OSD Funded and Developed Open Air IRCM Threat Simulators and Methodology

Legacy Threat Stimulators

- Legacy Missile Warning Sensors (MWS) typically required only stimulation, not simulation

- Legacy stimulators typically provide a signal to “ring the bell,” not necessarily accurately simulate the threat

Modern MWS Systems

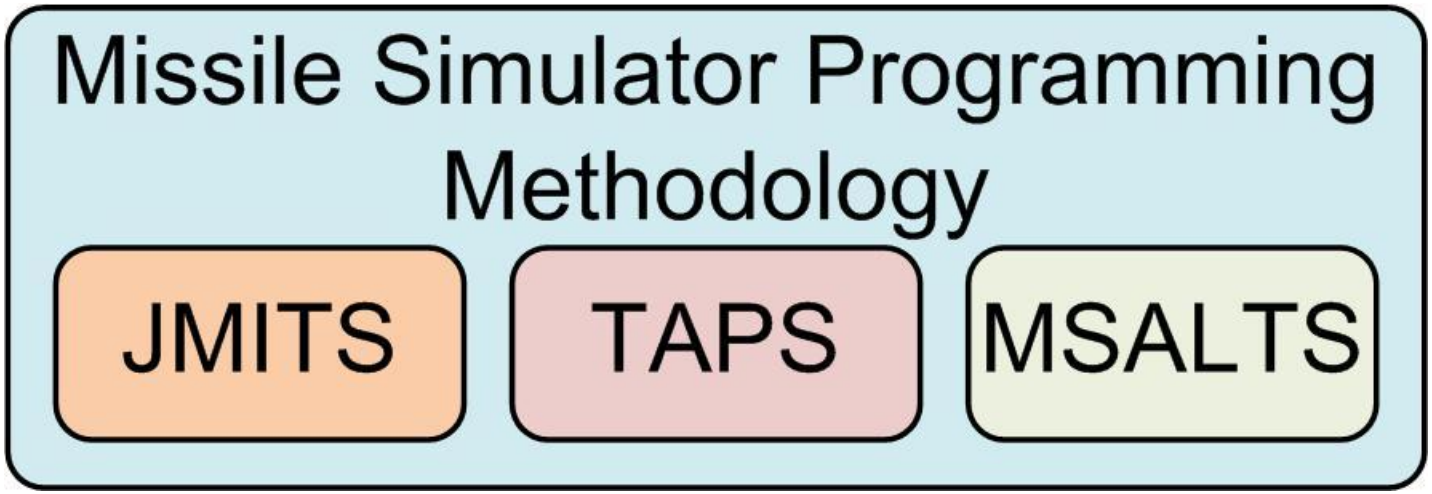
- Modern MWS systems are more sophisticated and require threat-representative simulations for testing
- Legacy stimulators typically cannot provide this level of fidelity
- Simulators, not stimulators, are needed to produce threat-representative signals

Modern Threat Simulators

- Three modern threat simulators exist or are being developed to provide threat-representative missile signatures
  - **Joint Mobile Infrared Countermeasure Test System (JMITS)**
  - **Towed Airborne Plume Simulator (TAPS)**
  - **Multi-Spectral Sea and Land Target Simulator (MSALTS) – Under Development**

Unifying Missile Simulator Programming Methodology

- All three simulators follow the same missile simulator programming methodology



Joint Mobile Infrared Countermeasure Test System

- CTEIP funded and developed in partnership with CCM
- Ground-based stationary simulator
- Simultaneous UV and dual color IR
- Near real-time atmospheric and emitter degradation correction
- Validated missile simulations include
    - Ejection spike
    - Ignition spike
    - Missile fly-out signature

JMITS Concept of Operation

Open Air Installed
IRCM Testing

JMITS Validation Report

- JMITS validated by Test and Evaluation Threat Resource Activity (TETRA)
- Validation report is available

JMITS Testing

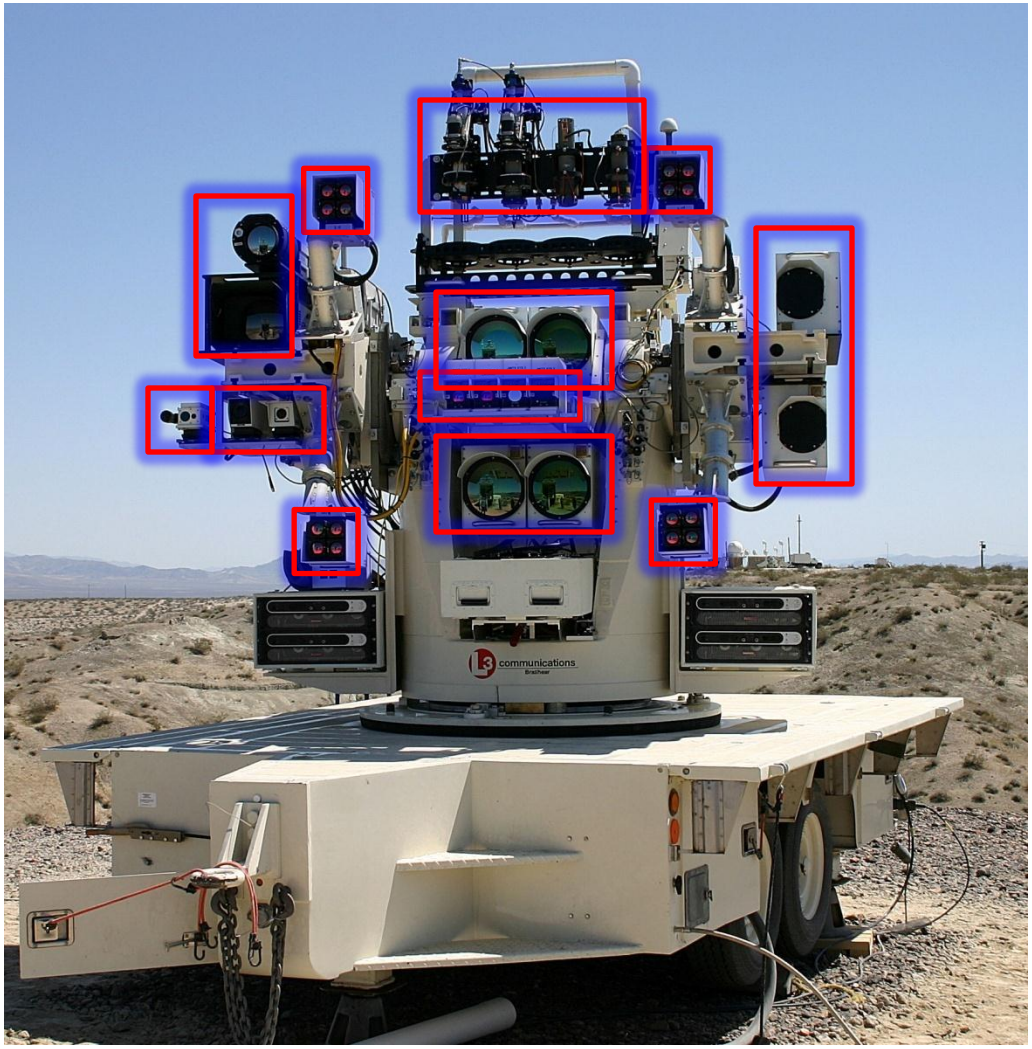
JMITS has been used extensively

- More than 10,000 open-air simulations
- Single & Dual JMITS system deployments
- Coordination & testing with other missile simulators/stimulators
- High valid signature yield (over 95% for recent test activities)

JMITS Programs Supported

- JATAS
- Navy DoN LAIRCM
- Air Force C-17A LAIRCM PHII
- Air Force CV-22 IOT&E
- PICS
- LAISM
- Army HFIS
- Department of Homeland Security

JMITS Hardware Overview



JMITS Flex-Play

- Planned future capability
- Development funded through OSD, TSWG
- Ability to fire simulations based on positive aircraft position feedback
- Results in more accurate simulations and a higher probability of achieving planned test parameters
- Ability to conduct more realistic “unscripted” OT test scenarios

Quantum Cascade Lasers

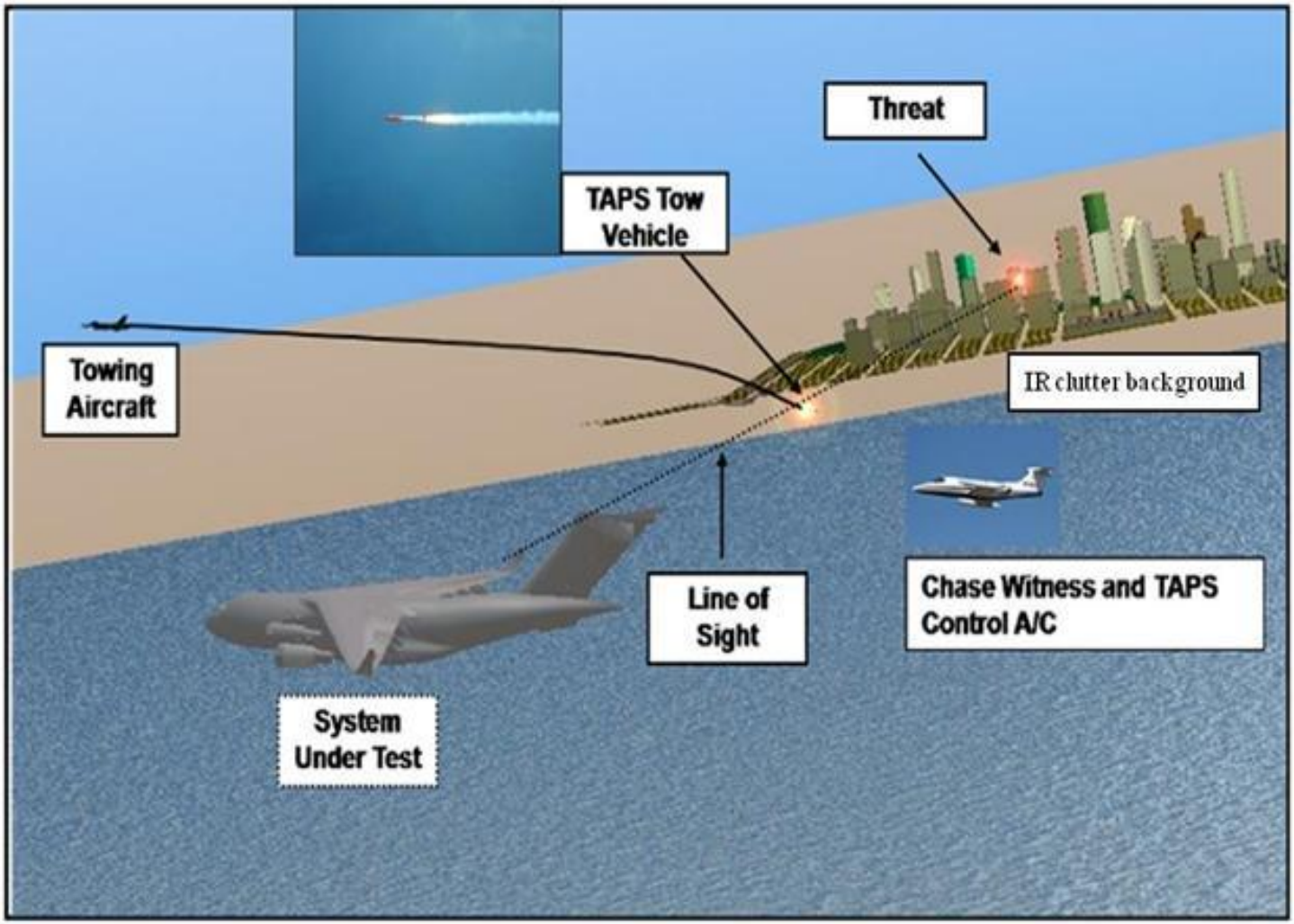
- Demonstration funded by T&E S&T
- The S&T effort demonstrated integration of QCL lasers is possible and gives significant increase in power
- Ongoing development task to insert the S&T demonstrated technology into JMITS to increase the available IR power
- Lasers operated in CW mode with electro-mechanical modulation

Towed Airborne Plume Simulator

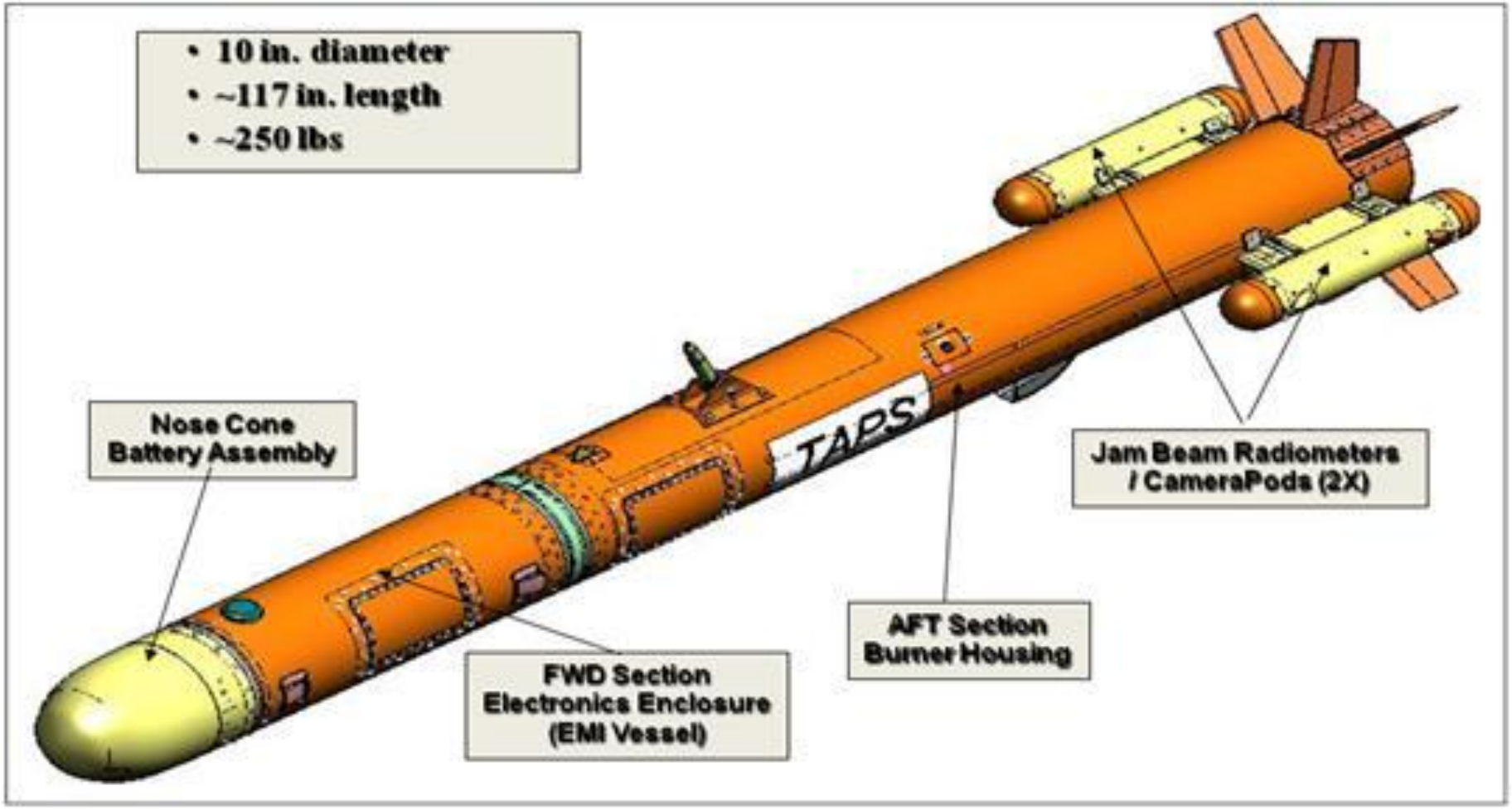
- Development funded through CTEIP
- Missile plume simulator that is towed behind an aircraft
- IR simulation only
- Provides spatially realistic operational environment in a IR clutter background
- Meets most angular rate criteria of modern MWS spatial algorithms

TAPS

TAPS Concept of Operation



TAPS Towed Vehicle



TAPS Testing and Validation

- TAPS will be used in support of the Air Force C-17A LAIRCM Phase II program

- TAPS validation report is being completed

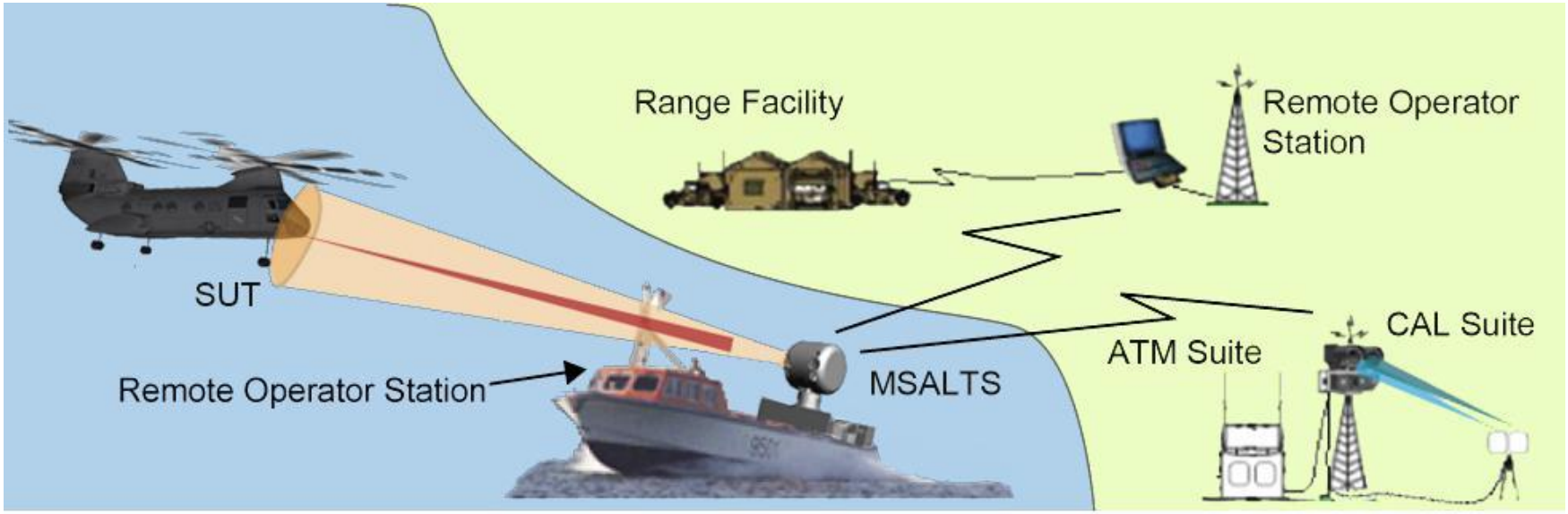
Multi-Spectral Sea and Land Target Simulator

- Development contract awarded in December 2010
- Funded through CTEIP REP
- Truly mobile ground-based simulator
- Provide simultaneous UV and dual-color IR simulations while moving
- Operate on land or on a ship in a littoral environment

MSALTS Design Concept

MSALTS Land Test Concept

MSALTS Sea Test Concept



MSALTS Technology

- MSALTS will build on and use existing proven JMITS technology
- Less manpower intensive than JMITS
- Use QCLs for high power
- Flex-play will be included in MSALTS

Missile Simulator Programming Methodology

- JMITS, TAPS, and MSALTS are unified by a common methodology
- Based on “SMEOS Programming Formulation”, the original programming methodology
- Allows for commonality and comparison between test events
- Methodology uses approved models and takes spectral responses and atmospherics into account

Methodology (continued)

- Define missile simulation parameters
  - Missile type
  - Engagement geometry
  - One-to-one simulation or not
- Generate fly-out model using Threat Modeling and Analysis Program (TMAP)

Methodology (continued)

- Use Enhanced Missile Signature (E-MSIG) database to extract missile signature as a Source Radiant Intensity (SRI) in the SUT spectral response
  - Must know SUT spectral response

Methodology (continued)

- Propagate the SRI signature through the simulated atmospheric conditions from the missile to the SUT
  - MODTRAN for IR, OSIC for UV
- Result is irradiance on the SUT aperture in the SUT spectral band
- This result is what the simulator must produce

Methodology (continued)

- The simulator spectral band will most likely not be the same as the SUT band
- Requires bandpass conversion from simulator to SUT
- At time of simulation, account for current atmosphere

Normalization

- During testing, small variations in the atmosphere and emitters occur which must be accounted for
- A normalization measures these variations to account for them
- Performed regularly throughout the test

Summary

- JMITS, TAPS, and MSALTS constitute a set of modern, advanced missile plume simulation tools
  - –OSD funded and developed
- All three simulators are unified by a common missile simulator programming methodology

Contact Information

R. David Hunter
david.hunter@ccm.osd.mil
Commercial: 575-678-7248
DSN: 258-7248

Questions?