Electronic Combat Testing in a Virtual Environment

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GET CONNECTED to LEARN, SHARE, AND ADVANCE.
OVERVIEW

• Purpose
• EW T&E cost and schedule drivers
• Virtual Electronic Combat Training System description
• VECTS as a training tool
• VECTS as a test tool
• EW test MOPS and VECTS application
• Virtual test in non-traditional environments
Purpose

- Stimulate the audience to think of innovative, affordable solutions to the current and future challenges of EW and ISR test and evaluation
- How to use the same assets for both test and training
EW T&E Cost and Schedule Drivers

- Range access, availability, priority
- Cost of C2 and emitter support
- Sortie requirements
- Data reduction, analysis and review
EW Virtual Test Enablers

- Avionics and EW bus structures
- Digital data recorders on the aircraft
- Communications between legacy boxes
- PC based analysis tools for data analysis
What is VECTS

• A software package to provide embedded EW suite training

• Resident in an EC integration and control processor

• Stimulates Radar Warning Receivers and Missile Warning Systems

• Programmable for use in any flight location

• Records bus data for PC mission playback and debriefing
Virtual Electronic Combat Training System for Training/Testing

• Training
  • Can be used anywhere
  • Provides a simulated RF/IR environment outside test ranges
  • Embedded in the aircraft EW suite
  • Reprogrammable
  • No range costs
  • No schedule issues
  • No frequency authorization

• Testing
  • Can be used anywhere
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VECTS
OVERVIEW/DESCRIPTION

Mission Planning

Integrated EC Training with RWR, MWS
CMDS

Mission Playback

Virtual Track Files

Fly the Training Mission
• Record system interactions and responses

Mission Playback
PCDS and EW Displays
Threats Simulations

**Threat Modes:**
Search, Acquire, Track, Missile Guidance, Break Lock

**Threat Mode Transitions:**
- Preplanned Rules of Engagement
- Range Relative to Threat
- Altitude Relative to Threat
- Line of Sight to Threat – Terrain Masking
- ECM Effectiveness
  - Chaff and/or flare dispense with maneuver
  - Maneuvers alone
  - Jamming
Training and Testing Area

- User can put boundaries on training area
- No RF or IR stimulation is received outside
VECTS AS A TRAINING TOOL

• Provides a threat representation to the aircraft sensors and to the operator

• Permits the operator to respond with countermeasures manually if desired

• Permits the system to respond with countermeasures if capable

• Provides positive real time feedback of countermeasures effectiveness to operator

• Recording of engagements provides ability to debrief mission and review TTPs
VECTS AS A TEST TOOL

- Stimulates the Radar Warning Receiver
  - RWR does not differentiate between virtual and real threat
- Stimulates the Missile Warning System
  - MWS does not differentiate between virtual and real threat
- Provides threats for Countermeasures response
- Reacts to countermeasures with verifiable results
- Permit the test director to control critical variables
Stimulation of the RWR

- Provides track files to RWR signal processor representing parameters of an actual RF system.

VECTS
Stimulation of the MWS

- Provides alerts to MWS signal processor representing parameters of an actual IR system
Countermeasures Employment

- Provides virtually generated threats for countermeasures response evaluation.
  - Detection
  - Jamming
  - Maneuvers
  - Chaff
  - Flares
  - Decoys
Countermeasures Responses

- Countermeasures can be verified and are repeatable
- Virtually generated threats respond to Countermeasures based on programmed employment
Control of Critical Variables

- Emitter location
- Range
- Altitude
- Terrain Masking
- Emitter modes and codes
- Number of emitters
- Priority and sequence of activation
EW Test Measures of Performance

- Threat Detection/ ID
- Threat Correlation
- Threat Prioritization
- Countermeasures
  - Jamming response
  - Chaff program
  - Flare program
  - Maneuvers
- EW system
- Operational flight program SW changes
- Mission data SW changes
- Aircraft OFP changes
- PVI and functional verification

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Benefits of Virtual EC Testing

- Scenario generation
- Flexible threat location
- Ease of profile control
- Positive control of emitter operation
Data Collection and Analysis

• Data Collection
  • Internal data recorder for multiplex busses
  • Capture messages between systems and displays
    • ALR-69 with Internal Data Recorder (Firefly)
    • DVR for 1553 MUX Bus (AV/EW/W)
  • IRIG 106 Chapter 10 Format

• Analysis Tools
  • “ANALYZE” bus playback tool provides playback and display of all recorded EW suite events
  • Personal Computer Debriefing System
Limitations of Virtual Testing

• Cannot test Countermeasures Effectiveness
• Cannot test sensor inputs at the receiver
• Currently a one-on-one tool (single aircraft versus single or multiple threats)
Planned Training Improvements

- Multi-Ship VECTS
- ECM Integration
- HTS Integration
What Aircraft are Equipped with VECTS

**Currently equipped**
- F-16C+(Block 30)(ALQ-213CMS)
- A-10(ALQ-213 CMS)
- C-130 AMC (Laptop)
- C-130 AFSOC (Laptop)

**In work or proposed**
- MH-47G USA
- MV-22 USMC
- AMC C-130 AMP
- AFSOC IEW
Virtual Testing outside of Traditional OAR Environments

• VECTS and similar tools facilitate testing in other areas than EC Ranges

• Gives test program managers more flexibility with less cost

• Provides additional threat density for correlation and prioritization

• Adds systems not on range
Virtual Test Range

• Capabilities
  • Command and Control via networked communications/links
  • Test execution and direction via broadband internet connectivity
  • Test asset connectivity via commercially available devices
  • Situational awareness through available applications
Virtual Test Range

- SADL
- Jockey
- Server
- Google Maps
- Aircell
- Xplane
- Falcon View
- AT&T
- iPhone
- Rx
- NMEA/Tx
- GPS
- FAA Radars
- Virtual Range Agent
- Dashboard
- Chat
- Virtual Test Range

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Summary

- VECTS and similar tools support many testing requirements that can be accomplished outside of traditional OARs
- VECTS does not replace all OAR test requirements
- VECTS permits test program managers precise control of many variables
- Used with other virtual range capabilities VECTS can reduce time and costs to accomplish EW testing
Questions/Comments