Unclassified

Air Combat Environment Test & Evaluation Facility

NAVAL AIR WARFARE CENTER

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PUBLIC AFFAIRS OFFICE
NAVAL AIR SYSTEMS COMMAND
H. Howard

NAVAL AVIATION SYSTEMS TEAM
ACETEF Mission

ACETEF’s primary mission is to reduce technical risk and cost for Navy aircraft and aircraft systems through the use of simulation and stimulation during installed systems testing. The facility provides a multitude of resources and capabilities which are used for Research, Development, Test and Evaluation (RDT&E) and Training in support of the systems development process and systems deployment.

Providing a capability which makes comprehensive Acquisition, RDT&E, and Training more affordable.
ACETEF Projected Workload

- ACETEF Workload Increased during declining DoD budget Years
- Increased use of Modeling and Simulation
- Increasing complexity of Aviation Systems drive testing to ACETEF like environments
- Integration of Network Centric Warfare capabilities into Naval Aviation will require complex and secure ground test environments that ACETEF can provide
- ACETEF recognized innovator in Simulation Based Acquisition
T&E “Tool-Set” Evolution

T&E tool-set application evolving to support not only T&E, but entire acquisition process

1970’s
FLY

1980’s
FLY

1990’s
FLY

“THE FUTURE”

STEP AND SBA

COLLABORATIVE ENGINEERING

FLY

SIMULATE

STIMULATE

ANALYZE AND FIX

SIMULATE ←→ STIMULATE

STEP - Simulation Test and Evaluation Process
SBA - Simulation Based Acquisition
Manned Flight Simulator

- Three High Fidelity Test Stations
  - 40 Ft Diameter Dome Projection System
  - Wide II Image Projection Sys (200° X 40°)
    - 6 DOF Rediffusion Motion Platform
  - M2DART Test Station (Improved Resolution)
- Two Low Fidelity Test Stations (200° X 40°)
- General Electric Compu-Scene Imaging Sys
- Linked to Live Test Range

V-22 in Motion Bay

- High Fidelity Cockpits
  - F/A-18 C/D
  - V-22 EMD
  - F-14 D
  - F/A-18 E/F
  - V-22 Prod
  - AH-1W
- Hardware-in-the Loop
  - Flight Control Computer Systems
  - Mission Computers
  - Multi-Function Displays

F/A-18 in Dome
Operations & Control

- Test Command and Control
- Test Visualization
- Facility Instrumentation
  - Loral 550 Front Ends and Alpha Workstations
- Internal/External Links
  - External: DSI, DREN, AIC, Direct Links
  - Internal: Shared Memory, Switched Ethernet/FDDI, Audio, Video
- Facility Video
- Facility Intercom
- Master GPS Time Source

Operations and Control Center
High Performance Computing

HPC Computational Technology Areas
- Integrated Modeling & Test (IMT)
- Signal/Image Processing
- Computational Fluid Dynamics
- Computational Electromagnetics
- Force Modeling

ACETEF Success Stories
- Joint Theater Missile Defense
- Inverse Synthetic Aperture Radar Imaging
- F/A-18 E/F Flying Qualities
- E-2C Phased Array Modeling
- "Origin 2000" Power Scene
- JSF Force Process Team Simulations
High Performance Computing

- ~42 GFLOPS
- 106 Total Processors
- 36 GB Main Memory
- 1 TB Main Disk Storage
- 12 TB Mass Archive Storage
- 9 Infinite Reality Engines
- Connectivity -
  - DREN, AIC, ACETEF
- Interfaces -
  - HIPPI, ATM, Ethernet, FDDI, Shared Memory

Onyx 2

HUB

To AIC Backbone

DREN

Challenge L

Disk Module

Power Challenge XL

Power Challenge GR

NAVAL AVIATION SYSTEMS
TEAM
Warfare Simulation Lab

Mini-Crewstations

- Manned Virtual Stations
  - SGI OTW Image Generation
  - Four Heads Up/Down Stations
  - Ten Heads Up Stations
  - Generic Platform & System Models
    - Attack / Sensors / C2 / Weapons / Aero / Controls

- Mission Planning and Rehearsal
  - JMCIS / TAMPS
  - AFMSS / CIS
  - CLOAR
  - TOPSCENE / Powerscene
Comm, Nav, Ident Lab

- Communications Environment Simulator
  - Phase and Amplitude Distribution Ports
  - Number of Simultaneous Emitters: 64 High Fidelity, 128 Background
  - RF Coverage: 500 kHz to 18 Ghz
- Strategic Data Link Simulator (SDLS)
  - OTCIXS/TRAP/TIBS/TADIXS-B
- Data Link Simulator - MLST3
  - Link 4A/Link 11/Link 16 (Link 16 Gateway)
  - LDSSS-11 - DTSS-11 (2)
    - Provides Land-line Link-11 (5 site)
- GPS & Aux Nav Simulator
  - 20 Satellite Constellation at RF
    - C/A, P & Y Codes (L1 and L2 Frequencies)
    - Selective Availability/Anti-Spoofing
- Airborne IFF Test System (AITS)
Electronic Warfare Integrated Systems Test Laboratory

- ATEWES
  - Phase and Amplitude Distribution Ports
    - 2 Quad - 8 Element Phase AOA
    - 8 Element Amplitude AOA
  - Number of Simultaneous Emitters: 1024
  - Max Number of Platforms: 255
  - Pulse Density: 1Mpps @2% Drop, 4Mpps Max
  - RF Coverage: 0.05-18.0 GHz, 32.0-40.0 GHz
  - Emitter Library Modes: 7000
- Remote Antenna Positioning System (RAPS)
  - Two Moving Targets in Two Dimensions
  - Mounts Controllable in Azimuth, Elevation and Pointing Angle
  - Supports RF, EO, and IR Sources
  - Provides 10’ x 10’ FOV
  - Max Slew Rate: 50 Inches/Sec
Offensive Sensors

- Radar Target Simulator (RTS)
  - A/A
    - F/A-18 Interface
    - F-14 D Interface
    - 32 Targets (max 4 in the beam)
    - +ECM, Scenario Driven

- Dynamic Infra-Red Point Source Simulator
  - Two IR point source targets
  - 8 - 12 mm region
  - Independent Position, motion, and intensity target control
Threat Air Defense Lab

- SAM Simulation System (I-23)
  - Frequency Range: X-Band
  - Closed Loop Threat Systems
  - Man-in-the-Loop
  - Seeker-in-the-Loop
  - Open Air Range Correlated Equipment
  - Validated Radar and Missile Flyout Model
- EW Acquisition System (EW ACQ)
  - Frequency Range: 800Mhz - 3Ghz
  - Closed Loop Early Warning Radars
  - Man-in-the-Loop
  - Simulates up to 3 RED Systems
  - Provides Handoff to I-23
  - Low Band Threats IOC FY98
Shielded Hangar/Anechoic Chamber

- Anechoic Chambers provide RF pure environments for Electromagnetic Environmental Effects Testing of components and complete systems
- Secure environments
- Have supported air platforms, weapon systems, ground vehicles and satellites
- Large Chamber Projects since ribbon cutting - S-3B, F/A-18, AH-1W, E-2C, FME, F/A-18E/F
# Future Upgrades

<table>
<thead>
<tr>
<th>System</th>
<th>Size</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Generic Radar</td>
<td>7 racks</td>
<td>$20.8M</td>
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<tr>
<td>Target Generator</td>
<td></td>
<td></td>
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<tr>
<td>Joint Communications</td>
<td>20 racks</td>
<td>$33.6M</td>
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<tr>
<td>Simulator</td>
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</tr>
<tr>
<td>Infrared Scene Simulator</td>
<td>3 racks</td>
<td>$24.0M</td>
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ACETEF Support to OT&E

Rigorous Accreditation Effort
- COTF
- Lessons Learned with ALR-67
- TEAM effort w/OTD & ITT

Initial Trial during OT-IID
Currently executing OT-IIE
- Completed first phase
- others scheduled CY-00

Highly realistic TRAP Mission
- Extensive re-use of JSF work
- Scenarios, data bases
- Tri-service validation efforts

Multi-Sensor Stimulation
- APR-39
- AAR-47
- AVR-2
- FLIR (Simulated)

Provides scenarios and threat density un-available in the US.
T&E “building blocks” applied beyond “traditional” T&E

A FACILITY SUPPORTING THE PRODUCT OVER THE LIFECYCLE CONTINUUM

Joint Strike Fighter
Virtual Strike Warfare Environment Exercises
Force Process Team Exercises

Joint Combat Search and Rescue
Evaluate Multi-Service CSAR doctrine and numerous interoperability issues.
AVTB (Ft. Rucker), TACCSF (Kirtland AFB), MCAS Miramar, ACETEF

Y2K Testing

F-14D
Digital Flight Control System

EP-3, P-3, E-2C
TDL, SDLS, GPS simulation and stimulation

Rapid Response Trainers
AH-1W, F-14A, UH-1N, SH-60

Joint Theater Missile Defense
Command and control evaluation to search out and destroy enemy surface launchers. ACETEF, RESA (San Diego), TACCSF, DS&ABL (Ft. Sill, OK)

EA-6B, F/A-18
EW Systems Testing

V-22
DT, TPS Training, OT

TACCSF - Theater Air Command Simulation Facility
AVTB - Aviation Test Bed
RESA - Research Evaluation Systems Analysis
DS&ABL - Depth and Simultaneous Attack Battle Lab
Any Questions