RF Threat Simulation in the Open Air

Presented to

SCI-130 WORKGROUP

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Ronald K. Stepp
Head
Electronic Combat Range
Management Division
RF Threat Simulation in the Open Air (U)

NAVAIR

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See also ADM401231. RTO-MP-SCI-130 Integrated Defensive Aids Systems and Testing (Les systemes integres d’aide a la defense et les essais), The original document contains color images.

See the report.

Security classification of:

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ECR MISSION

• DEVELOP, OPERATE, MAINTAIN, AND CONTINUOUSLY IMPROVE A FREE SPACE LABORATORY.

• PROVIDE ENGINEERING, TESTING (DT&E / OT&E), ANALYSIS, AND TRAINING RESOURCES TO: DEVELOPERS, INTEGRATORS, TESTERS, AND USERS OF SYSTEMS THAT COUNTER OR PENETRATE AIR DEFENSES.

• KEY FUNCTIONS ARE:
  – ACQUIRE / DEVELOP AIR DEFENSE THREATS
  – ACQUIRE / DEVELOP RANGE INSTRUMENTATION
  – DEVELOP REQUIRED FACILITIES
  – OPERATE AND MAINTAIN THE RANGE
TYPES OF TESTS

• ELECTRONIC COUNTER MEASURES (ECM) EFFECTIVENESS
  – ACTIVE
  – PASSIVE
• RADAR WARNING RECEIVERS
• MISSILE APPROACH WARNING SYSTEMS
• ANTI-RADIATION WEAPONS
• TOWED DECOYS
• HARDWARE-IN-THE-LOOP
  – MOVING TARGET SIMULATION (SLATE RANGE FACILITY)
• EXPENDABLES TESTING
  – CHAFF
  – INFRARED
• UAV / CRUISE MISSILES
• TRAINING
FOREIGN MILITARY

• SUPPORTED THE FOLLOWING:

  Germany       Italy
  Australia     Canada
  United Kingdom Netherlands
  Switzerland   Sweden
  Malaysia      Kuwait
  Israel        South Korea
  Finland
ECR ELEMENTS

THREAT SENSORS AND EW/ACQ RADARS

THREAT SAM/AAA RADAR SIMULATORS

GPS TSPI REFERENCE

NIKE TSPI REFERENCE

VIDEO AUDIO DIGITAL INSTRUMENTATION SYSTEM

OPS CENTER DISPLAYS

COMMUNICATIONS SYSTEMS

THREAT COMMAND AND CONTROL

SLATE RANGE FACILITY

MTS SIMON STARPEX

TM

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TYPES OF SAM SYSTEMS

- COMMAND GUIDANCE
- RF SEMI-ACTIVE HOMING
- IR HOMING
- COMBINATION SYSTEM

TARGET TRACK: GUIDANCE - ILLUMINATION - ENERGY

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THREAT SYSTEMS

- EW/ACQ
- AAA
- SAM
  - Command Guided Missiles
  - Systems with RF Missile Seekers
  - Systems with IR Seekers
- MAWS Stimulation
REAL THREAT SYSTEMS
AT ECHO

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UNIQUE THREAT SYSTEMS

POP GROUP

RSDE

TOP DOME

MATS

FFM

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EARLY WARNING ACQUISITION RADARS

Spoon Rest
Flat Face
Long Track

- Height Finder
  - Thin Skin

All Actual Systems
Systems only have Video & Audio Instrumentation
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MISSILE ON THE MOUNTAIN (MoM)

West Radar Site

Seeker Table

Radar to MoM Geometry

MoM Site

East

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Missile on a Mountain (MoM) #1
- Actual seeker mounted on three axis rate Table
- Two modes of operation
  - Traditional flyout with FMIC model
    - Test for break lock & major errors
    - Closest point of approach scoring using differential GPS TSPI
  - Close Fly By
    - Measure angular errors caused by ECM up close with all effects
  - One intercept per run- intercept timed to occur as system under test passes in front of dome scored with FMIC Model
- Extensive Instrumentation of Seeker
  - Over 200 measured parameters @ 100Hz
INFRARED COUNTERMEASURES ASSESSMENT SYSTEM (ICAS)

- 1 v 1 - 1 Aircraft verses 1 Threat (FY-04)
  - UV Stimulator, Fire & Forget Missile (FFM), Zoom Optics, Fly-Out Model, Ozone Atmospherics
- 1 v 2 - 1 aircraft verses 2 threats (FY-05)
  - Adds IR Stimulator, IR Target Array, & IR Atmospherics to 1 v 1
  - Closed-Loop ability to evaluate IR MWS & directed IR countermeasures
- 1 v Many - 1 aircraft verses many threats (FY-08)
  - Additional seekers to FFM
  - Closed-Loop ability to evaluate end-game effectiveness for expendables and DIRCM countermeasures
- Many v Many - Many aircraft verses many threats (FY-08/09)
  - 1 v Many capability against 2 or more aircraft
UV STIMULATOR CONCEPT
MISSILE PLUME SIGNATURE SIMULATION

3/9/98 Lamps Test Data
As Detected by AAR-47 on a UH-1N Helo

UV Intensity

LASER
LINEAR ARRAY
Range
30 meters

FFM WITH ZOOM LENS
DISAMS FLYOUT
Light Box

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1. Each array will have 208 v 60hz, single phase power drops Spaced at 50 meter interval.

2. Lamps will be spaced at a Minimum of 30 meter interval.

3. Intersection of arrays 1, 2, and 3 will contain uv laser and ffm Systems.
SLATE RANGE FACILITY

- SIGNAL MONITORING
- STATIC TARGET GENERATION
- MOVING TARGET SIMULATION
MOVING TARGET SIMULATOR (MTS)

- RWR RESPONSE
  - ALR-67
- ECM RESPONSE
  - ASPJ
  - F-15 TEWS
- ECR DATA PRODUCTS
  - ALL DATA PRODUCTS AVAILABLE TO FLIGHT TESTS, ALSO AVAILABLE VIA MTS

THREAT RADAR

TRANSMITTED THREAT SIGNAL

TARGET RANGE DATA

CENTRAL SITE REAL-TIME COMPUTER

START/STOP MONITOR

OPS CENTER DISPLAYS AND CONTROLS

CONTROLS TARGET POSITION COLLECTS/PROCESSES TEST DATA

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ECHO IS DEDICATED TO EC TESTING

- LAND AND AIRSPACE

- AIRSPACE SCHEDULED & CONTROLLED

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RF WEAPON THREAT SIMULATION IN THE OPEN AIR

Conclusions

Existing & planned ECR capabilities provide an effective, affordable, and accurate ability to examine installed RF warning and countermeasures equipment.

- Future threats with multi-mode sensors and seekers will require additional T&E capabilities.
- Complete integration of RF and IR/EO T&E will present new and complex challenges for the ECR team.