



# **RF Threat Simulation in the Open Air**

**Presented to**

# **SCI-130 WORKGROUP**

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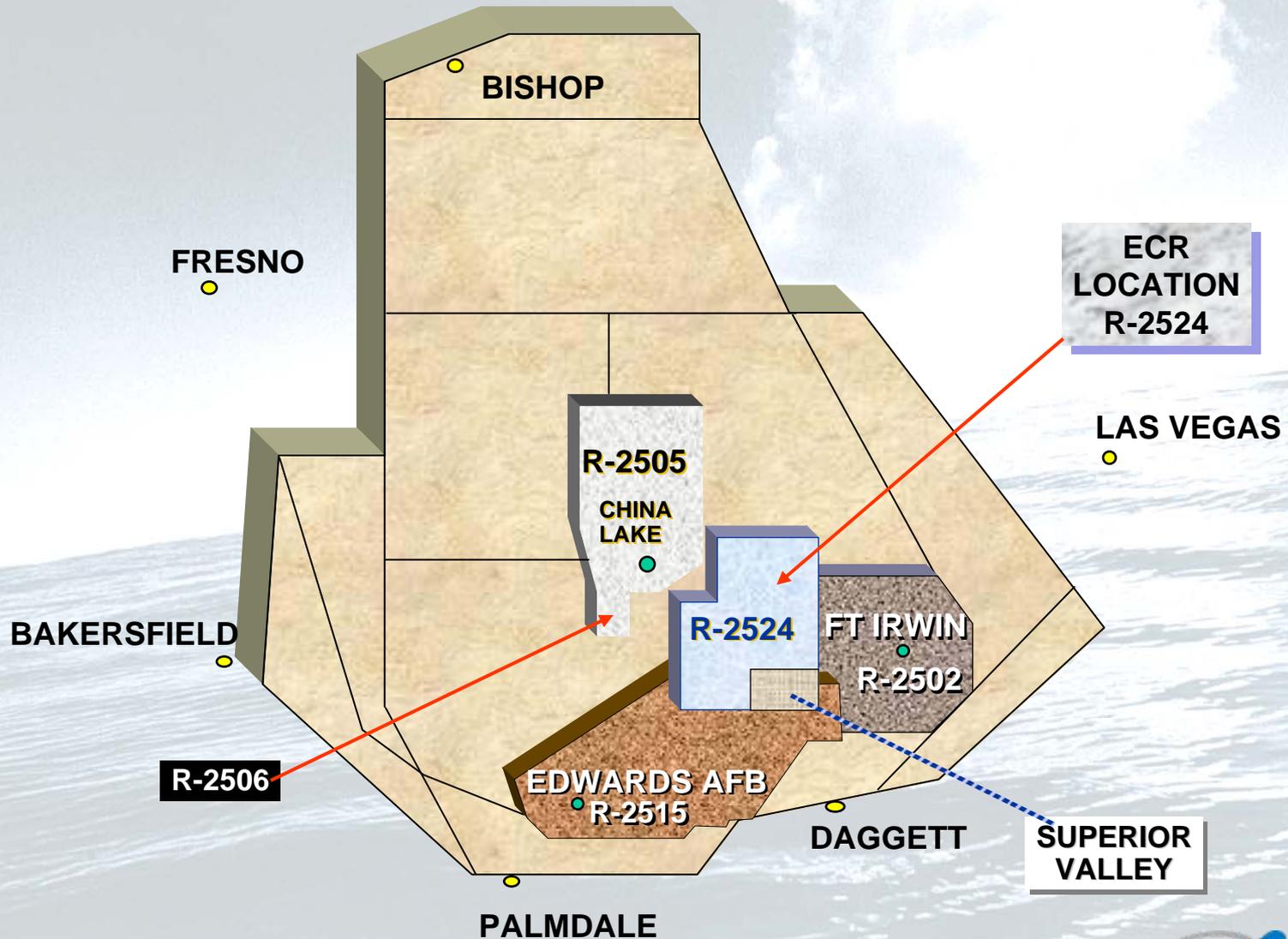
# ECR MISSION

- **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**

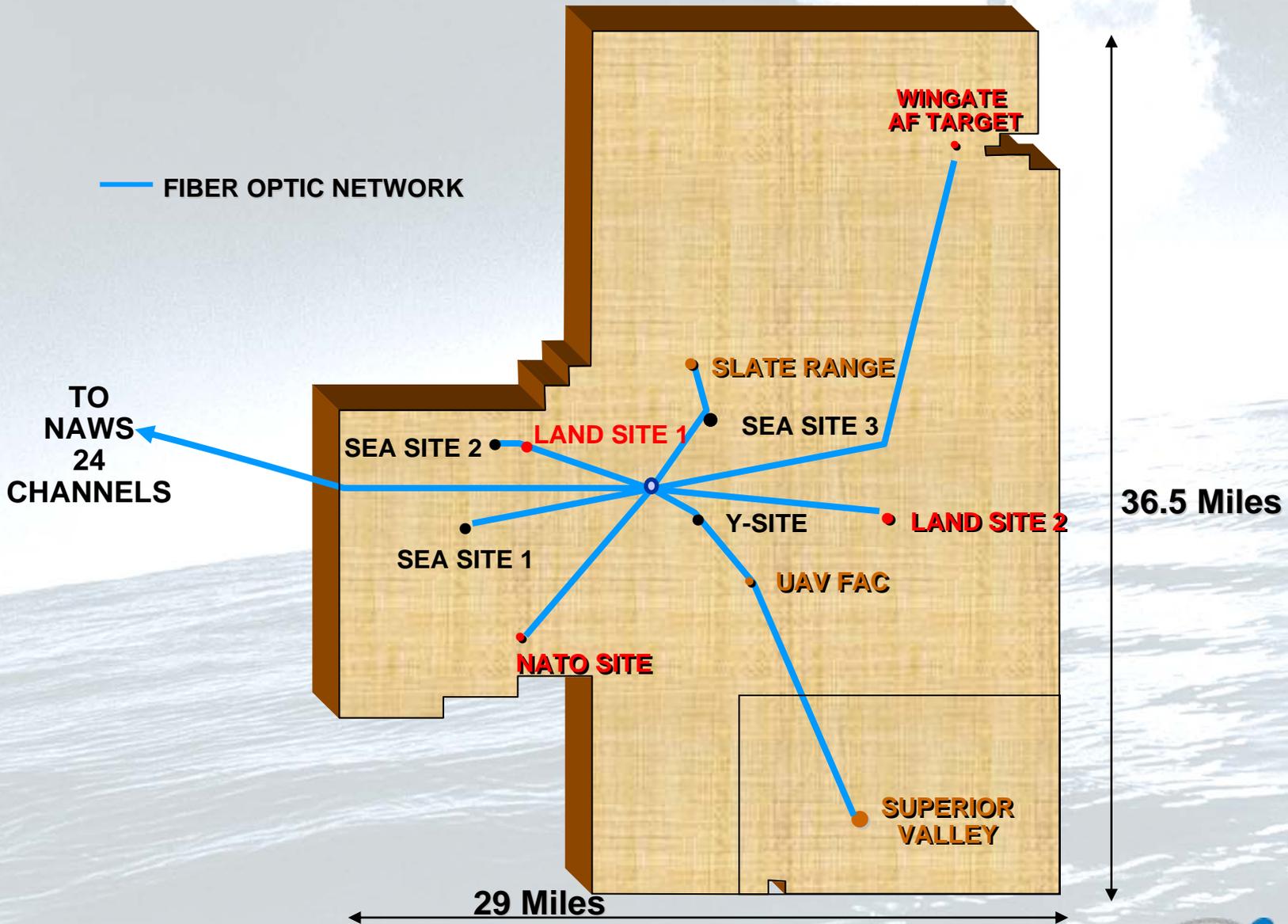
# TYPES OF TESTS

- **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**

# R-2508 AIRSPACE



# LAND SPACE



# FOREIGN MILITARY

## •SUPPORTED THE FOLLOWING:

**Germany**

**Italy**

**Australia**

**Canada**

**United Kingdom**

**Netherlands**

**Switzerland**

**Sweden**

**Malaysia**

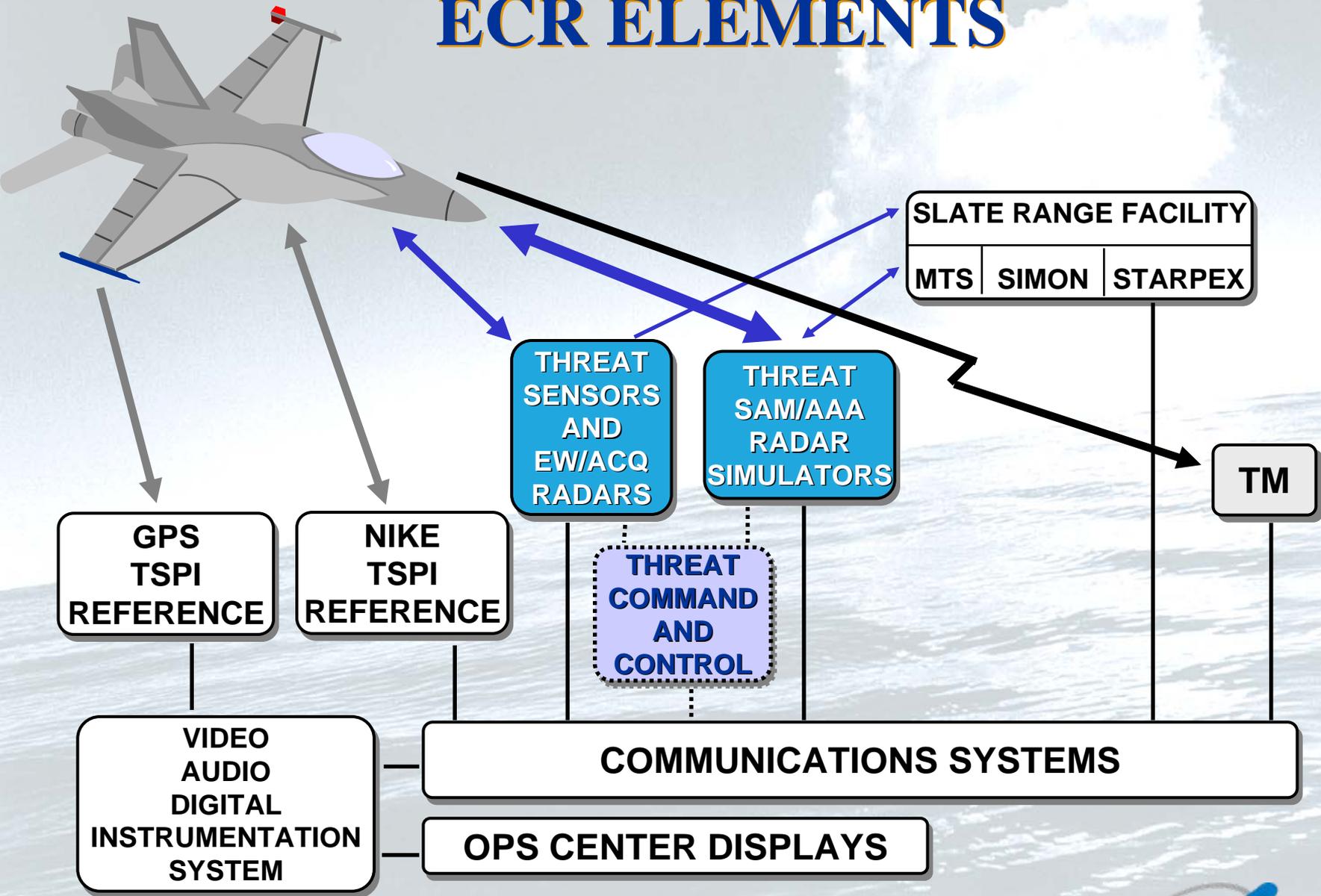
**Kuwait**

**Israel**

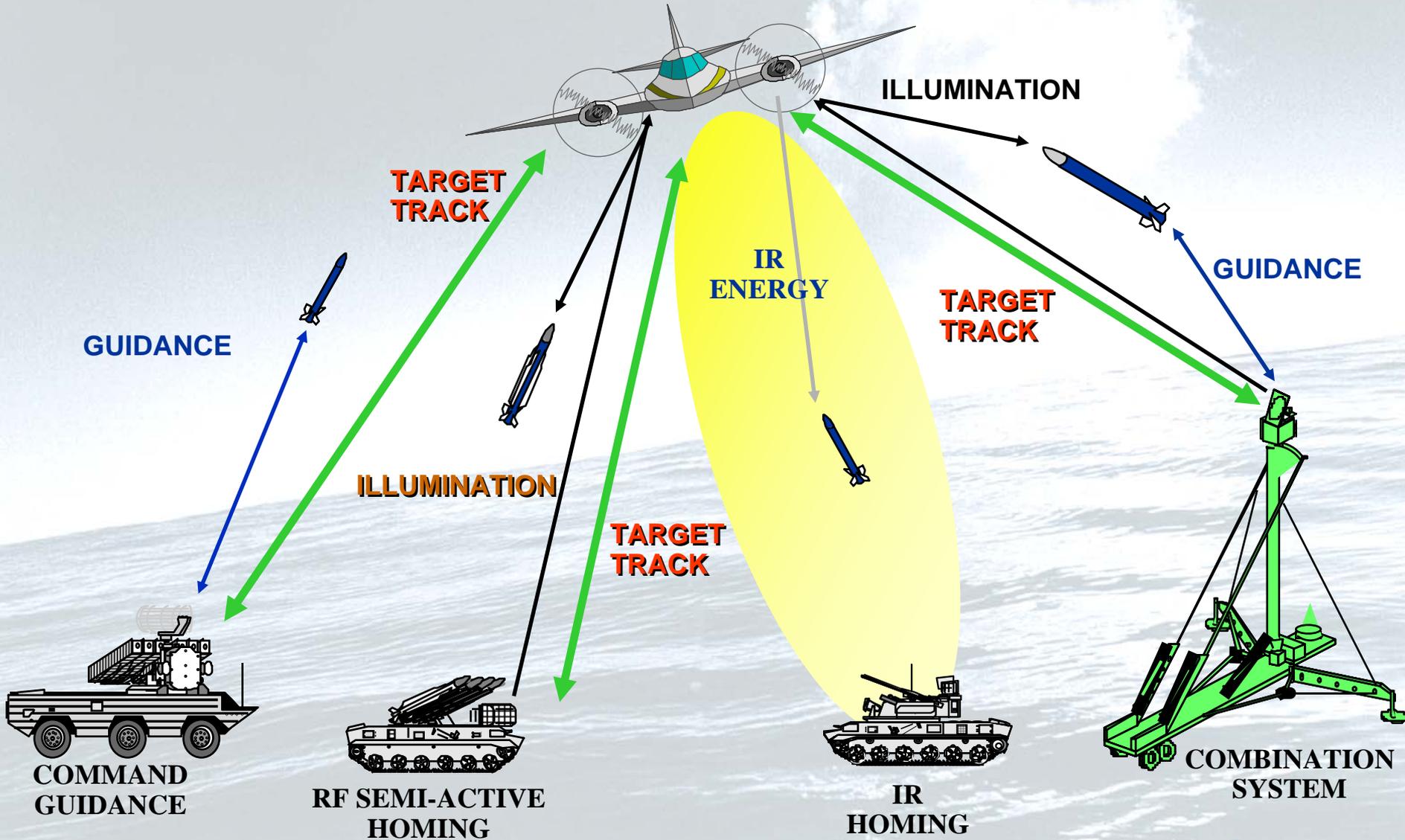
**South Korea**

**Finland**

# ECR ELEMENTS



# TYPES OF SAM SYSTEMS



# THREAT SYSTEMS

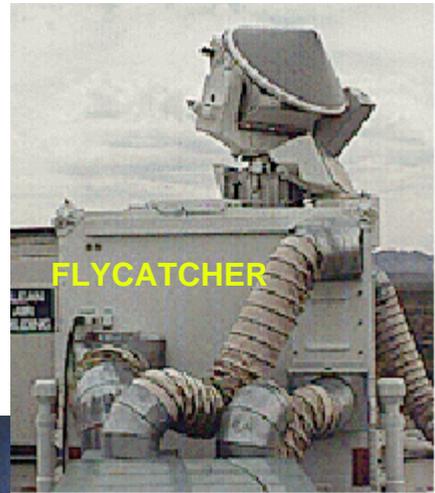
- **EW/ACQ**
- **AAA**
- **SAM**
  - **Command Guided Missiles**
  - **Systems with RF Missile Seekers**
  - **Systems with IR Seekers**
- **MAWS Stimulation**

# REAL THREAT SYSTEMS AT ECHO

SA-6 STRAIGHT FLUSH



SA-2 FAN SONG



FLYCATCHER



I-HAWK



SA-6 TEL



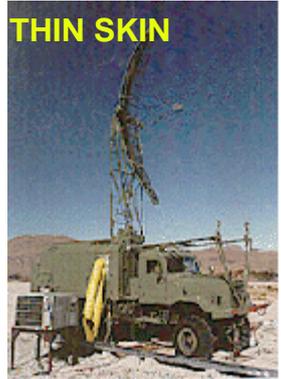
EURO-ROLAND



SA-8 LAND ROLL



BASS TILT



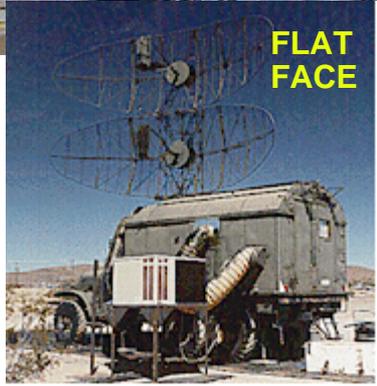
THIN SKIN



SPOON REST



LONG TRACK



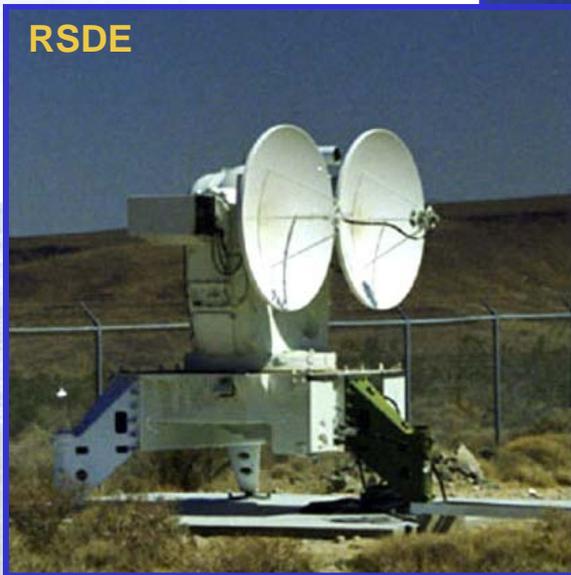
FLAT FACE

# UNIQUE THREAT SYSTEMS

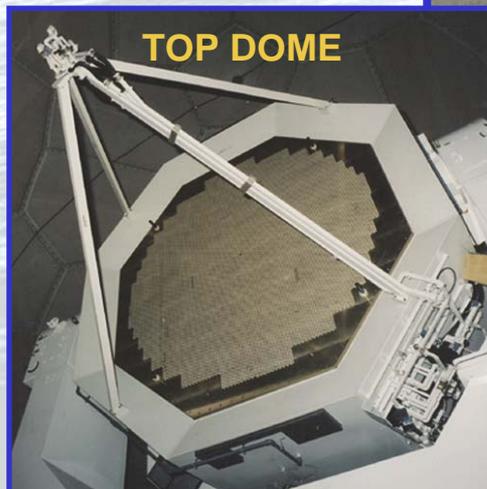
POP GROUP



RSDE



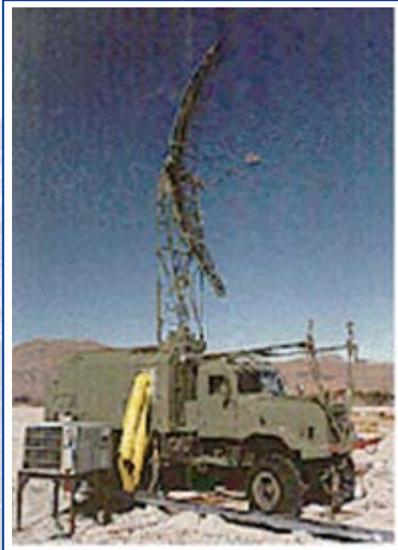
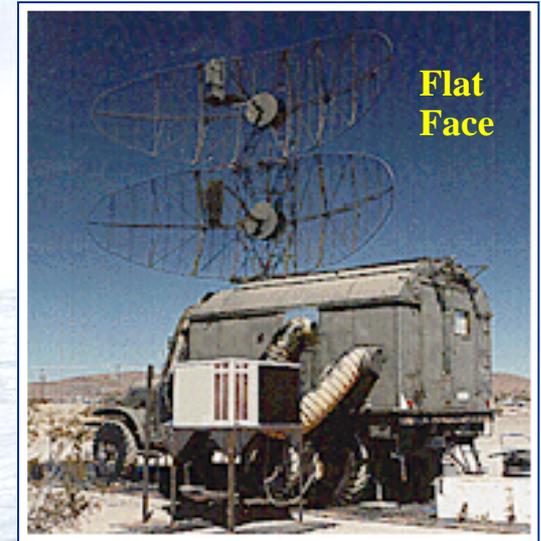
TOP DOME



# EARLY WARNING ACQUISITION RADARS



**Spoon Rest**  
**Flat Face**  
**Long Track**

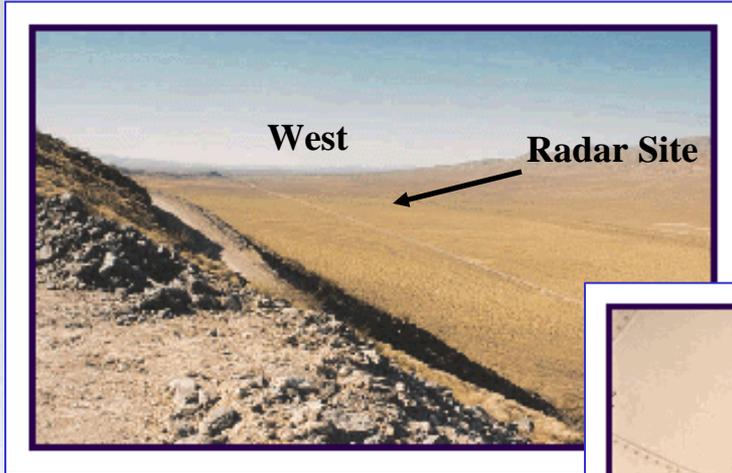


- **Height Finder**  
– **Thin Skin**

**All Actual Systems**

**Systems only have Video & Audio  
Instrumentation**

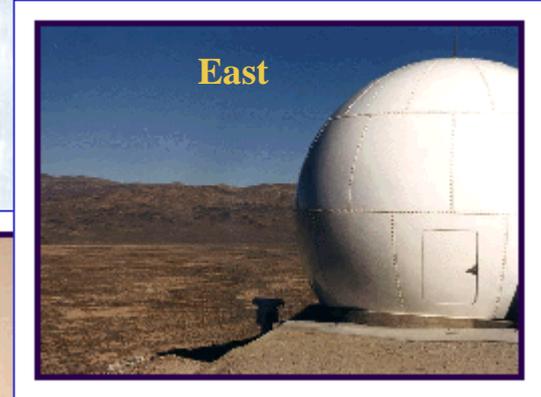
# MISSILE ON THE MOUNTAIN (MoM)



West

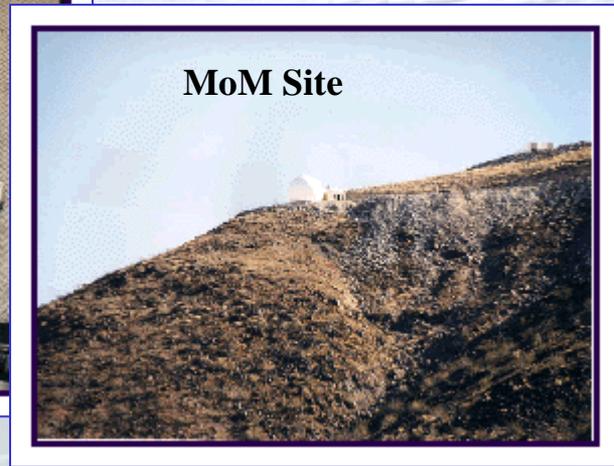
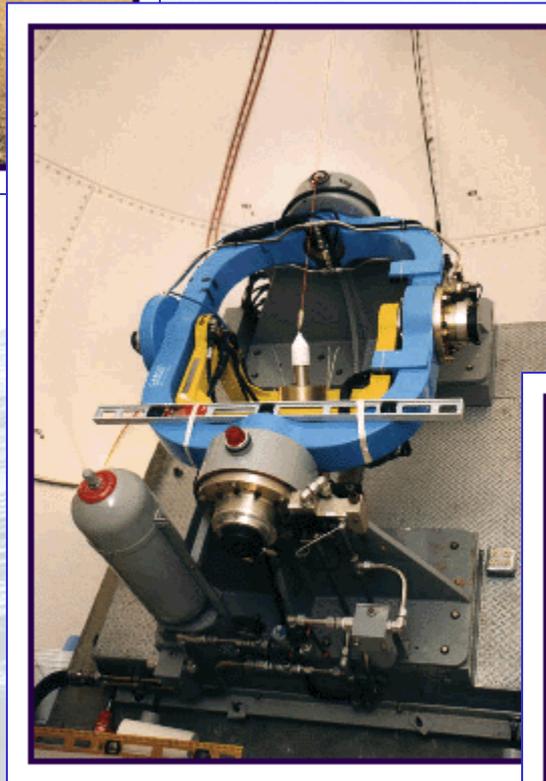
Radar Site

Radar to MoM Geometry



East

Seeker Table



MoM Site

# MoM #1

- **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**

3 Axis Rate Table  
In MoM Dome



MoM  
Control



MoM



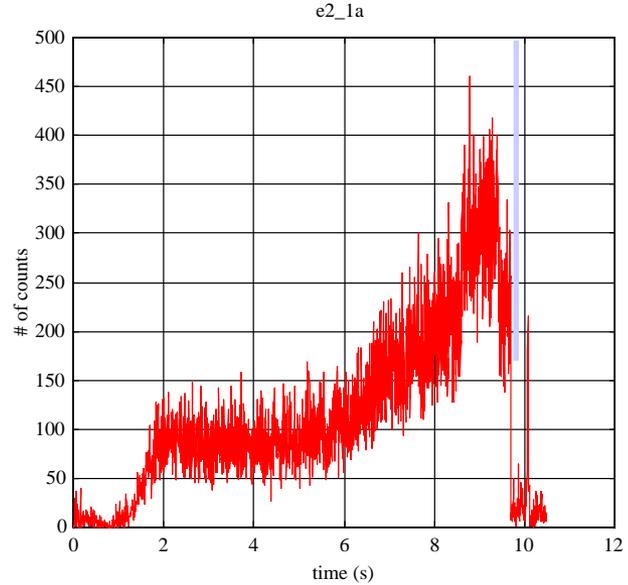
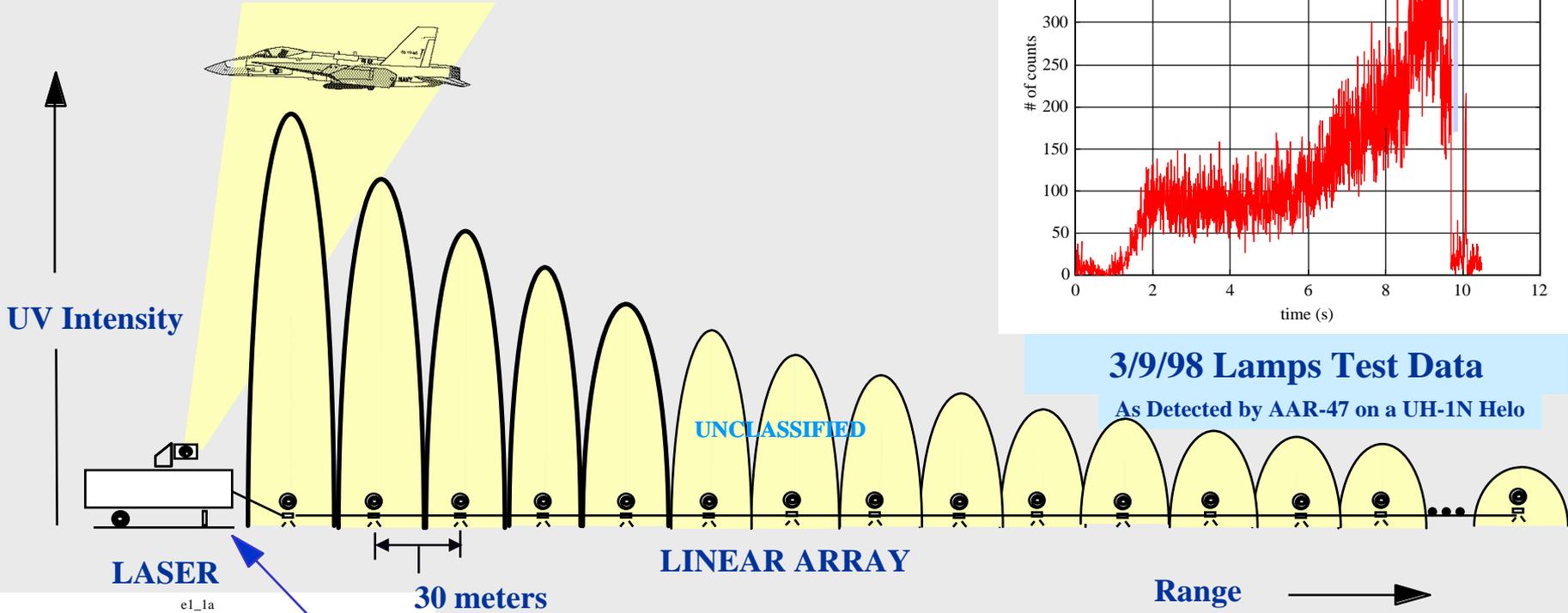
# INFRARED COUNTERMEASURES ASSESSMENT SYSTEM (ICAS)

- **1 v 1 - 1 Aircraft verses 1 Threat (FY-04)**
  - UV Stimulator, Fire & Forget Missile (FFM), Zoom Optics, Fly-Out Model, Ozone Atmospheric
- **1 v 2 - 1 aircraft verses 2 threats (FY-05)**
  - Adds IR Stimulator, IR Target Array, & IR Atmospheric 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

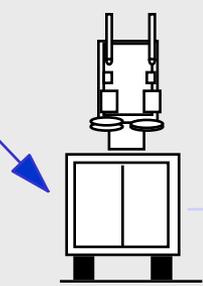
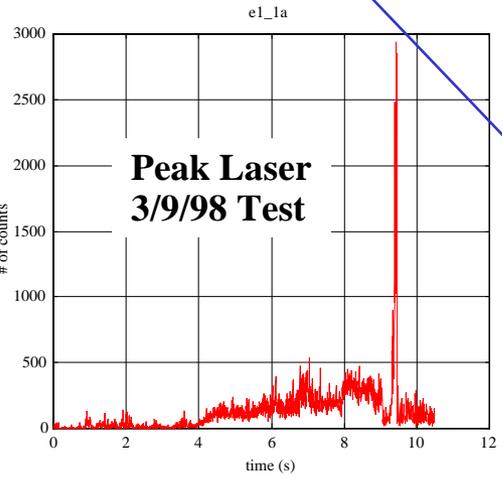


# UV STIMULATOR CONCEPT

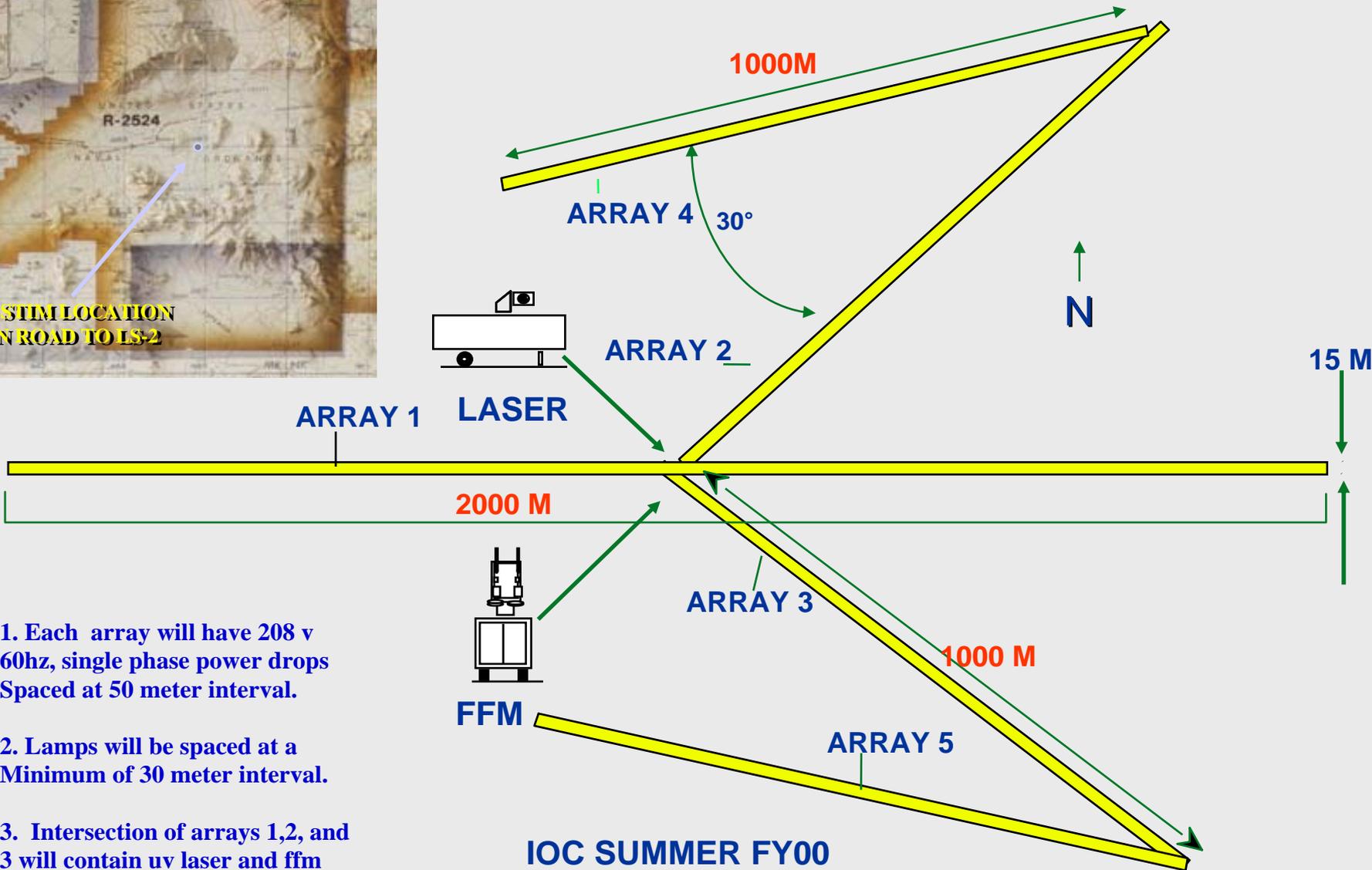
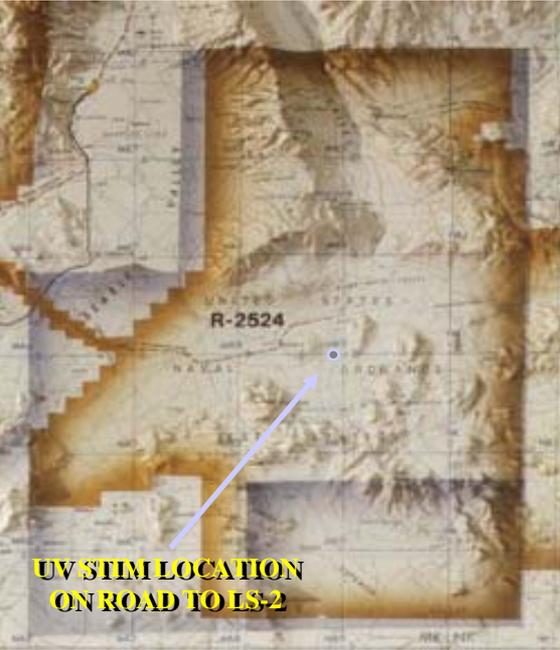
## MISSILE PLUME SIGNATURE SIMULATION



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



# UV STIMULATOR ARRAY CONFIGURATION



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.

IOC SUMMER FY00

UNCLASSIFIED

# OPS CENTER



UNCLASSIFIED

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# SLATE RANGE FACILITY

**FRONT**



- **SIGNAL MONITORING**
- **STATIC TARGET GENERATION**
- **MOVING TARGET SIMULATION**

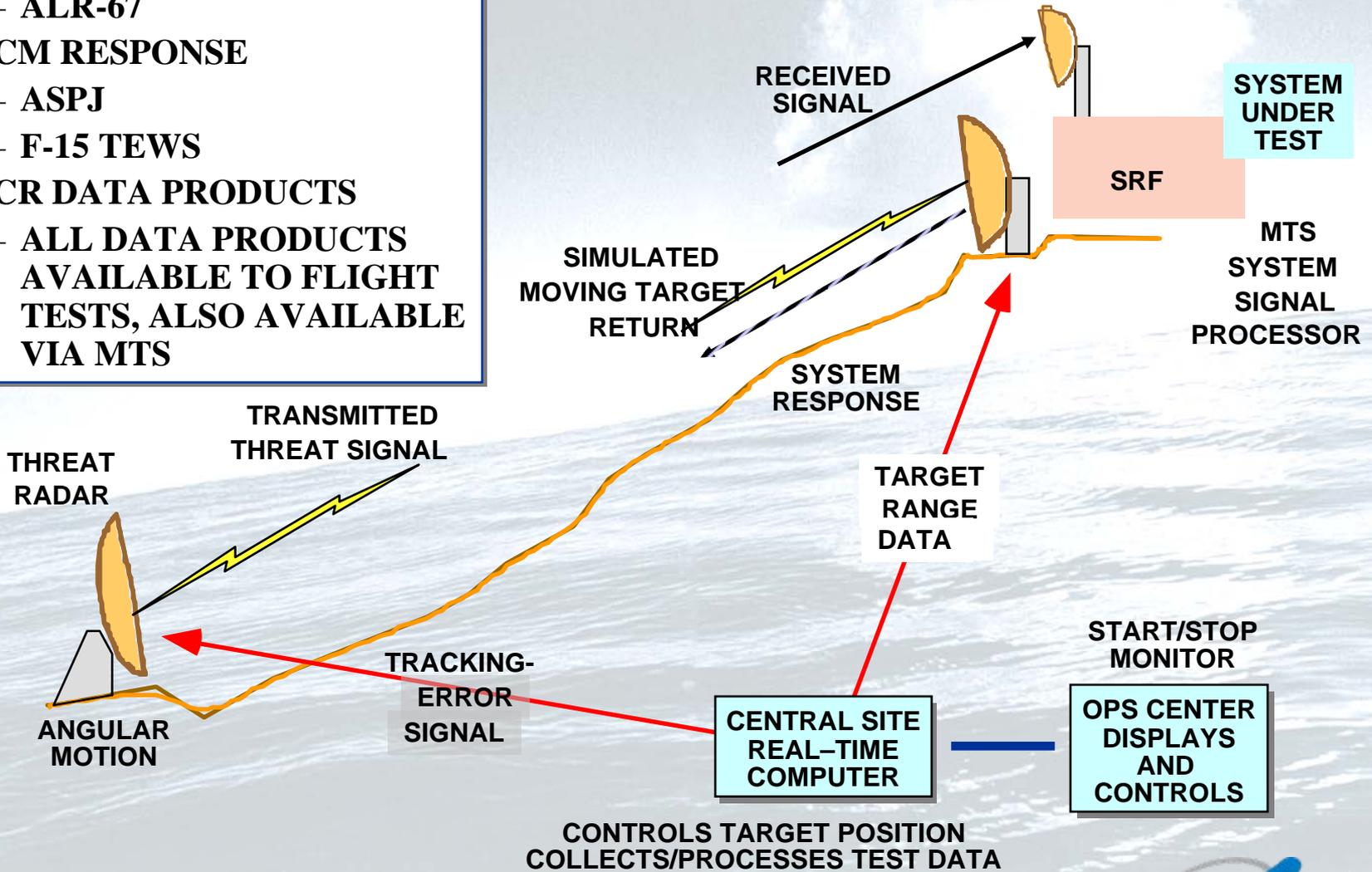
**BACK**



# MOVING TARGET SIMULATOR

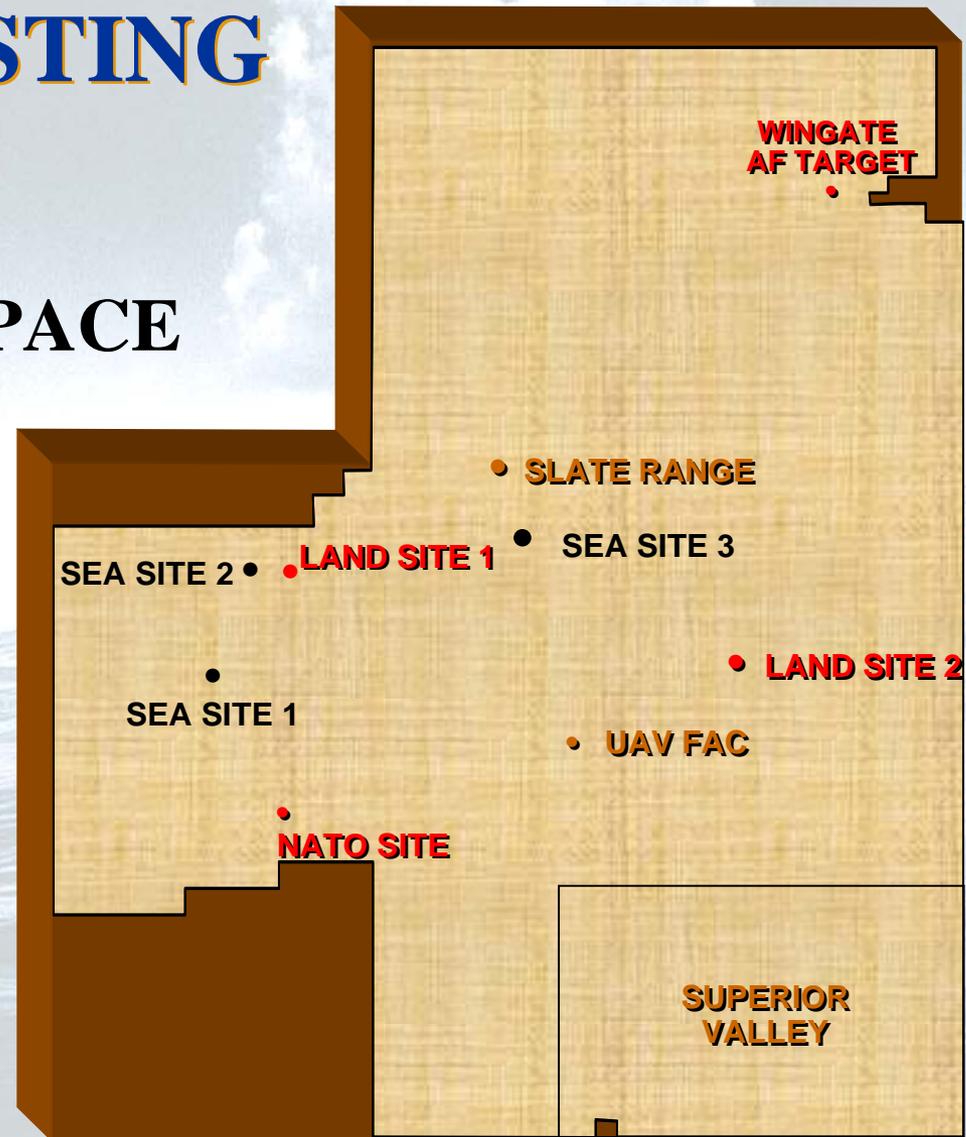
## (MTS)

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



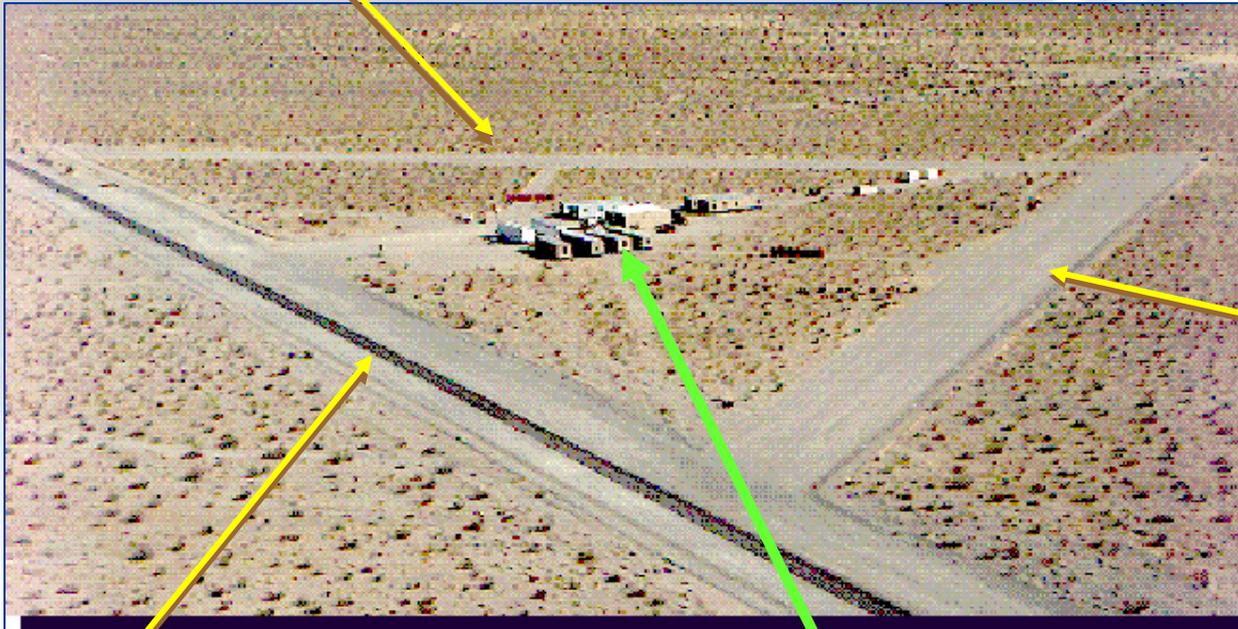
# ECHO IS DEDICATED TO EC TESTING

- LAND AND AIRSPACE
- AIRSPACE SCHEDULED & CONTROLLED



# ECR UAV FACILITY

DIRT RUNWAY #1



DIRT RUNWAY #2

MAIN RUNWAY



HANGER

OFFICE SPACE

# 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.

NAV  AIR

