETERMINATION OF UTILITY OF DECISION AIDS
• RECOMMENDATION OF APPLICATION EFFORTS
DECISION AIDS FOR TARGET AGGREGATION

STUDY & ANALYSIS OF FUNCTIONAL APPLICATIONS

APPLICATION & IMPLEMENTATION OF DECISION AIDS ON SELECTED FUNCTIONAL APPLICATIONS

FEASIBILITY DEMO & EVALUATION OF DECISION AID APPLICATIONS

DECISION AIDS TECHNOLOGY
  • DECISION ANALYSIS
  • ARTIFICIAL INTELLIGENCE

INTERACT WITH OTHER CONTRACTORS
  • BATTLE STAFF REQUIREMENTS STUDY
  • C² FACILITY FOR DECISION AIDS
TEST BED REQUIREMENTS

- Test and evaluate concepts
- Demonstrate capabilities in environment comparable to users
- Interaction with users
- Transferability
- Provide realistic ADP environment to contractors
- Maintain software configuration control
PLANNED RADC PROGRAM, FY 81

APPLICATIONS OF DECISION AIDS TO TARGET AGGREGATION

STUDY OF BATTLE STAFF REQUIREMENTS FOR DECISION AIDS

C2 FACILITY FOR DECISION AIDS EVALUATION
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<td>J37/J73 COMP &amp; SUPPORT TOOLS</td>
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- **ADV LANG & COMP TEST TOOLS**
  - 6.3

- **PROTOTYPE LCF**

- **PROTOTYPE HOL CONTROL FACILITY**
  - 6.4

- **RIGOROUS J73 COMP VALIDATOR**

- **J73 CODE AUDITOR**
  - J73 PSL
  - J73 AVS

- **EC 135 J3 COMP**
  - IBM 360
  - DEC-10
  - CDC 6600
  - MIL-STD-1750

- **J3/J73 COMPILERS**

- **J73 TOOLS**
  - J73 PSL
  - J73 AVS
EXTENSIBLE HOL vs APPLICATIONS

- SMALL "CORE" LANGUAGE - COMMON TO "ALL" APPLICATIONS
- "CORE" CAN BE EXTENDED TO MEET REQUIREMENTS — WITHOUT MODIFYING COMPILER
- EACH APPLICATION CAN HAVE ITS OWN UNIQUE EXTENSIONS — NOBODY PAYS FOR "UNUSED GENERALITY"
- AS NEW APPLICATIONS ARE ADDED, EACH GAINS FROM PREVIOUS INVESTMENTS
  - COMPILERS
  - SUPPORT TOOLS
  - TRAINING
  - APPLICATION DEPENDENT SOFTWARE LIBRARIES
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**RADC TPO**

**THRUST:**

| 4G4 HIGHER ORDER LANGUAGE (ADA IMPLEMENTATION) |

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**ADA ADVANCED ERROR DETECTOR**

5

6.2

RIGID ADA SPEC

6.1

HARVARD EXT LANGUAGE

6.2

**ADA IMPLEMENTATION**

6.2, 6.3, 6.3

**ADA ENVIRONMENT UPGRADE**

6.2, 6.3

**RETARGETABLE COMPILER IMPLEMENTATION**

6.2

**ADA Q/A TOOLS**

6.2, 6.3

**ADA REHOSTS, RETARGETS AND T&E**

6.2, 6.3, 6.3

**ADA RUGGEDIZED ENVIRONMENT**

6.3

**ADA SYSTEM APPLICATION DEMO**

6.4

**ADA GFP ENV**

**RUGGEDIZED ENV T&E**

6.3

CONTINUED
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 464 HIGHER ORDER LANGUAGE (ADVANCED SOFTWARE DEVELOPMENT TECHNIQUES)

EFFORT BLOCK TITLE: ADA ENVIRONMENT UPGRADE

OBJECTIVE: UPGRADE QUALITY, CURRENCY, CAPABILITY OF THE ADA ENVIRONMENT

TECHNICAL APPROACH:
- IMPLEMENT CORRECTIONS
- IMPLEMENT LANGUAGE CHANGES
- IMPLEMENT OPTIMIZATIONS
- INTEGRATE ADVANCED ERROR DETECTOR

PAY OFF: COMPILER WILL CONFORM TO LATEST ADA SPEC, ENVIRONMENT ENHANCED
SCHEMA:  SEMI-AUTOMATICALLY GENERATE HIGH QUALITY ADA COMPILER CODE GENERATORS

SCHEMA APPRACH:  WORK FROM COMPUTER DESCRIPTICL LANGUAGE

CAPITALIZE ON STD COMPILER FRON-ND

REDUCED COST OF COMPILERS, ADA MORE READILY AVAILABLE
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 464 HIGHER ORDER LANGUAGE (ADVANCED SOFTWARE DEVELOPMENT TECHNIQUES)

EFFORT BLOCK TITLE: ADA Q/A TOOLS

OBJECTIVE: DEVELOP SOPHISTICATED Q/A TOOLS FOR USE WITH ADA.

TECHNICAL APPROACH:

- AUTOMATED VERIFICATION SYSTEM
- QUALITY METRICS MEASUREMENT

BENEFITS: LOWER TEST COSTS, FEWER RESIDUAL ERRORS, INCREASED SUFFICIENCY.
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING
SUB-THRUST #/TITLE: 464 HIGHER ORDER LANGUAGE (ADA IMPLEMENTATION)
EFFORT BLOCK TITLE: ADA REHOST, RETARGETS, AND TEST AND EVALUATION

OBJECTIVE: FURTHER PREPARE AND CHECK OUT ADA ENVIRONMENT FOR GFE

TECHNICAL APPROACH: REHOST/RETARGET ADA ENVIRONMENT
- DEC-10, CDC6600, 1750A, DIS
TEST ADA UNDER APPLICATIONS CONDITIONS
- AVIONICS, ARMAMENTS, COMMUNICATIONS

PAY OFF: ALLOWS EARLY REQUIRED USE OF ADA ON AIR FORCE CONTRACTS
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 464 HIGHER ORDER LANGUAGE (ADVANCED SOFTWARE DEVELOPMENT TECHNIQUES)

EFFORT BLOCK TITLE: ADA SYSTEM APPLICATION DEMO

OBJECTIVE: "MATURE" THE ADA INTEGRATED ENVIRONMENT

TECHNICAL APPROACH:  

. CANDIDATE SYSTEM APPLICATIONS PROVIDED BY PRODUCT DIVISIONS

. ENVIRONMENT IMPLEMENTED FOR SELECTED SYSTEM

PAY OFF: ADA PROVEN OUT, AVAILABLE ON MORE SYSTEMS
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<td>AI ENHANCED S/W MAINT</td>
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TFD/THRUST #/TITLE: 46 INFORMATION PROCESSING
SUB-THRUST #/TITLE: 464 HIGHER ORDER LANGUAGE (ADVANCED SOFTWARE DEVELOPMENT TECHNIQUES)
EFFORT BLOCK TITLE: J73 SOFTWARE MAINTENANCE IMPLEMENTATION

OBJECTIVE: IMPLEMENT TOOLS TO TAKE OVER TEDIOUS, ROUTINE "MAINTENANCE" TASKS

TECHNICAL APPROACH: USE APPLICABLE ARTIFICIAL INTELLIGENCE TECHNOLOGY
- THEOREM PROVING
- FLOW ANALYSIS
- COMPILER OPTIMIZATION

PAY-OFF: REDUCED MAINTENANCE COSTS
TPO/TOPIST #/TITLE: 45 Information Processing
SUB-TOPIST #/TITLE: 45A Higher Order Language Development Techniques

EFFORT BLOCK TITLE: ADA Software Maintenance Implementation

OBJECTIVE: Implement "maintainability" tools for ADA

TECHNICAL APPROACH: Use applicable artificial intelligence technology

PAYOFF: Reduced maintenance costs
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING
SUB-THRUST #/TITLE: 464 HIGHER ORDER LANGUAGE (ADVANCED SOFTWARE DEVELOPMENT TECHNIQUES)
EFFORT BLOCK TITLE: KNOWLEDGE-BASED SOFTWARE ASSISTANT

OBJECTIVE: INTERACTIVE AID TO INTELLIGENTLY ASSIST ALL PHASES OF SOFTWARE LIFE CYCLE

TECHNICAL APPROACH:
. FORMALIZE "EXPERT" KNOWLEDGE
. EMBODY "EXPERTISE" IN KNOWLEDGE-BASED SYSTEM
. ITERATIVELY REFINE

PAY-OFF: LOWER LIFE CYCLE COSTS
. MINIMIZE INTEGRATION PROBLEMS
. CORPORATE MEMORY OF ALL LIFE CYCLE DECISIONS
. MINIMIZE IMPACT OF PERSONNEL CHANGES
TP0/THRUST #/TITLE: 46 INFORMATION PROCESSING

SÜB-THRUST #/TITLE: 464 HIGHER ORDER LANGUAGE (ADVANCED SOFTWARE DEVELOPMENT TECHNIQUES)

EFFORT BLOCK TITLE: VHL PROG SYSTEM IMPLEMENTATION

OBJECTIVE: HIGHER LEVEL COMMUNICATION LANGUAGE BETWEEN HUMAN AND COMPUTER

TECHNICAL APPROACH: MODIFY AND EXTEND LOGLISP SYSTEM
- MORE POWERFUL KNOWLEDGE BASE
- INCREASE EFFICIENCY
- IMPROVE USER INTERFACE

PAY OFF: INCREASE PROGRAMMER PRODUCTIVITY IN ALL LIFE CYCLE PHASES
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**SOFTWARE SYNTHESIS**

**SOFTWARE SYNTHESIS DOMAIN**

**S/W SYN APPL & EXPANDED**

**S/W SYN SKELETON**

**DOMAIN DEMO** 6.2.6.3
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING
SUB-THRUST #/TITLE: 4G4 HIGHER ORDER LANGUAGE (ADVANCED SOFTWARE DEVELOPMENT TECHNIQUES)
EFFORT BLOCK TITLE: SOFTWARE SYNTHESIS DOMAIN EXPANSION & IMPLEMENTATION
OBJECTIVE: GENERATE SOFTWARE FROM HIGH LEVEL SPECIFICATIONS
TECHNICAL APPROACH: . SYNTHESIS FROM I/O SPECIFICATIONS (MANNA & WALDINGER)
. SELECT MEANINGFUL APPLICATION DOMAIN
PAY OFF: REDUCE SCOPE OF LABOR INTENSIVE AND ERROR-PRONE ASPECTS OF SOFTWARE:
CODING, TESTING, MAINTENANCE
INDUSTRY LOOKS AT RADC 1980
HIGHER ORDER LANGUAGES
TP04G4

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TPO/THRUST: RECONNAISSANCE AND INTELLIGENCE

SUB-THRUST: WIDEBAND RECORDING

PROGRAM GOALS: TO DEVELOP THE NECESSARY ANALOG AND DIGITAL DATA RECORDING, TECHNOLOGIES TO INSURE THE PROPER COLLECTION, PROCESSING, STORAGE AND DISSEMINATION OF EXTREMELY HIGH DATA RATE INTELLIGENCE INFORMATION.

TECHNICAL AREAS: MAGNETIC, ELECTRON BEAM, OPTICAL DISK, CONVENTIONAL LASER, AND LASER HOLOGRAPHIC

PROGRAMS

FUNDING (IN THOUSANDS)

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WIDE BAND RECORDING

C3I DATA STORAGE & DISSEMINATION

DIGITAL PROCESS EXPLOIT ETC

BUFFER

DISPLAY

BUFFER

DISPLAY

BUFFER

DISPLAY

BUFFER SYSTEMS

SYSTEM QUEUING

RECORDER

PRE PROCESS

QUEUING

QUEUING

QUEUING

INSURANCE

INSURANCE RECORDERS

675
IPO/THRUST: RECONNAISSANCE AND INTELLIGENCE

SUB-THRUST: WIDEBAND RECORDING

BLOCK TITLE: LB AND EBR MATERIAL EVALUATION

OBJECTIVE: PERFORM A QUANTITATIVE ANALYSIS OF REAL TIME RECORDING MATERIALS FOR APPLICATIONS SUCH AS IMAGE GENERATION (RECONNAISSANCE, TRANSMISSION AND DUPLICATION), WB OPTICAL DIGITAL DATA ACQUISITION AND HIGH DENSITY DIGITAL STORAGE AND RETRIEVAL.

APPROACH: DETERMINE ACHIEVABLE SPEED, RESOLVING POWER, SPECTRAL RESPONSE, GRANULARITY, ETC., OF CANDIDATE MATERIALS. FABRICATE EDM, EVALUATE MATERIAL.

PAYOFF: HIGH. FLEXIBLE RECORDING MATERIALS FOR REAL TIME OR NEAR REAL TIME IMAGE AND DIGITAL DATA EXPLOITATION AND DISSEMINATION.
DIGITAL STORAGE
ON/OFF LINE
OPTICAL DISK

- GREATER THAN $10^{16}$ BITS
- LONG TERM STORAGE

- 100 DISKS
- $10^{13}$ BITS STORAGE

- 12 INCH DISK
- $10^{11}$ BITS STORAGE
TP0/THrust: RECONNAISSANCE AND INTELLIGENCE
SUB-THRUST: WIDEBAND RECORDING
BLOCK TITLE: READ/WRITE/ERASE DISK
OBJECTIVE: TO DETERMINE FEASIBILITY, LIMITATIONS AND TRADE OFFS OF APPLYING READ/WRITE/ERASE MATERIALS IN OPTICAL DIGITAL DISK CONFIGURATIONS.
APPROACH: PERFORM A QUANTITATIVE ANALYSIS OF ACHIEVABLE DATA RATE, BIT ERROR RATE, PACKING DENSITY, NUMBER OF REUSE CYCLES, ETC., AS APPLIED TO HIGH DENSITY, DIGITAL EXPLOITATION SCENARIOS.
PAY OFF: HIGH. EXTREMELY FLEXIBLE DIGITAL DISK FOR REAL TIME HIGH DATA RATE, HIGH VOLUME DIGITAL EXPLOITATION.
TPO/THRUST: RECONNAISSANCE AND INTELLIGENCE

SUB-THRUST: WIDEBAND RECORDING

BLOCK TITLE: REUSABLE DISK BREADBOARD

OBJECTIVE: TO DESIGN, DEVELOP AND EXPERIMENTALLY EVALUATE EXPLORATORY DEVELOPMENT MODEL OF A ERASABLE/REUSABLE DIGITAL OPTICAL DISK.

APPROACH: CANDIDATE MATERIALS FROM THE ERASE/REUSE INVESTIGATIONS WILL BE EVALUATED AS POTENTIALS IN OPTICAL DISK CONFIGURATIONS.

PAYOFF: HIGH. EXTREMELY FLEXIBLE DIGITAL DISK FOR REAL TIME EXPLOITATION OF HIGH RESOLUTION DIGITAL IMAGERY, HIGH DATA RATE INTELLIGENCE DATA, ETC.
TPO/THRUST: RECONNAISSANCE AND INTELLIGENCE

SUB-THRUST: WIDEBAND RECORDING

BLOCK TITLE: ON-LINE 10^13 BIT DISK DEVELOPMENT

OBJECTIVE: DESIGN, DEVELOP AND EXPERIMENTALLY EVALUATE OPTICAL DIGITAL DISK TECHNOLOGY IN A "JUKE BOX" CONFIGURATION FOR MASS STORAGE AND RETRIEVAL APPLICATIONS.

APPROACH: IMPLEMENT 10^13 "JUKE BOX" TO DETERMINE FEASIBILITY, LIMITATIONS AND ULTIMATE CAPABILITIES.

PAYOFF: HIGH. EXTREMELY FLEXIBLE DATA BASE MANAGEMENT CONCEPT TO HANDLE LARGE DATA BASES, WHERE FAST ACCESS IS REQUIRED.
TPO/THRUST: RECONNAISSANCE AND INTELLIGENCE

SUB-THRUST: WIDEBAND RECORDING

BLOCK TITLE: 600 MEGABIT PER SECOND COMPUTER COMPATIBLE TAPE RECORDER

OBJECTIVE: DESIGN, DEVELOP AND DEMONSTRATE AN EXPLORATORY DEVELOPMENT MODEL 600 MBPS, AND BEYOND COMPUTER COMPATIBLE TAPE DRIVE.

APPROACH: IMPROVE PACKING DENSITY AND TAPE DRIVE MECHANICAL CHARACTERISTICS TO PROVIDE REQUIRED RECORD/REPRODUCE RATES, CONTROLLED SEARCH AND FAST STOP/START CHARACTERISTICS. DEVELOP AUTOMATED ACCESSING CAPABILITY TO ACCURATELY LOCATE DATA ON TAPE.

PAYOFF: HIGH. OFFERS ORDER OF MAGNITUDE IMPROVEMENT OVER THE STORAGE AND ACCESSING CAPABILITIES OF CONVENTIONAL COMPUTER COMPATIBLE TAPE (CCT) UNITS.
SPEECH PROCESSING
ADVANCED/EXPLORATORY
DEVELOPMENT OVERVIEW

PRESENTED BY:
DR. BRUNO BEEK
TPO/THRUST: RECONNAISSANCE & INTELLIGENCE
SUB-THRUST: SPEECH PROCESSING

PROGRAM GOALS: TO DEVELOP AND IMPLEMENT AUTOMATED TECHNIQUES FOR VOICE DATA ENTRY NARROWBAND COMMUNICATIONS, AND EXPLOITATION OF INTERCEPT VOICE DATA.

TECHNICAL AREAS: AUDIO/SPEECH EXPLOITATION COMINT AUDIO TRANSCRIPTION AUDIO ENHANCEMENT ADVANCED SPEECH PROCESSING

PROGRAMS FY 81-86 FUNDING (IN THOUSANDS)

6.1 450
6.2 6,000
6.3 2,000
TPO/THRUST: RECONNAISSANCE & INTELLIGENCE
SUB-THRUST: SPEECH PROCESSING

BLOCK TITLE: NARROWBAND TACTICAL PROCESSING EXPERIMENT

OBJECTIVE: DEVELOP A SPEECH PROCESSING TECHNOLOGY CAPABLE OF TRANSMITTING/
RECEIVING SPEECH SIGNALS AT DATA RATES OF LESS THAN 200 BITS/
SECOND.

TECHNICAL APPROACH: INVESTIGATE AUTOMATIC PHONETIC ANALYSIS/SYNTHESIS TECHNIQUES
WHICH CAN PROVIDE INTELLIGIBLE, NATURAL, AND HIGH QUALITY
SPEECH.

PAYOFF: REDUCE BIT RATE IN TACTICAL COMMUNICATION LINKS AND IMPROVED
RESISTANCE TO JAMMING.
TPO/THRUST: RECONNAISSANCE & INTELLIGENCE
SUB-THRUST: SPEECH PROCESSING

BLOCK TITLE: CONNECTED SPEECH RECOGNITION & AUDIO INTEL EXPLOITATION

OBJECTIVES: DEVELOP A HIGHLY RELIABLE CONNECTED WORD RECOGNITION TECHNIQUE FOR C3I APPLICATIONS.
ANALYSIS OF ACOUSTIC INTEL SIGNALS.

TECHNICAL APPROACH: FABRICATE, TEST, AND EVALUATE A BREADBOARD MODEL OF A SOLID STATE LIMITED CONNECTED WORD RECOGNITION SYSTEM.
DEVELOPMENT OF AUTOMATED ACOUSTIC SIGNAL PROCESSING TECHNIQUES.

PAYOFF: NATURAL CONNECTED WORD RECOGNITION FOR AIR FORCE C3I PROGRAMS.
AUTOMATED BACKGROUND NOISE ANALYSIS FOR FTD.
ADVANCED SPEECH PROCESSING STATION (ASPS)

- SPEECH ENHANCEMENT
- VARIABLE SPEED CONTROL
- SPEECH FILING
- INSTANT RECALL
- KEYWORD RECOGNITION
- SPEAKER IDENTIFICATION
- LANGUAGE ID
- VOICE/DATA ENTRY
VOICE PROCESSOR TRAINING SYSTEM (VPTS)
(COMPUTER AIDED INSTRUCTIONS)

CPU

COMMUNICATIONS CONTROLLER

INSTRUCTOR POSITION # 1

INSTRUCTOR POSITION # 6

INST # 10

STUDENT TRAINING LANGUAGE ID
BOOTH # 1

ADP SHORT-HAND
REDUNDANCY REMOVAL
VOICE TRANSCRIPTION

STUDENT TRAINING
BOOTH # 200
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<tr>
<th>DEVELOPMENT STAGE</th>
<th>VOICE DATA ENTRY</th>
<th>ENTRY CONTROL</th>
<th>MESSAGE SORTING</th>
<th>COMMUNICATIONS ENHANCEMENT</th>
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<td>IN-HOUSE DATA ENTRY TEST BED</td>
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<td>PHONEMIC LOW DATA RATE COMMUNICATIONS</td>
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<td>EXPLORATORY DEVELOPMENT</td>
<td>SOLID STATE CONNECTED SPEECH, MULTI-MODE DATA ENTRY</td>
<td>DEVELOPMENT OF NEW PERSONAL ATTRIBUTES HYBRID SYSTEMS</td>
<td>KEYWORD/GISTING LANGUAGE ID, SPEAKER ID</td>
<td>IN-HOUSE LOW DATA RATE COMM, MULTI-TALKER SEPARATION, NOISE FILTER</td>
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<td>ADVANCED DEVELOPMENT</td>
<td>DRLMS ADVANCED DEVELOPMENT MODEL</td>
<td>OPERATIONAL TESTING OF ADVANCED PIA DEVICES</td>
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<td>SPEECH ENHANCEMENT OPERATIONAL T&amp;E</td>
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<td>MULTI-STATION DLMS VOICE DATA ENTRY</td>
<td>ENGINEERING DEVELOPMENT OF ASV</td>
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## RECONNAISSANCE & INTELLIGENCE/SPEECH PROCESSING

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<td>ACOUSTIC/PHONETIC ANALYSIS FOR C3I</td>
<td>NARROW AND TACTICAL PROCESSING EXPER</td>
<td>CONNECTED SPEECH RECOGNITION/ AUDIO INTEL EXPLOITATION</td>
<td>C3 CONNECTED COMMAND LANG., WORD RECOG/ENCODING T&amp;E 6.2</td>
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<td>SPEAKER/LANGUAGE ID/AUDIO GESTING DEVELOPMENT</td>
<td>AUDIO DATA HANDLING TECHNIQUES</td>
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<td>ADVANCED SPEECH PROCESSING STATION UPGRADE</td>
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<td>VOICE TRANSCRIPTION CORRELATION</td>
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Automated C3I COLLECTION ANALYSIS EXPLOITATION SY
KEY CONTACT POINTS

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<tr>
<th>Name</th>
<th>Contact</th>
<th>Phone</th>
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<tr>
<td>DR. BRUNO BEEK</td>
<td>RADC/IRA</td>
<td>330-4024</td>
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<tr>
<td>MR. RICHARD S. VONUSA</td>
<td></td>
<td></td>
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<tr>
<td>MR. EDWARD J. CUPPLES</td>
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<tr>
<td>MR. MELVIN G. MANOR</td>
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<tr>
<td>LT JOHN V. FERRANTE</td>
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<td>LT JEFFREY P. WOODARD</td>
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</tbody>
</table>
RADAR EQUIPMENT/SYSTEM R&M PROGRAM

CONTACTS

ENGINEERING BRANCH (RBE) - ANTHONY J. FEDUCCIA - X4920

R&M ENGINEERING TECHNIQUES SECTION (RBET) - ANTHONY COPPOLA - X4726

R&M ENGINEERING SECTION (RBES) - ANTHONY D. PETTINATO - X2702

SYSTEM ENGINEERING SECTION (RBES) - RICHARD MAIR - X3068
RADC EQUIPMENT/SYSTEM R&M PROGRAM

PRESENTATION OUTLINE

• OVERVIEW

• RELIABILITY TECHNIQUES

• MAINTAINABILITY TECHNIQUES

• RELIABILITY ANALYSIS CENTER

• MILITARY STANDARDS AND HANDBOOKS

• R&M ENGINEERING SUPPORT

• SUMMARY
RADCOM Equipment/System R&M Program

Overview

- R Prediction Studies
- R Demonstration Studies
- R Improvement Studies

MAINTENANCE & IMPROVEMENT OF RELIABILITY DISCIPLINE

- M Prediction Studies
- M Demonstration Studies
- M Improvement Studies

MAINTAINABILITY MODERNIZATION PROGRAM

TESTABILITY PROGRAM

TRANSITION
RADf EQUIPMENT/SYSTEM R&M PROGRAM

PRESENTATION OUTLINE

- OVERVIEW
- RELIABILITY TECHNIQUES
- MAINTAINABILITY TECHNIQUES
- RELIABILITY ANALYSIS CENTER
- MILITARY STANDARDS AND HANDBOOKS
- R&M ENGINEERING SUPPORT
- SUMMARY
RELIABILITY TECHNIQUES

RELIABILITY PREDICTION

RELIABILITY: THE PROBABILITY THAT AN ITEM WILL PERFORM ITS INTENDED FUNCTION FOR A SPECIFIED TIME UNDER STATED CONDITIONS.

\[ R = e^{-\left(\sum \lambda_i\right)T} \]

MTBF = MEAN TIME BETWEEN FAILURES

\[ MTBF = \frac{1}{\sum \lambda_i} \]

\( \lambda_i \) = FAILURE RATE OF AN INDIVIDUAL PART

PART FAILURE RATES CONTAINED IN MIL-HDBK-217 "RELIABILITY PREDICTION OF ELECTRONIC EQUIPMENT".
RELiABILITY TECHNIQUES

EXAMPLE OF FAILURE RATE MODEL FOR FIELD EFFECT TRANSISTORS

\[ \lambda_P = \lambda_B (\pi_E x \pi_A x \pi_Q x \pi_C) \text{ failures/10^9 hours} \]

WHERE:

- \( \lambda_B \) = BASE FAILURE RATE
- \( \pi_E \) = ENVIRONMENTAL FACTOR
- \( \pi_A \) = APPLICATION FACTOR
- \( \pi_Q \) = QUALITY FACTOR
- \( \pi_C \) = COMPLEXITY FACTOR

SOURCE: MIL-HDBK-217B "RELIABILITY PREDICTION OF ELECTRONIC EQUIPMENT"
RELIABILITY TECHNIQUES

RELIABILITY PREDICTION

EMERGING DEVICE TECHNOLOGIES

SYSTEM OPERATIONAL DATA

RADC
RELIABILITY & MAINTAINABILITY PROGRAM

FAILIRE ANALYSIS METHODS

MIL-HDBK-217

STATISTICAL ANALYSIS METHODS

DOD CONTRACTORS

MILITARY AGENCIES

COMMERCIAL SYSTEM DESIGNERS
RELIABILITY TECHNIQUES
RELIABILITY PREDICTION

MIL-HDBK-217C, NOTICE 1 AVAILABLE MAY 1980
- MONOLITHIC IC's (SSI/MSI/LSI)
- MICROWAVE SOLID STATE DEVICES

MIL-STD-217D SCHEDULED MARCH 1981
- CCD & BUBBLE MEMORIES
- GAAS FET
- ENVIRONMENTAL FACTORS (EXCEPT AVIONICS)

- MIL-HDBK-217D REVISION SCHEDULED MARCH 1982
  - MONOLITHIC IC's
  - FIBRE OPTICS
  - MICROWAVE POWER DEVICES
  - TWT's
  - AVIONIC ENVIRONMENTAL FACTORS

- FUTURE
  - LASERS
  - PC BOARDS
  - IC SOCKETS
  - VHSIC
RELIABILITY TECHNIQUES
EQUIPMENT BURN-IN

HVPS FAILURE RATE IN F-111 RADAR TESTS

FAILURE RATE

2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2


INSTITUTED VENDOR BURN-IN
RELIABILITY TECHNIQUES
EQUIPMENT BURN-IN
AN/ARC-164 BURN-IN CYCLE

STABILIZATION AT +55°C AMBIENT

-54°C

UNIT OFF | UNIT ON | UNIT ON | UNIT OFF

2 HRS ★ 2 HRS ★★ 2 HRS

★ TIME TO STABILIZE AT -54°C WITH UNIT OFF
★★ TIME TO STABILIZE AT +55°C WITH UNIT ON
RELIABILITY TECHNIQUES

EQUIPMENT BURN-IN
AN/ARC-164 BURN-IN

HYPOTHESIS:
AN/ARC-164 DEFECTS ARE MORE SENSITIVE TO THERMAL CYCLES THAN TO SUSTAINED HIGH TEMPERATURE.

EXPERIMENT:
HALF OF THREE MONTHS PRODUCTION BURNED IN WITHOUT 2 HOUR HIGH Temperature dwell. FAILURE HISTORY COMPARED TO OTHER HALF.
RELIABILITY TECHNIQUES
EQUIPMENT BURN-IN
AN/ARC-164 BURN-IN

RT-1168 AVG FAILURES PER UNIT

FAILURES PER UNIT

4-HOUR CYCLE

6-HOUR CYCLE

BURN-IN CYCLES

0 5 10 15 20 25 30 35
RELIABILITY TECHNIQUES

OTHER STUDIES OF INTEREST

COMPLETED

WARRANTY-GUARANTEE APPLICATION GUIDELINES FOR
AIR FORCE GROUND ELECTRONIC EQUIPMENT (RADC-TR-79-287)

IN PROGRESS

COMBINED HARDWARE-SOFTWARE RELIABILITY MODELS

SCHEDULED FOR FY-81

• PART DERATING GUIDELINES
• SNEAK CIRCUIT ANALYSIS
• RELIABILITY OF COMMERCIAL EQUIPMENT
• RELIABILITY DESIGN HANDBOOK
• FAULT TOLERANCE IN DISTRIBUTED SYSTEMS
• NON-ELECTRONICS COMPONENT RELIABILITY
RADC EQUIPMENT/SYSTEM R&M PROGRAM

PRESENTATION OUTLINE

- OVERVIEW
- RELIABILITY TECHNIQUES
- MAINTAINABILITY TECHNIQUES
- RELIABILITY ANALYSIS CENTER
- MILITARY STANDARDS AND HANDBOOKS
- R&M ENGINEERING SUPPORT
- SUMMARY
MAINTAINABILITY TECHNIQUES

MAINTAINABILITY PROBLEMS

PREDICTION METHODS ARE OBSOLETE:

- BASED ON REGRESSION ANALYSIS OF EQUIPMENTS BUILT 15 YEARS AGO

- DO NOT ACCOUNT FOR MODULARITY, MODERN DIAGNOSTIC METHODS, BUILT-IN TEST

- DO NOT IMPACT DESIGN

FIGURES OF MERIT HAVE UNDESIRABLE CHARACTERISTICS
MAINTAINABILITY TECHNIQUES

MAINTAINABILITY PREDICTION

MODERN MAINTAINABILITY PREDICTION TECHNIQUE PUBLISHED IN RADC-TR-78-169, MAINTAINABILITY PREDICTION AND ANALYSIS STUDY

- APPLICABLE TO MODERN TECHNOLOGY
- CONTAINS METHOD FOR DESIGN TRADES

TO BE TRANSITIONED VIA MIL HDBK-472, MAINTAINABILITY PREDICTION

VALIDATION STUDIES SCHEDULED FOR FY-81
MAINTAINABILITY TECHNIQUES

COMPUTING SYSTEM MEAN TIME TO REPAIR

MTBF = 50
MTTR = 2

MTBF = 50
MTTR = .5

MTTR = 1/2 (2) + 1/2 (.5) = 1.25
IF RELIABILITY IMPROVES:

MTBF = 50
MTTR = 2

MTBF = 100
MTTR = .5

MTTR = 2/3 (2) + 1/3 (.5) = 1.5
••• MTTR CAN DEGRADE IF RELIABILITY IMPROVES
MAINTAINABILITY TECHNIQUES

A BETTER APPROACH TO COMPUTING MAINTAINABILITY

MAINTENANCE HOURS/OPERATING HOUR

\[
\frac{MRT}{MTBF} = \text{PER LRU}
\]

\[
\sum \frac{MRT}{MTBF} = \text{PER EQUIPMENT}
\]

\[
A = \frac{1}{1 + \sum \frac{MRT}{MTBF}}
\]

- FIGURE IMPROVES AS EITHER RELIABILITY OR MAINTAINABILITY IMPROVE
- COMPUTATIONS ARE SIMPLIFIED
MAINTAINABILITY TECHNIQUES

RADIC TESTABILITY PROGRAM

RADC R&M MISSION: DEVELOP METHODS FOR PREDICTING, DEMONSTRATING, & IMPROVING RELIABILITY & MAINTAINABILITY (R&M)

TESTABILITY IMPACT: MAINTAINABILITY PREDICTION & DEMONSTRATION TECHNIQUES MUST CONSIDER FAULT DETECTION & ISOLATION PARAMETERS (TESTABILITY)

TESTABILITY STATUS: A NEGLECTED ENGINEERING DISCIPLINE WITH A SIGNIFICANT IMPACT ON LIFE CYCLE COSTS
MAINTAINABILITY TECHNIQUES

RADC TESTABILITY PROGRAM

EXAMPLE OF COST IMPACT

REQUEST FOR DIGITAL PCB TESTER SPECIFICATIONS

RADC TESTABILITY PROGRAM

SURVEY OF AIR FORCE NEEDS

SURVEY OF AVAILABLE TESTERS

STUDY FOUND MOST AIR FORCE DIGITAL PCB TEST NEEDS MET BY AVAILABLE TESTERS

PROPOSED SPECIAL TESTER ($4 MILLION) × 427-M PROGRAM

AVAILABLE TESTER PROCURED ($1 MILLION)
# Maintainability Techniques

RADc Testability Program

<table>
<thead>
<tr>
<th>Testability Discipline Needs</th>
<th>RADc Products</th>
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<tbody>
<tr>
<td>• Specifiable Figures of Merit</td>
<td>• BIT/EXTERNAL FIGURES OF MERIT AND DEMONSTRATION TECHNIQUES (RADc-TR-79-309)</td>
</tr>
<tr>
<td>• Demonstration Methodology</td>
<td>• DESIGN GUIDELINES AND OPTIMIZATION PROCEDURES FOR TEST SUBSYSTEM DESIGN (RADc-TR-80-XXX)</td>
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<tr>
<td>• Design Tools</td>
<td>• AN OBJECTIVE PRINTED CIRCUIT BOARD TESTABILITY DESIGN GUIDE AND RATING SYSTEM (RADc-TR-79-327)</td>
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<td>• Cost Trade-Offs</td>
<td>• BIT-EXTERNAL TESTER RELIABILITY CHARACTERISTICS (RADc-TR-80-32)</td>
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<td>• OPERATION AND SUPPORT COST CHARACTERISTICS OF TESTERS AND TEST SUBSYSTEMS (RADc-TR-79-334)</td>
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<td>• AVAILABILITY/OPERATIONAL READINES TEST SUBSYSTEM COST TRADE-OFFS (RADc-TR-80-XXX)</td>
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MAINTAINABILITY TECHNIQUES

IN PROGRESS
- TESTABILITY NOTEBOOK
- FMEA METHODOLOGY
- CAUSES OF UNNECESSARY REMOVALS
- STUDY OF FALSE ALARMS

PLANNED FOR FY-81
- ANALYTICAL PROCEDURES FOR TESTABILITY
- FAULT TOLERANCE IN DISTRIBUTED SYSTEMS
- BIT HARDWARE/SOFTWARE TRADE-OFFS
- TESTER SOFTWARE COST ESTIMATION
- NON-ELECTRONIC COMPONENT TESTABILITY
- PROGRAMMABLE INTERFACES
RELIABILITY ANALYSIS CENTER

FIELD DATA → RAC (DOD CENTER) → RAOC (MANAGER) → DATA PRODUCTS

RAC (DOD CENTER) → INQUIRY SERVICE → DATA PRODUCTS

- MONOGRAPHS
  - DATA TABULATIONS
  - BIBLIOGRAPHIES ABSTRACTS

RAC (DOD CENTER) → SPECIAL STUDIES

- ADVICE TO SUBSCRIBERS
  - RELIABILITY OF SMOKE DETECTORS (NBS)
  - FAILURE RATE MODELS (RAOC)
  - SEEK IGLOO COST STUDIES (ESD)
  - RELIABILITY HANDBOOKS (FAA)
  - STORAGE STANDARDS (U.S. ARMY)
RADIC EQUIPMENT/SYSTEM R&M PROGRAM

PRESENTATION OUTLINE

• OVERVIEW

• RELIABILITY TECHNIQUES

• MAINTAINABILITY TECHNIQUES

• RELIABILITY ANALYSIS CENTER

• MILITARY STANDARDS AND HANDBOOKS

• R&M ENGINEERING SUPPORT

• SUMMARY
RADC EQUIPMENT/SYSTEM R&M PROGRAM

MILITARY STANDARDS AND HANDBOOKS

RADC IS DOD PREPARING ACTIVITY FOR:

MIL-HDBK-217 RELIABILITY PREDICTION OF ELECTRONIC EQUIPMENT
MIL-STD-470 MAINTAINABILITY PROGRAM REQUIREMENTS
MIL-STD-471 MAINTAINABILITY VERIFICATION/DEMONSTRATION/EVALUATION
MIL-STD-1591 ON AIRCRAFT FAULT DIAGNOSIS SUB-SYSTEMS ANALYSIS/SYNTHESIS OF
MIL-STD-001591 (USAF) COMMAND, CONTROL AND COMMUNICATIONS (C³) SYSTEM & COMPONENT
              FAULT DIAGNOSIS, SUBSYSTEMS, ANALYSIS/SYNTHESIS OF
RADC EQUIPMENT/SYSTEM R&M PROGRAM

MILITARY STANDARDS AND HANDBOOKS

RADC IS AIR FORCE CUSTODIAN OF:

MIL-STD-756 RELIABILITY PREDICTION
MIL-STD-721 DEFINITION OF EFFECTIVENESS TERMS FOR RELIABILITY, MAINTAINABILITY, HUMAN FACTORS & SAFETY
MIL-HDBK-472 MAINTAINABILITY PREDICTION
MIL-STD-1629 PROCEDURES FOR PERFORMING A FMECA

RADC IS A REVIEWING ACTIVITY FOR:

MIL-STD-781 RELIABILITY TESTS: EXPONENTIAL DISTRIBUTION
MIL-STD-785 RELIABILITY PROGRAM FOR SYSTEMS & EQUIPMENT

ALL OTHER DOD R&M DOCUMENTS
RADCOM EQUIPMENT/SYSTEM R&M PROGRAM

R&M ENGINEERING SUPPORT

- PREPARE R&M REQUIREMENTS
- EVALUATE PROPOSALS
- REVIEW R&M PROGRAM PLANS
- EVALUATE R&M PREDICTIONS
- MONITOR R&M PROGRAM
- REVIEW R&M DEMONSTRATION PLANS
- REVIEW & ANALYZE TEST RESULTS
- PROVIDE SPECIALIZED SERVICES
RAD C EQUIPMENT/R&M SYSTEM PROGRAM

SUMMARY

R&M Specifications & Standards

Tailored Application

Technical Information

System Acquisition

Problems & Data

Primary Transition

R&M Technology Development

Unique RAD C Capability

RAD C Leading Role

Many Different Agencies
TPO/THRUST: 46 INFORMATION PROCESSING

SUB-THRUST: 463 SOFTWARE ENGINEERING

PROGRAM GOALS: DEVELOP AND EXPLOIT SOFTWARE ENGINEERING TECHNOLOGY FOR IMPROVED SYSTEM PERFORMANCE, QUALITY, AND RELIABILITY. ENFORCE ENGINEERING DISCIPLINE FOR SOFTWARE PRODUCTION AND TAKE ADVANTAGE OF MODERN PROGRAMMING PRACTICES. IMPROVE MANAGEMENT VISIBILITY INTO THE SOFTWARE LIFE CYCLE.

TECHNICAL AREAS:

- REQUIREMENTS SPECIFICATION ENGINEERING
- DESIGN AND MANAGEMENT
- SOFTWARE TOOLS
- STANDARDS
- DATA COLLECTION
- MODELING
- QUALITY MEASUREMENTS
REQUIREMENTS SPECIFICATION ENGINEERING

- AUTOMATED REQUIREMENTS ANALYSIS TECHNOLOGY HAS POTENTIAL FOR GREATEST LEVERAGE IN REDUCING SYSTEM LIFE CYCLE COSTS.

- PROGRAM BASELINE - SREM SELECTED AS MOST SUITABLE TECHNOLOGY FOR SOFTWARE AND SYSTEM REQUIREMENTS ANALYSIS.
REQUIREMENTS SPECIFICATION ENGINEERING
TPO/THrust #/TITLE: 4G INFORMATION PROCESSING
SUB-THRUST #/TITLE: 4G3 SOFTWARE ENGINEERING (REQUIREMENTS SPECIFICATION ENGINEERING)
EFFORT BLOCK TITLE: SOFTWARE SPECIFICATION TOOL DEVELOPMENT

OBJECTIVE:
- DEVELOP METHODOLOGY AND TOOLS FOR AUTOMATED REQUIREMENTS SPECIFICATION ANALYSIS.
- PROVIDE CAPABILITY TO VALIDATE MIL-STD 490 TYPE B5 SPECIFICATIONS.

TECHNICAL APPROACH:
- UTILIZE SREM AS BASELINE TECHNOLOGY.
- ENHANCEMENTS FOR C3I EMBEDDED COMPUTER SYSTEMS.

PAY OFF:
- INTEGRATED SET OF SPECIFICATION EVALUATION TOOLS.
- LIFE CYCLE COST REDUCTION - EARLY DETECTION/Correction OF SPECIFICATION PROBLEMS.
- CONSISTENT, COMPLETE, UNAMBIGUOUS SPECIFICATIONS.
DESIGN AND MANAGEMENT

- MERGE ADVANCED DESIGN TECHNIQUES WITH AUTOMATED REQUIREMENTS SPECIFICATION TECHNOLOGY.

- PROVIDE MANAGEMENT CAPABILITY TO PREDICT SOFTWARE LIFE CYCLE COSTS.

- DEVELOP TECHNIQUES TO PERFORM COST/PERFORMANCE TRADEOFFS DURING SYSTEM CONCEPT AND VALIDATION PHASES.
RADC TPO 4G INFORMATION PROCESSING

THrust: 463 SOFTWARE ENGINEERING (DESIGN AND MANAGEMENT) (Contd.)

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<td>AUTOMATED SPECIFICATION</td>
<td>AUTOMATED SPECIFICATION</td>
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TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 4G3 SOFTWARE ENGINEERING (DESIGN AND MANAGEMENT)

EFFORT BLOCK TITLE: SOFTWARE COST MODEL DEVELOPMENT

OBJECTIVE: DEVELOP ADVANCED MODELS FOR PREDICTING SOFTWARE LIFE CYCLE COSTS.

TECHNICAL APPROACH:
- UTILIZE RESULTS OF ONGOING STATE-OF-THE-ART ANALYSIS.
- SELECT AND DEVELOP "BEST FIT" COST MODEL(S).
- VALIDATE MODEL USING ACTUAL SOFTWARE COST DATA.

PAY OFF:
- IMPROVED CAPABILITY TO ESTIMATE LIFE CYCLE COSTS DURING CONCEPT/VALIDATION PHASES.
- AVOID UNANTICIPATED COST OVERRUNS.
TPO/THRUST #/TITLE: 4G INFORMATION PROCESSING
SUB-THRUST #/TITLE: 4G3 SOFTWARE ENGINEERING (DESIGN AND MANAGEMENT)
EFFORT BLOCK TITLE: FRAMEWORK FOR SOFTWARE QUALITY TRADE-OFF ANALYSIS
OBJECTIVE: DEVELOP CAPABILITY TO PERFORM SOFTWARE COST VS. QUALITY TRADE-OFFS.

TECHNICAL APPROACH:
- SIMULATE SOFTWARE ACQUISITION LIFE CYCLE.
- INCLUDE CAPABILITY TO VARY DEVELOPMENT APPROACHES.
- MERGE LIFE CYCLE COST MODELS AND QUALITY FACTOR CRITERIA.

PAY-OFF:
- COST/QUALITY TRADE-OFF STUDIES DURING CONCEPT AND VALIDATION PHASE.
- CAPABILITY TO SELECT FROM ALTERNATIVE DEVELOPMENT APPROACHES.
- MATCH SELECTED APPROACH TO AVAILABLE RESOURCES.
SOFTWARE TOOLS

- DEVELOP SOFTWARE TESTING TOOLS AND PROCEDURES TO OBTAIN MORE EFFECTIVE TESTING PER AF DOLLAR.

- PROVIDE APPLICATION PROGRAM TEST GUIDANCE TO OPTIMIZE TESTING APPROACH.

- INVESTIGATE AND DEVELOP SOFTWARE TOOLS TO COPE WITH UNIQUE ATTRIBUTES OF DISTRIBUTED SYSTEMS.
TPO/THRUST #/TITLE: 4G INFORMATION PROCESSING
SUB-THRUST #/TITLE: 4G3 SOFTWARE ENGINEERING (SOFTWARE TOOLS)
EFFORT BLOCK TITLE: SOFTWARE TEST HANDBOOK

OBJECTIVE: PRODUCE HANDBOOK TO MATCH SOFTWARE TESTING APPROACH TO APPLICATION ENVIRONMENT.

TECHNICAL APPROACH:
- DETERMINE APPLICABLE COST-EFFECTIVE TECHNIQUES AND TOOLS.
- DEVELOP STEP-WISE METHODOLOGY FOR APPLYING TEST METHODS.

PAY OFF:
- HANDBOOK PROVIDES FOCUS ON SOFTWARE TEST METHODOLOGY.
- SOFTWARE TEST GUIDANCE AND IMPROVED TEST STRATEGY.
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING
SUB-THRUST #/TITLE: 463 SOFTWARE ENGINEERING (SOFTWARE TOOLS)
EFFORT BLOCK TITLE: SOFTWARE RE-TEST TECHNIQUES
OBJECTIVE: IMPROVE SOFTWARE RE-TEST METHODS FOR IMPLEMENTED SYSTEMS.

TECHNICAL APPROACH:
- EXAMINE REQUIREMENTS FOR SOFTWARE RF-TEST DURING OPERATION AND MAINTENANCE PHASE.
- DETERMINE APPLICABLE STATE-OF-THE-ART METHODS.
- SPECIFY NEW OR AUGMENTED TECHNOLOGIES FOR SOFTWARE RE-TEST.

PAY OFF:
- IMPROVEMENTS TO SOFTWARE SUPPORT ACTIVITIES - MODIFICATION AND ERROR CORRECTION.
- ACCOMODATE SOFTWARE MAINTENANCE "RIPPLE EFFECT".
TPO/THRUST #/TITLE: 4G INFORMATION PROCESSING

SUB-THRUST #/TITLE: 4G3 SOFTWARE ENGINEERING (SOFTWARE TOOLS)

EFFORT BLOCK TITLE: SOFTWARE ASSERTION TECHNIQUES

OBJECTIVE: DEVELOP PROGRAM ASSERTION TECHNIQUES FOR IMPROVED SOFTWARE TESTING.

TECHNICAL APPROACH:
- INVESTIGATE PROGRAM ASSERTION METHODOLOGY FOR AUTOMATED TEST TOOLS.
- DEVELOP SUITABLE ASSERTION METHODS COMPATIBLE WITH KNOWN TESTING METHODS.
- VALIDATE TECHNIQUES USING AUTOMATED VERIFICATION SYSTEM (E.G. CAVS).

PAY OFF:
- IMPROVED SOFTWARE TESTABILITY AND PERFORMANCE.
- DYNAMIC TESTING OF SOFTWARE SYSTEMS SUPPORTED.
- HIGHER QUALITY OF DELIVERED PRODUCT.
TP0/THUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 463 SOFTWARE ENGINEERING (SOFTWARE TOOLS)

EFFORT BLOCK TITLE: DISTRIBUTED PROCESSING TOOLS DEFINITION

OBJECTIVE: TO IDENTIFY/SPECIFY TOOLS AND TECHNIQUES TO SUPPORT THE DEVELOPMENT OF DISTRIBUTED PROCESSING SYSTEMS.

TECHNICAL APPROACH:

- INVESTIGATE ATTRIBUTES OF DISTRIBUTED PROCESSING SYSTEMS AND APPLICABILITY OF EXISTING TOOLS.
- DEFINE IMPROVED METHODS FOR ALLOCATION OF SYSTEM FUNCTIONS.
- IDENTIFY NEEDS FOR NEW PROGRAMMING STRATEGIES.
- PROVIDE FUNCTIONAL REQUIREMENTS FOR NECESSARY TECHNOLOGY DEVELOPMENTS.

PAY OFF:

- COHERENT SOFTWARE DEVELOPMENT APPROACH FOR DISTRIBUTED PROCESSING.
- TECHNOLOGY TRANSFER OF EXISTING SOFTWARE ENGINEERING CAPABILITIES.
DATA COLLECTION

- ESTABLISH A FOCAL POINT CENTER FOR THE RECEIPT AND ANALYSIS OF
  SOFTWARE DATA FOR USE BY MANAGERS AND TECHNOLOGISTS.

- PROVIDE STANDARDIZED DATA COLLECTION METHODOLOGY.

- SUPPORT SOFTWARE ENGINEERING RESEARCH OBJECTIVES.
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<td>FY82</td>
<td>PRODUCTIVITY AND MAINTENANCE DATA 6.3</td>
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<td>FY83</td>
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<td>SPECIALIZED DATA SAMPLING 6.3</td>
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<td>ANALYSIS OF IV&amp;V DATA 6.3</td>
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TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 463 SOFTWARE ENGINEERING (DATA COLLECTION)

EFFORT BLOCK TITLE: PRODUCTIVITY AND MAINTENANCE DATA

OBJECTIVE: TO ACQUIRE SOFTWARE DATA, ON A CONTINUING BASIS, TO SUPPORT SOFTWARE ENGINEERING RESEARCH OBJECTIVES.

TECHNICAL APPROACH:
- IDENTIFY DATA REQUIREMENTS - E.G., TO SUPPORT MODELING AND QUALITY MEASUREMENTS.
- SELECT APPROPRIATE PROJECTS FOR DATA COLLECTION.
- APPLY DATA ITEM DESCRIPTION FOR STANDARDIZED FORMAL AND DATA FLOW.

PAY OFF:
- ENABLE THE EVALUATION OF IMPROVED SOFTWARE ENGINEERING TECHNIQUES.
- PROVIDE DIRECTION FOR FUTURE RESEARCH ACTIVITIES.
TP0/THRUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 463 SOFTWARE ENGINEERING (DATA COLLECTION)

EFFORT BLOCK TITLE: ERROR DATA BASELINE ANALYSIS

OBJECTIVE: DEVELOP BASELINES TO TRACK AND ASSESS RELIABILITY OF SOFTWARE SYSTEMS DURING DEVELOPMENT.

TECHNICAL APPROACH:

- UTILIZE DATA FROM EXPERIMENTAL DACS AND ANALYSIS OF IV&V DATA EFFORT.
- DEVELOP ERROR PROFILES AND BASELINES FOR CATEGORIZED C3I SYSTEMS.

PAY OFF:

- PROVIDES CAPABILITY TO ASSESS IMPACT OF NEW SOFTWARE ENGINEERING TECHNOLOGY.
- IMPROVED REFERENCES FOR VALIDATING SOFTWARE QUALITY MEASUREMENTS.
MODELING

- PROVIDE A CAPABILITY TO PREDICT SYSTEM PERFORMANCE CHARACTERISTICS.

- ESTABLISH GUIDES, STANDARDS, AND SPECIFICATIONS FOR ASSESSING IMPLEMENTED SYSTEM PERFORMANCE DURING VARIOUS LIFE CYCLE PHASES.

- DEVELOP MODELS TO ASSIST SOFTWARE ENGINEERING RESEARCH.
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 4G3 SOFTWARE ENGINEERING (MODELING)

EFFORT BLOCK TITLE: SOFTWARE RELIABILITY-COMPLEXITY MODELS

OBJECTIVE: TO DEVELOP MODELS OF THE SOFTWARE DEVELOPMENT PROCESS THROUGH THE FORMULATION OF INTEGRATED SOFTWARE RELIABILITY AND COMPLEXITY MODELS.

TECHNICAL APPROACH:
- EXAMINE SOFTWARE STRUCTURAL COMPLEXITY.
- RELATE COMPLEXITY TO SOFTWARE RELIABILITY AND DEVELOPMENT.

PAY OFF:
- CAPABILITY TO PERFORM RELIABILITY/COMPLEXITY TRADEOFFS.
- ASSISTANCE IN PERFORMING SOFTWARE TASK PARTITIONING.
TPO/THRUST #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 463 SOFTWARE ENGINEERING (MODELING).

EFFORT BLOCK TITLE: MIL-HDBK FOR SOFTWARE QUALITY MEASUREMENT

OBJECTIVE: DEVELOP MIL-HDBK FOR PERFORMING SOFTWARE QUALITY MEASUREMENTS.

TECHNICAL APPROACH:

- AUGMENT MIL-HDBK FOR SOFTWARE RELIABILITY ASSESSMENT WITH RESULTS FROM SOFTWARE QUALITY FACTORS APPLICATION.
- PRODUCE MIL-HDBK FOR SOFTWARE QUALITY MEASUREMENTS.

PAYOFF:

- CAPABILITY TO SPECIFY REQUIRED SOFTWARE QUALITY FACTORS (E.G., RELIABILITY).
- MIL-HDBK PROVIDES FOCUS ON SOFTWARE QUALITY.
TP0/THRUST #/TITLE: 4G INFORMATION PROCESSING

SUB-THRUST #/TITLE: 4G3 SOFTWARE ENGINEERING (MODELING)

EFFORT BLOCK TITLE: RELIABILITY/TEST/DESIGN CONSIDERATIONS FOR FAULT TOLERANT SYSTEMS.

OBJECTIVE: INVESTIGATE HARDWARE/SOFTWARE ASPECTS OF FAULT TOLERANT SYSTEMS TO IMPROVE RELIABILITY AND TESTABILITY.

TECHNICAL APPROACH:
- COMBINED HARDWARE/SOFTWARE MODELING ACTIVITY.
- DEVELOP NEW METHODS TO EVALUATE AND TEST FAULT TOLERANT SYSTEMS.
- JOINT DEVELOPMENT - RADC/IS AND RB.

PAY OFF: IMPROVED SYSTEM RELIABILITY AND TESTABILITY.
QUALITY MEASUREMENTS

- PROVIDE ACQUISITION MANAGEMENT WITH A CAPABILITY TO PREDICT COST/QUALITY/PERFORMANCE TRADEOFFS.

- ESTABLISH THE PROPER METRICS AND TOOLS FOR QUALITATIVE AND QUANTITATIVE ANALYSIS OF SOFTWARE SYSTEMS.

- DEVELOP AUTOMATED TOOLS FOR COLLECTING AND ANALYZING METRIC DATA AND VALIDATE THE RESULTS.
PO/THRUST #/TITLE: 4G INFORMATION PROCESSING

SUB-THRUST #/TITLE: 4G3 SOFTWARE ENGINEERING (QUALITY MEASUREMENTS)

EFFORT BLOCK TITLE: QUANTITATIVE MEASURES FOR SOFTWARE QUALITY

OBJECTIVE: TO DEVELOP SPECIFIC METRICS OF SOFTWARE ATTRIBUTES AND INTERRELATIONSHIPS OF QUALITY FACTORS SUCH AS MAINTAINABILITY, REUSABILITY, INTEROPERABILITY, ETC.

TECHNICAL APPROACH:

- ANALYZE APPLICATION ENVIRONMENTS AND CLASSIFY SOFTWARE DEVELOPMENTS.
- EMPIRICAL DATA ANALYSIS TO DETERMINE SOFTWARE QUALITY MEASURES.
- CRITICAL SOFTWARE ATTRIBUTES SPECIFIED.

PAY OFF:

- IMPROVED UNDERSTANDING OF SOFTWARE QUALITY METRICS.
- ABILITY TO MATCH SOFTWARE METRICS TO DESIRED SYSTEM FEATURES (E.G., PORTABILITY).
TP0/THRUST #/TITLE: INFORMATION PROCESSING
SUB-THRUST #/TITLE: 463 SOFTWARE ENGINEERING (QUALITY MEASUREMENTS)
EFFORT BLOCK TITLE: COLLECTION AND ANALYSIS TOOLS

OBJECTIVE: IMPLEMENT AUTOMATED DATA COLLECTION AND ANALYSIS TOOLS FOR PERFORMING SOFTWARE QUALITY MEASUREMENTS.

TECHNICAL APPROACH:

- UTILIZE PROTOTYPE COBOL TOOL FOR DATA COLLECTION.
- INITIAL VALIDATION OF MEASUREMENTS AND TEST RESULTS.
- DEVELOP METHODS FOR PREDICTING SOFTWARE QUALITY.

PAY OFF: IMPROVED SOFTWARE QUALITY ASSURANCE.
TP0/THRUST #/TITLE: 46 INFORMATION PROCESSING
SUB-THRUST #/TITLE: 463 SOFTWARE ENGINEERING (QUALITY MEASUREMENTS)
EFFORT BLOCK TITLE: MEASUREMENT VALIDATION

OBJECTIVE: TO APPLY AND DEMONSTRATE SOFTWARE QUALITY MEASUREMENT TOOLS IN AN AIR FORCE ACQUISITION PROGRAM.

TECHNICAL APPROACH:
- CANDIDATE COBOL PROJECT SELECTED (H6100/GCOS ENVIRONMENT).
- COLLECT AND ANALYZE METRIC DATA USING PROTOTYPE TOOL.

PAY OFF:
- CAPABILITY TO PREDICT AND ASSESS SOFTWARE QUALITY.
- VALIDATED COLLECTION TOOL TO PROVIDE R&D BASIS FOR ADDITIONAL TOOLS FOR VARIOUS PROGRAMMING LANGUAGES.
TP0/THrust #/TITLE: 46 INFORMATION PROCESSING

SUB-THRUST #/TITLE: 463 SOFTWARE ENGINEERING (QUALITY MEASUREMENT)

EFFORT BLOCK TITLE: QUALITY FACTORS APPLICATION

OBJECTIVE: PROVIDE A CAPABILITY FOR ACQUISITION MANAGEMENT TO SPECIFY SOFTWARE QUALITY.

TECHNICAL APPROACH:
- DEMONSTRATE INTERACTION BETWEEN VARIOUS SOFTWARE QUALITY FACTORS.
- SURVEY C3I ENVIRONMENT TO PRIORITIZE QUALITY REQUIREMENTS.
- CONDUCT TRADE-OFF STUDIES OF CRITICAL SOFTWARE ATTRIBUTES.
- PRODUCE A QUALITY REQUIREMENTS GUIDEBOOK.

PAY OFF:
- EFFECTIVE SPECIFICATION OF KEY SOFTWARE QUALITY REQUIREMENTS.
- GUIDANCE DIRECTLY USABLE BY MANAGEMENT.
- MEANS FOR ASSURING ADHERENCE TO QUALITY REQUIREMENTS.
SOFTWARE ENGINEERING

INDUSTRY LOOKS AT RAD. 1980

TPQ 463

PROGRAM MANAGER

W. PIPKA
P. MIERER
A. SUKERT
F. LAWNICA
J. PALAIRO
A. SUKERT
J. CAVANO

SYMBOL/PHONE

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1515/7834
1515/3851
1515/7834
1515/4325
1515/3851
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AREA

REQUIREMENTS SPECIFICATION ENGINEERING
SOFTWARE DESIGN
SOFTWARE MANAGEMENT
SOFTWARE TOOLS
DATA COLLECTION
MODELING
QUALITY MEASUREMENTS

766
EMC CONTROL

OBJECTIVE:

DEVELOP ADVANCED CONTROL/SUPPRESSION TECHNIQUES TO ALLEVIATE INTERFERENCE PROBLEMS NOT SOLVABLE BY CONVENTIONAL TECHNIQUES
4F  RELIABILITY, MAINTAINABILITY & COMPATIBILITY

4F3  EM COMPATIBILITY - CONTROL

EMC TECHNOLOGY FOR ADVANCED COMMUNICATIONS  12

ADVANCE ELECTRONICALLY TUNABLE RESONATOR (ETR) TECHNOLOGY

HIGH POWER SUB-BAND UHF COVERAGE ETR

MEDIUM POWER FULL BAND COVERAGE ETR

IMPROVED COLLOCATION ON C^3I PLATFORMS
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<td>SUB-THRUST:</td>
<td>4F3 EM COMPATIBILITY - CONTROL</td>
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<tr>
<td>BLOCK TITLE:</td>
<td>ADVANCED SYNTHESIZER EMC TECHNOLOGY 13</td>
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<tr>
<td>OBJECTIVE:</td>
<td>DEVELOP ELECTRONICALLY TUNABLE OSC (ETO) TECHNOLOGY FOR NEW SYNTHESIZER APPLICATION</td>
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<td>TECHNICAL APPROACH:</td>
<td>• PROVE FEASIBILITY OF HIGH LEVEL/LOW NOISE ETO</td>
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<td>• USE ETO TECH TO DEVELOP A Ø LOCKED LOOP SYNTHESIZER</td>
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<td>PAY OFF:</td>
<td>• REDUCE XMTR NOISE/SPURIOUS OUTPUTS</td>
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<td>• REDUCE RCVR GUARDBANDS</td>
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<td>• PROVIDE TECH SPIN-OFF TO TEST EQUIPMENT</td>
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TPO/THRUST #/TITLE: 4F RELIABILITY, MAINTAINABILITY & COMPATIBILITY
SUB-THRUST: 4F3 EM COMPATIBILITY - CONTROL
BLOCK TITLE: HF ANTENNA COUPLER EMC TECHNOLOGY
OBJECTIVE: DEVELOP TECHNOLOGY TO REDUCE ANTENNA COUPLER NONLINEAR INTERFERENCE
TECHNICAL APPROACH:
0 IDENTIFY INTERFERENCE MECHANISM
0 REDUCE INTERFERENCE BY DESIGN
0 DEVELOP ADD-ON DEVICE
PAY OFF: HF XMT/AFSATCOM EMC WITHOUT FREQUENCY MANAGEMENT
TPO/THRUST #/TITLE: 4F  RELIABILITY, MAINTAINABILITY & COMPATIBILITY

SUB-THRUST: 4F3  EM COMPATIBILITY - CONTROL

BLOCK TITLE: EMC TECHNOLOGY FOR REDUCING NONLINEAR INTERFERENCE

OBJECTIVE: DEVELOP TECHNOLOGY TO IDENTIFY AND REDUCE NONLINEAR GENERATED INTERFERENCE

TECHNICAL APPROACH:
0  STUDY MECHANISMS AND ID TECHNIQUES
0  NONLINEAR CANCELLATION TECHNIQUE
0  ADAPT Ø CONTROL
0  NONLINEAR SYNTHESIS

PAY OFF: COLLOCATION OF ULTRA SENSITIVE RCVRS ON C3I PLATFORMS
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<tr>
<td>BLOCK TITLE:</td>
<td>COMPUTER AIDED EMC DESIGN TECHNIQUES</td>
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<tr>
<td>OBJECTIVE:</td>
<td>DEVELOP GENERALIZED PRINTED CIRCUIT LAYOUT, GROUNDING AND BY-PASS TECHNIQUES TO REDUCE UNWANTED COUPLING PATHS</td>
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<tr>
<td>TECHNICAL APPROACH:</td>
<td>INVESTIGATE UNWANTED COUPLING MECHANISMS AND PROVIDE COMPUTER AIDED DESIGN ALTERNATIVES</td>
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<td>PAY OFF:</td>
<td>0 HANDHELD CALCULATOR PROGRAMS</td>
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<td>0 UPDATE AFSC DH 1-4 EMC</td>
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EMC CONTROL

**Tx OUTPUTS**
- DESIRED OUTPUT
- NOISE
- SPURIOUS
- HARMONICS
- IM PRODUCTS

**Medium**
- DIRECT PATH
- REFLECTED PATH
- FUSELAGE
- NON-LINEAR
- APERTURES

**Rx INPUTS**
- DESIRED SIGNAL
- BRUTE FORCE
- NOISE
- SPURIOUS
- HARMONICS
- IM PRODUCTS

**Rx OUTPUT**
- L.O. SIGNAL
- SPURIOUS
- IM PRODUCTS
- HARMONICS
EMC ANALYSIS, PREDICTION AND MEASUREMENT

THE OBJECTIVE OF THIS TECHNICAL AREA IS:

1. TO CONDUCT LONG RANGE CONTINUING RESEARCH AND SYSTEM'S ANALYSIS FOR USE IN DEVELOPING RECOMMENDATIONS AND TECHNIQUES TO EFFICIENTLY UTILIZE THE EM SPECTRUM IN A COMPATIBLE MANNER.

2. TO EMPHASIZE RESEARCH, DEVELOPMENT, TEST AND EVALUATION EVOLVING MODELING TECHNIQUES FOR COMPONENTS, CIRCUITS, EQUIPMENTS, SUB-SYSTEMS AND SYSTEMS DESIGN THROUGHOUT THEIR LIFE CYCLE.

3. TO ENSURE THE EFFICIENT AND BROAD EXCHANGE OF THE INFORMATION OBTAINED REGARDING THE RESULTS OF THIS AREA.
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TPO/THRUST #/TITLE: 4F RELIABILITY, MAINTAINABILITY & COMPATIBILITY

SUB-THRUST #/TITLE: 4F3 EM COMPATIBILITY

BLOCK TITLE: EMC FIELD COUPLING MAPPING/MEASUREMENTS & MODEL VALIDATION

OBJECTIVE:
- Demonstrate capabilities & define limits of finite difference time domain (FDTD)/coupling into missiles
- Interface advanced coupling techniques
- Measure E&H fields in missiles

TECHNICAL APPROACH:
- Model arbitrary angles of incidence & polarization
- Model wires behind apertures
- Develop interface software techniques
- Develop E&H field probes with accuracy of ± 1 dB and spatial resolution of ± 0.5 cm

PAY OFF:
Accurate techniques for predicting/verifying EM fields into missiles
TPO/THRUST #/TITLE: 4F RELIABILITY, MAINTAINABILITY & COMPATIBILITY
SUB-THRUST #/TITLE: 4F3 EM COMPATIBILITY
BLOCK TITLE: OPERATIONAL SYSTEM LEVEL EMC ANALYSIS MODELS (IAP/IEMCAP) 9
OBJECTIVE: UPGRADE IEMCAP CAPABILITY TO ADDRESS DEFICIENCIES SURFACED BY USERS, F-15 AND B-52 EVALUATIONS, & OTHER CURRENT & PROJECTED APPLICATIONS
TECHNICAL APPROACH: DEVELOP, INCORPORATE INTO IEMCAP, AND DOCUMENT:
- IMPROVED SPECTRA AND RECEPTOR MODELS
- ANTENNA OUT-OF-BAND MODELS
- NONLINEAR ANALYSIS
- EFFECTS OF WIRE HANGERS, JUNCTION BOXES, BULKHEADS
- BUNDLE-TO-BUNDLE COUPLING
- BOX-TO-BOX COUPLING
PAY OFF: HIGHLY IMPROVED TOOL FOR PRELIMINARY EMC ANALYSIS/DESIGN; REDUCE COSTLY EMC TESTS; PROVIDE STANDARD WEAPON SYSTEM EMC DATA BASE FOR FUTURE SYSTEM MODS
- IEMCAP

- SUPPLEMENTAL MODELS
  - P-STATIC
  - TEMPEST
  - MAGNETOSPHERIC SUBSTORMS
  - LIGHTNING

- OFF-LINE MODELS
  - NONLINEAR CIRCUIT ANALYSIS
  - EM FIELDS AND COUPLING ANALYSIS
  - WIRE COUPLING ANALYSIS

- EM IMPACT OF ADVANCED COMPOSITE MATERIALS
IAP TRAINING
TOTAL OF 195 STUDENTS REPRESENTING

Aerojet Electro Systems Co
Aeroneutronics Ford
Aerospace Corp
AFAL
AFATL
AFCS
AFFDL
AFGL
AFLC
AFSC
AFWL
ALC
ASD
Atlantic Research Corp
Bell Northern Research
Boeing
Collins
Concordia Univ
Dayton T. Brown Inc
Def. Research Est-Ottawa
ECAC
ESD
Fairchild Space & Electronics
General Dynamics
General Electric
Georgia Institute of Technology
Grumman
GTE Sylvania
Harris ESD
Hughes Aircraft
IBM
IIT Research Inst
IRT Corp
Israel-Defense Ministry
Lockheed
Loral Electronic Systems
Martin-Marietta
Mitre
Motorola
NADC
NASA-Goddard Space Center
National Aerospace Lab
NASC
NAVSAC
Naval Electronics Lab Center
NRL
NSWC
NUSC
MWC
Northrop Corp
Pacific Missile Test Center
Purdue Univ
RADC
Rand
Raychem
Raytheon
RCA Corporation
Rockwell Intl
Sachs-Freeman Associates
Samso
Sandia Laboratories
Southwest Research Inst
Sperry Univac
Stanford Research Inst
Systematics General Corp
Teledyne-Ryan-Aeronautical
TRW
USA CEEIA
USA CRDC
USA DAVAA-E
USAF
US Dept of Commerce
Vought Corp
Western Electric
Westinghouse Electric Corp
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FIGURE 6-1B. E4-A BASELINE ANTENNA LOCATIONS - CONFIGURATION 2
TP0/THrust #/TITLE:  4F RELIABILITY, MAINTAINABILITY & COMPATIBILITY

SUB-THRUST #/TITLE:  4F3 EN COMPATIBILITY

BLOCK TITLE:  IAP/USER/COMPUTER INTERFACE

OBJECTIVE:
- DEFINE AREAS WHERE COMPUTER GRAPHICS CAN EFFECTIVELY INCREASE IAP USAGE
- FURTHER DEFINITION & DEVELOPMENT OF THE IAP OUTPUT DATA SYSTEM FILE HANDLER (SFH)
- DEVELOP AN IAP USER HANDBOOK FOR PROGRAM MANAGERS

TECHNICAL APPROACH:
- SURVEY GRAPHICS CAPABILITIES FOR IAP USER DATA VERIFICATION/ PLOTTING, STRUCTURE DESCRIPTION, ETC.
- DEVELOP SOFTWARE TO INTERFACE SFH WITH THE USER AND IAP DATA
- DEVELOP GUIDELINES FOR IAP ANALYSIS AND REQUIRED DELIVERABLES.

PAY OFF:  IMPROVE TECHNOLOGY TRANSFER MECHANISM AND INCREASE RETURN ON INVESTMENT OF EMC ANALYSIS RESOURCES
SUMMARY

- TECHNOLOGY ROADMAP
- IAP ROADMAP
- EMC/IAP SUPPORT CENTER
- KEY PERSONNEL

MR. JOHN F. SPINA  
RADC/RBCT  
GRIFFISS AFB NY 13441  
(315)330-2519

DR. GERARD T. CAPRARO  
RADC/RBCT  
GRIFFISS AFB NY 13441  
(315)330-3490
MISSION

of

Rome Air Development Center

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