



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

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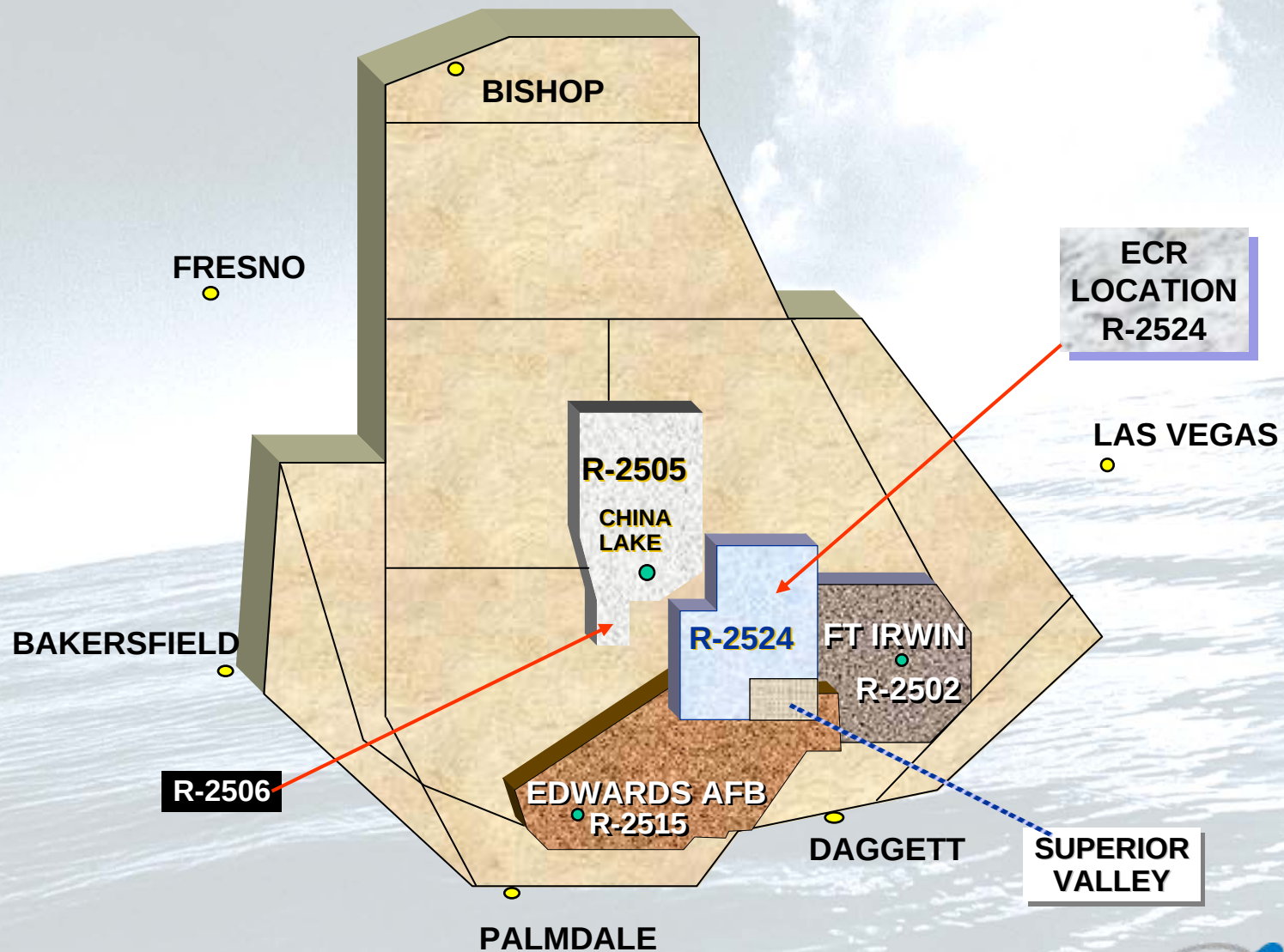
ECR MISSION

- **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

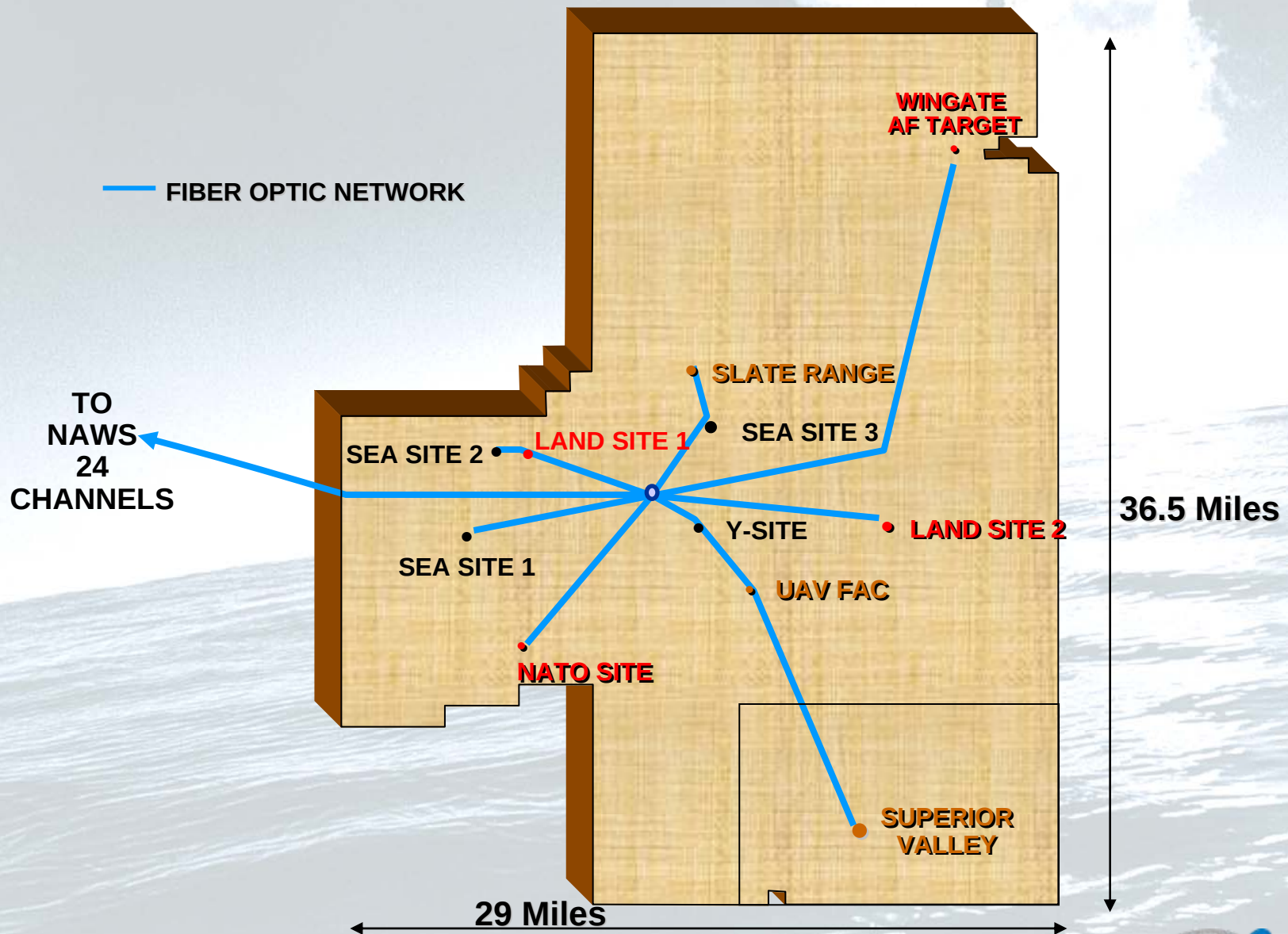
- **ELECTRONIC COUNTER MEASURES (ECM) EFFECTIVENESS**
 - **ACTIVE**
 - **PASSIVE**
- **RADAR WARNING RECEIVERS**
- **MISSILE APPROACH WARNING SYSTEMS**
- **ANTI-RADIATION WEAPONS**
- **TOWED DECOYS**
- **HARDWARE-IN-THE-LOOP**
 - **MOVING TARGET SIMULATION (SLATE RANGE FACILITY)**
- **EXPENDABLES TESTING**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

R-2508 AIRSPACE



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LAND SPACE



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FOREIGN MILITARY

•SUPPORTED THE FOLLOWING:

Germany

Italy

Australia

Canada

United Kingdom

Netherlands

Switzerland

Sweden

Malaysia

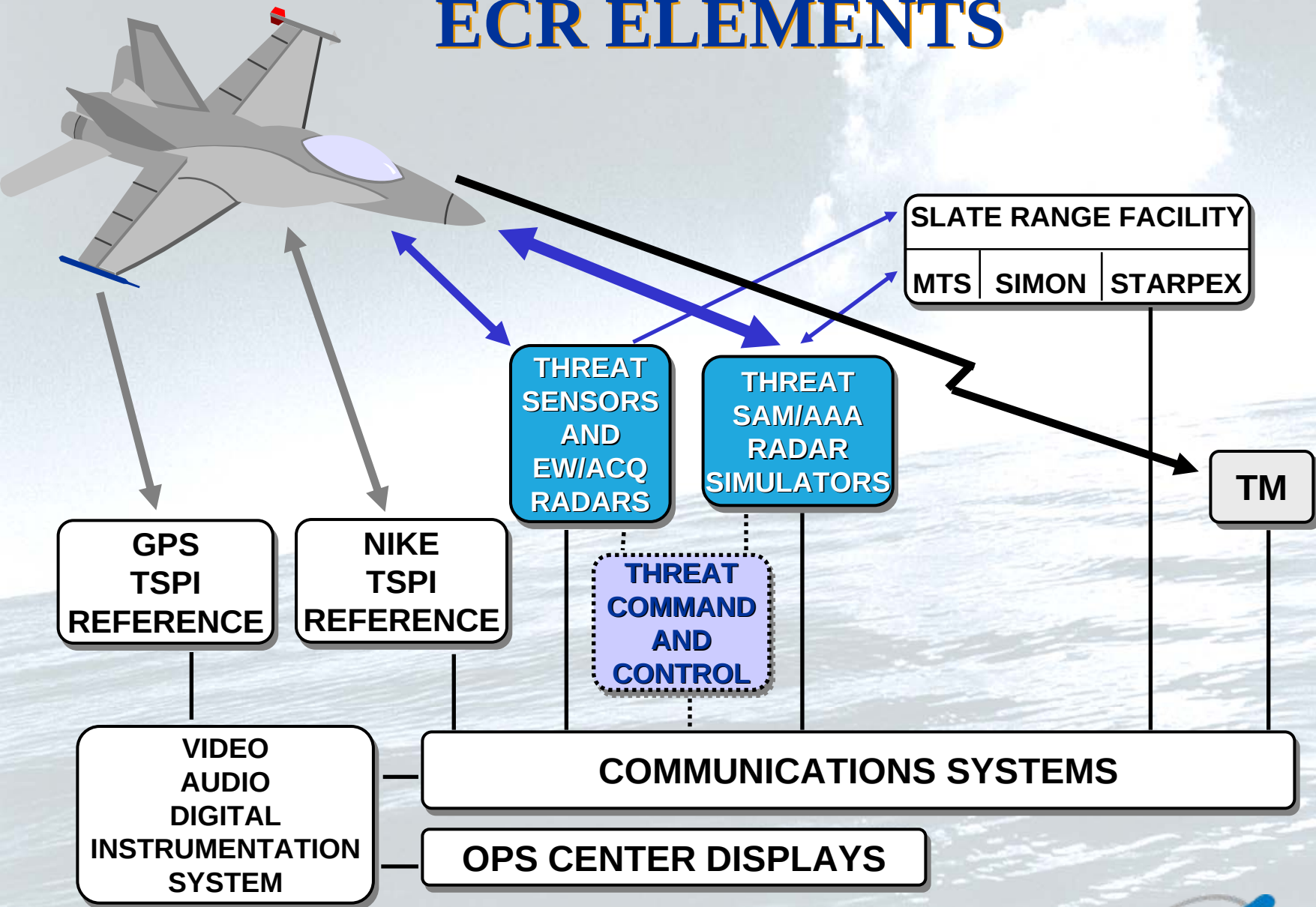
Kuwait

Israel

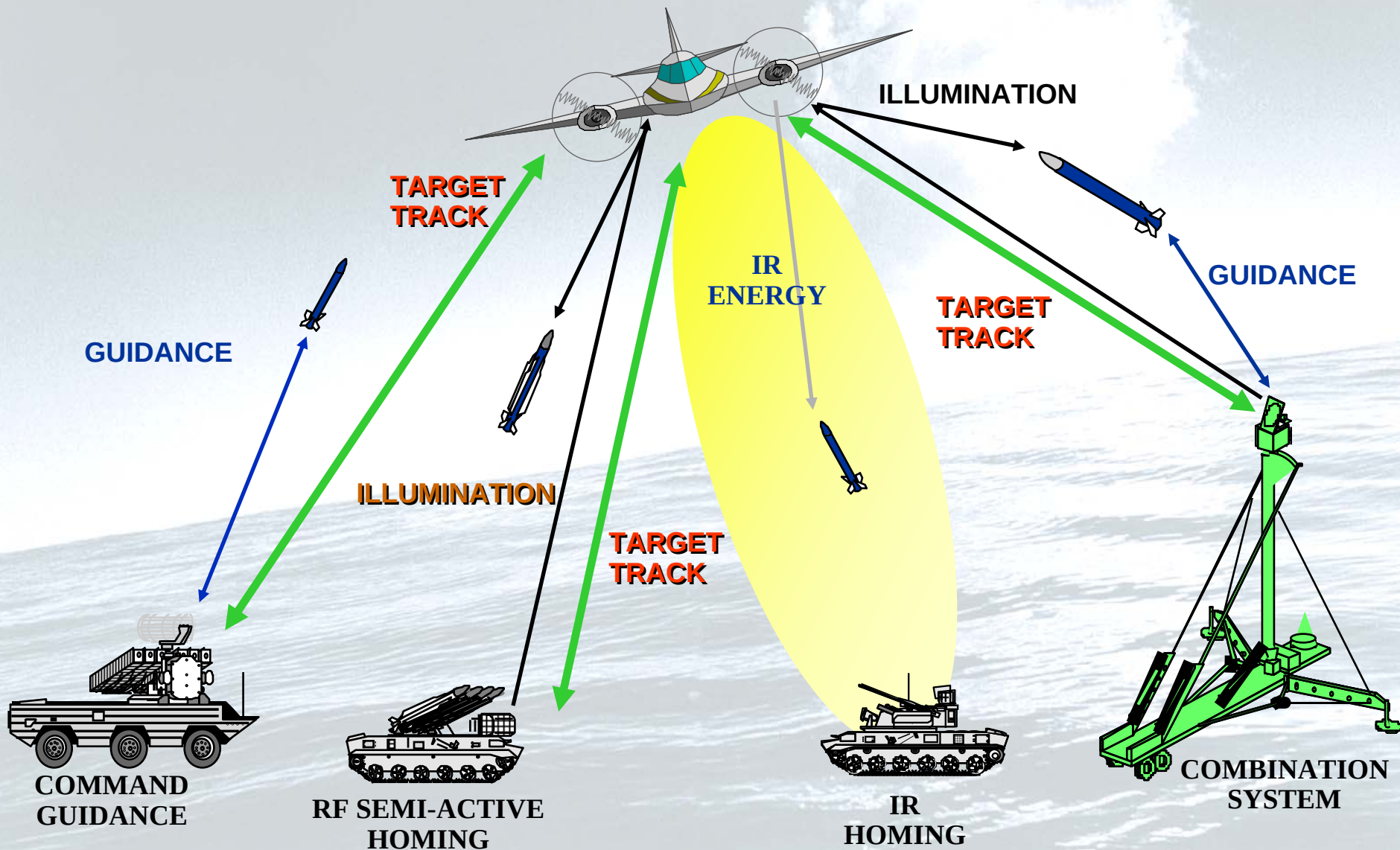
South Korea

Finland

ECR ELEMENTS



TYPES OF SAM SYSTEMS

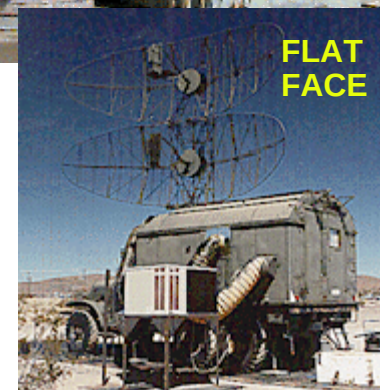


THREAT SYSTEMS

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

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REAL THREAT SYSTEMS AT ECHO



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UNIQUE THREAT SYSTEMS

POP GROUP



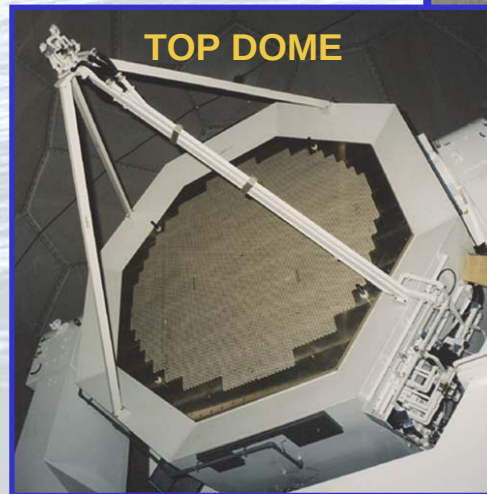
RSDE



MATS
FFM



TOP DOME



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EARLY WARNING ACQUISITION RADARS



Spoon Rest
Flat Face
Long Track



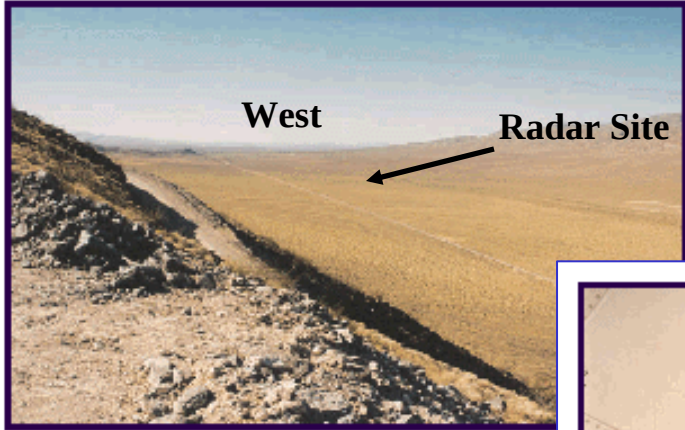
- **Height Finder**
– **Thin Skin**



All Actual Systems

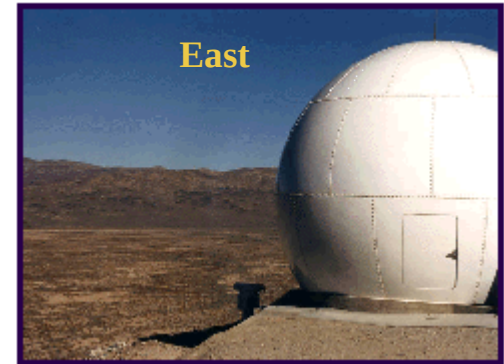
**Systems only have Video & Audio
Instrumentation**

MISSILE ON THE MOUNTAIN (MoM)



Radar to MoM Geometry

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



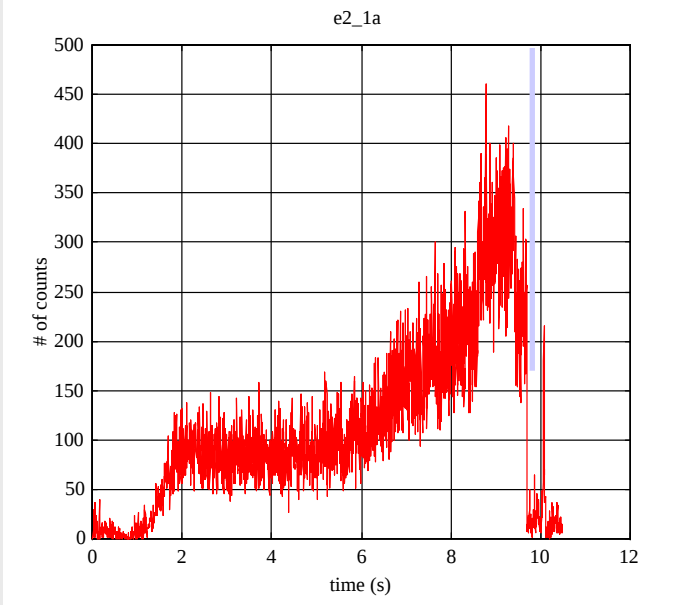
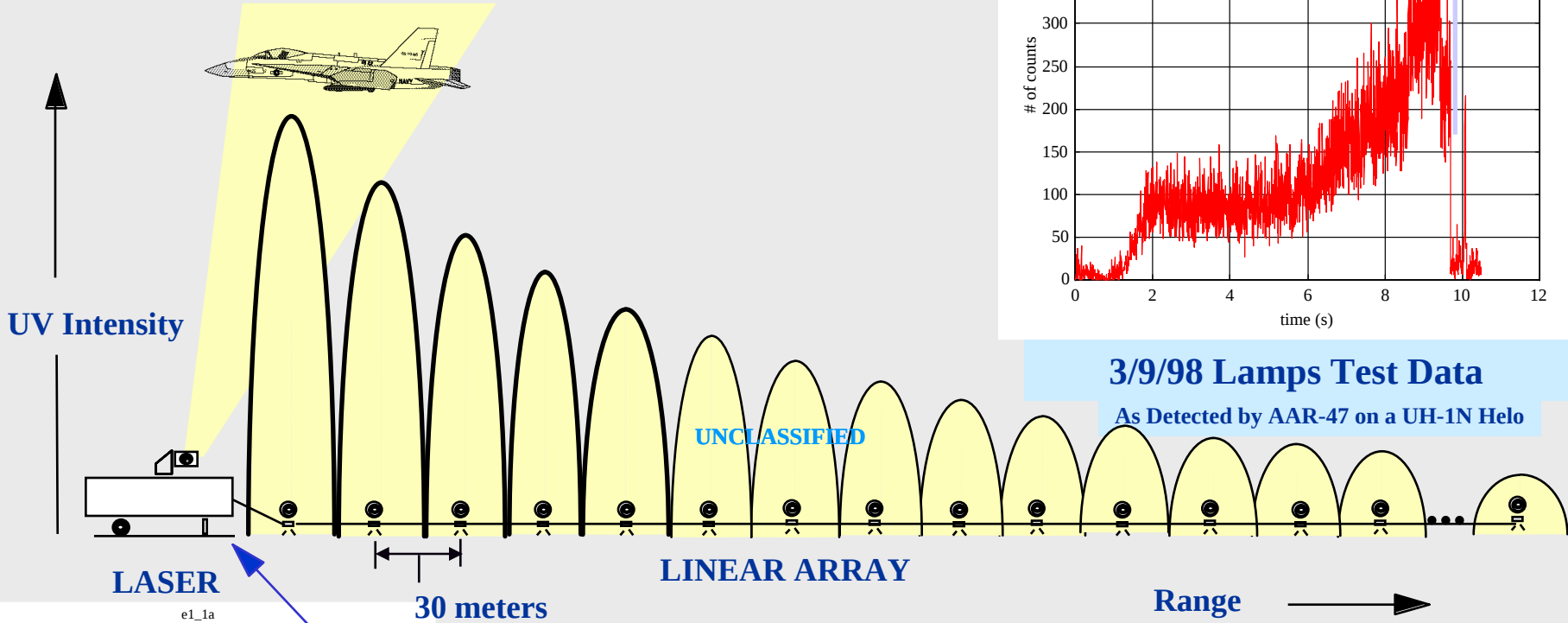
INFRARED COUNTERMEASURES ASSESSMENT SYSTEM (ICAS)

- **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

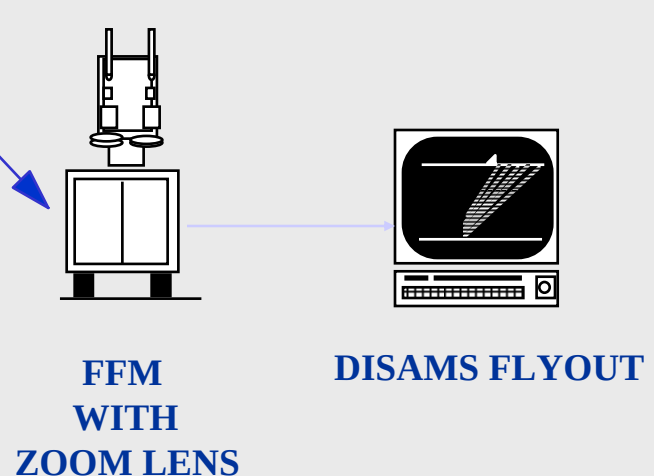
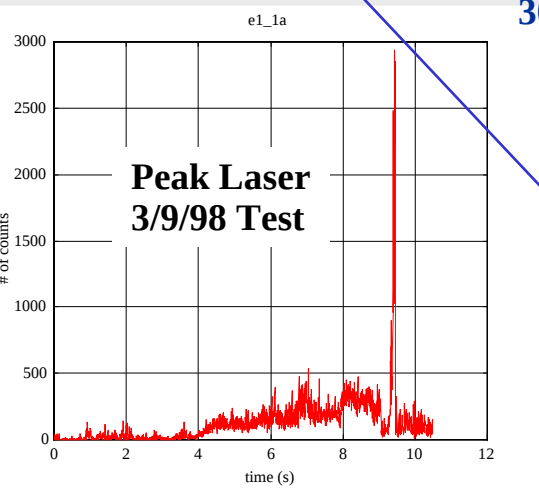


UV STIMULATOR CONCEPT

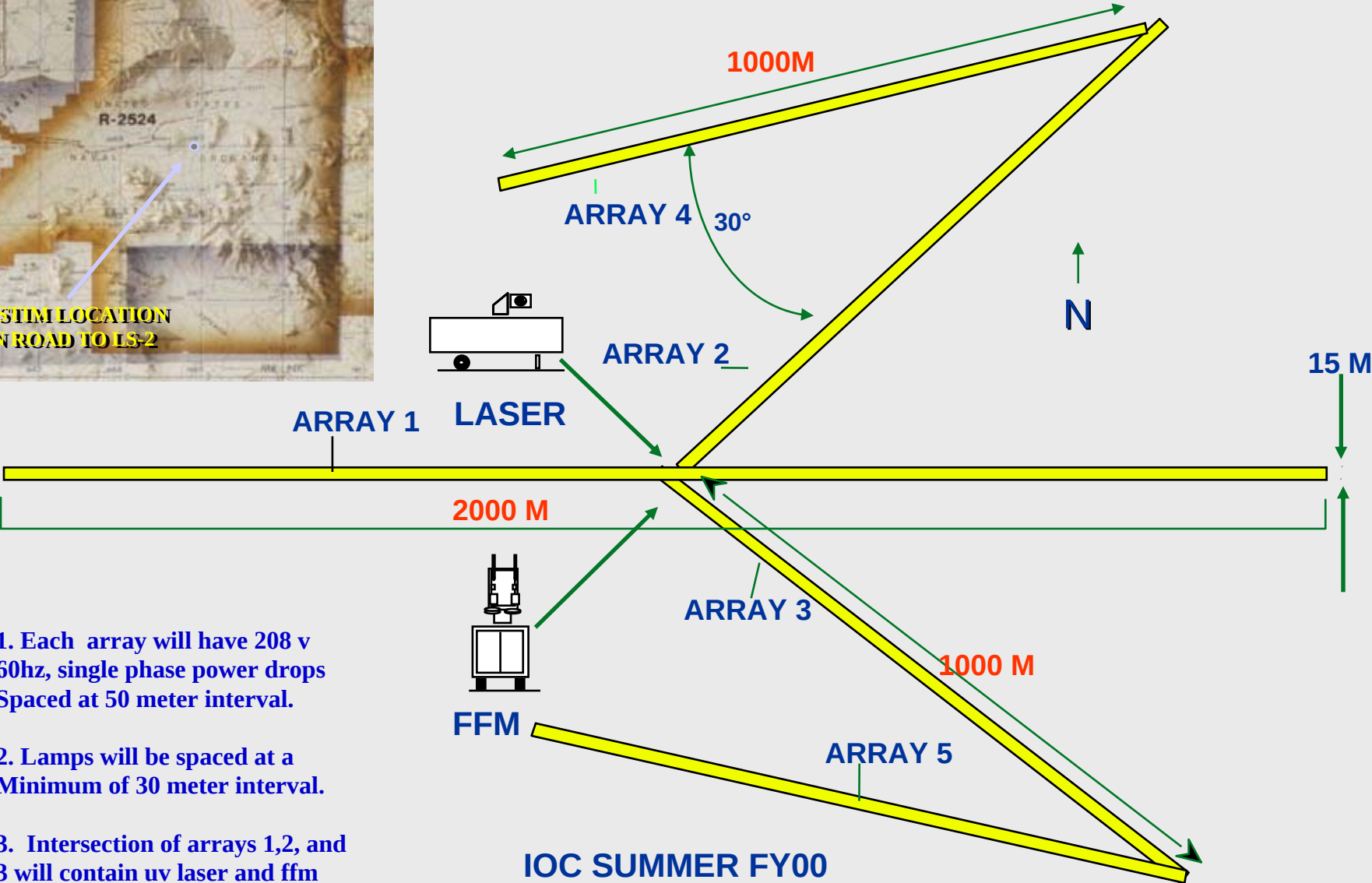
MISSILE PLUME SIGNATURE SIMULATION



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.

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OPS CENTER



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SLATE RANGE FACILITY

FRONT



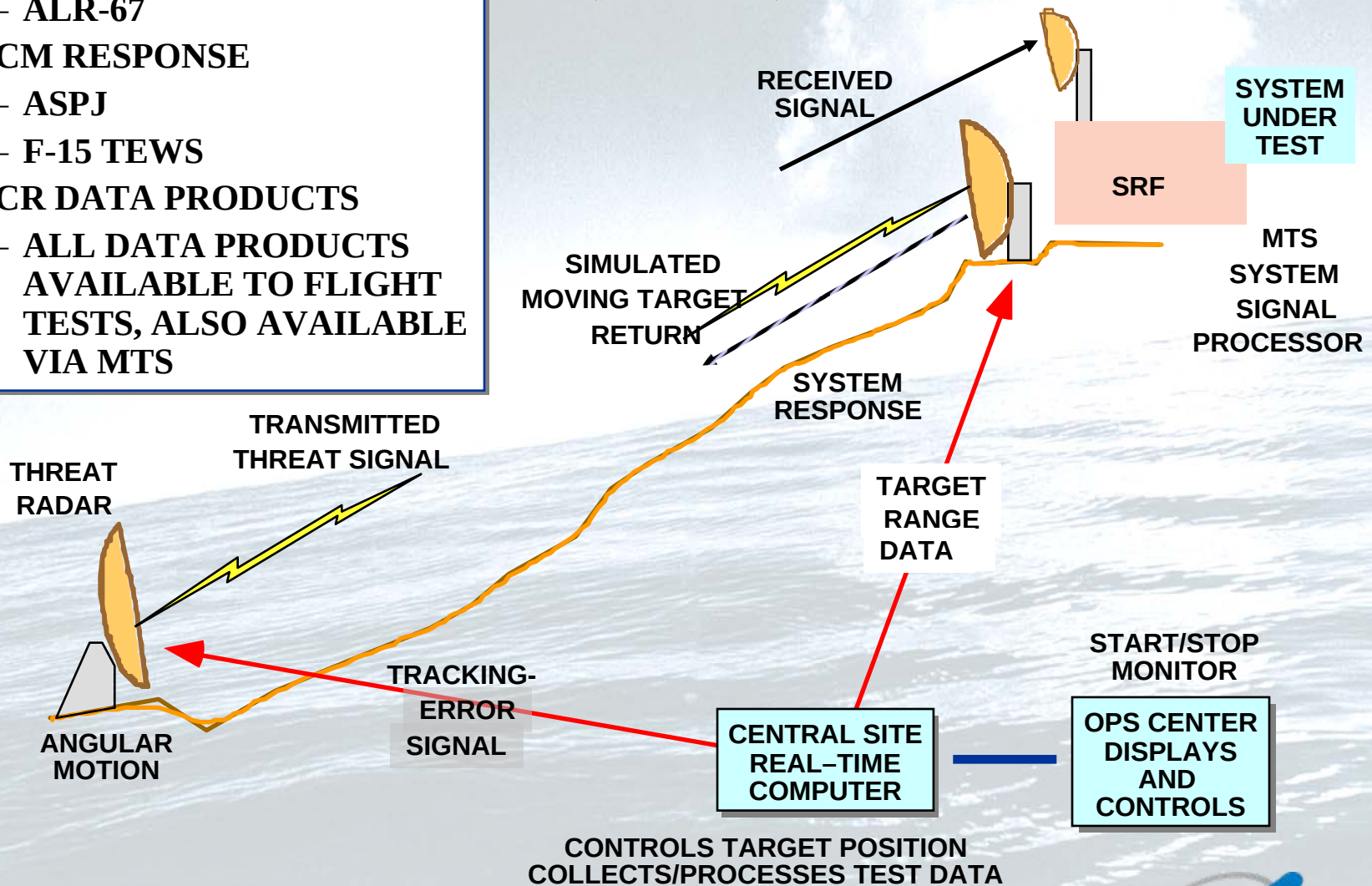
- SIGNAL MONITORING
- STATIC TARGET GENERATION
- MOVING TARGET SIMULATION

BACK



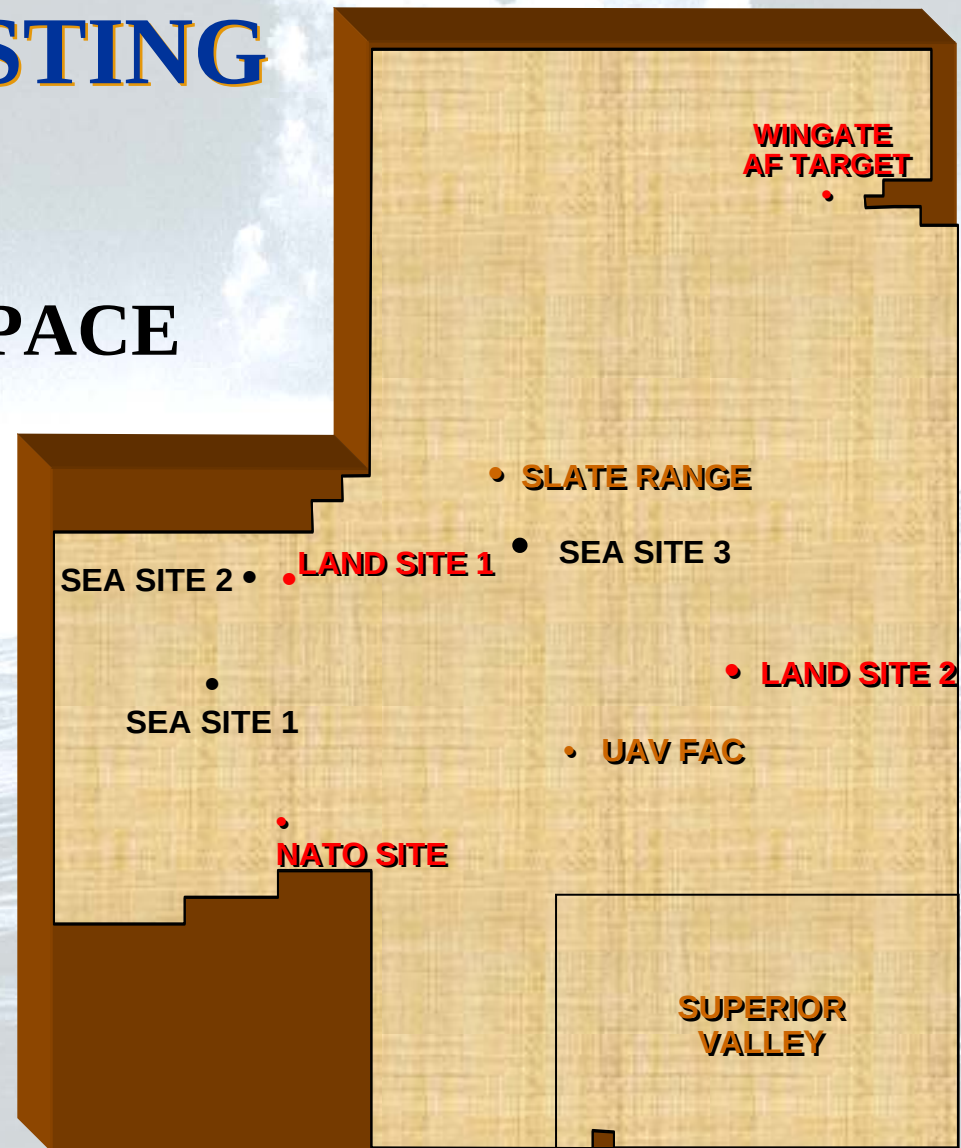
MOVING TARGET SIMULATOR (MTS)

- 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

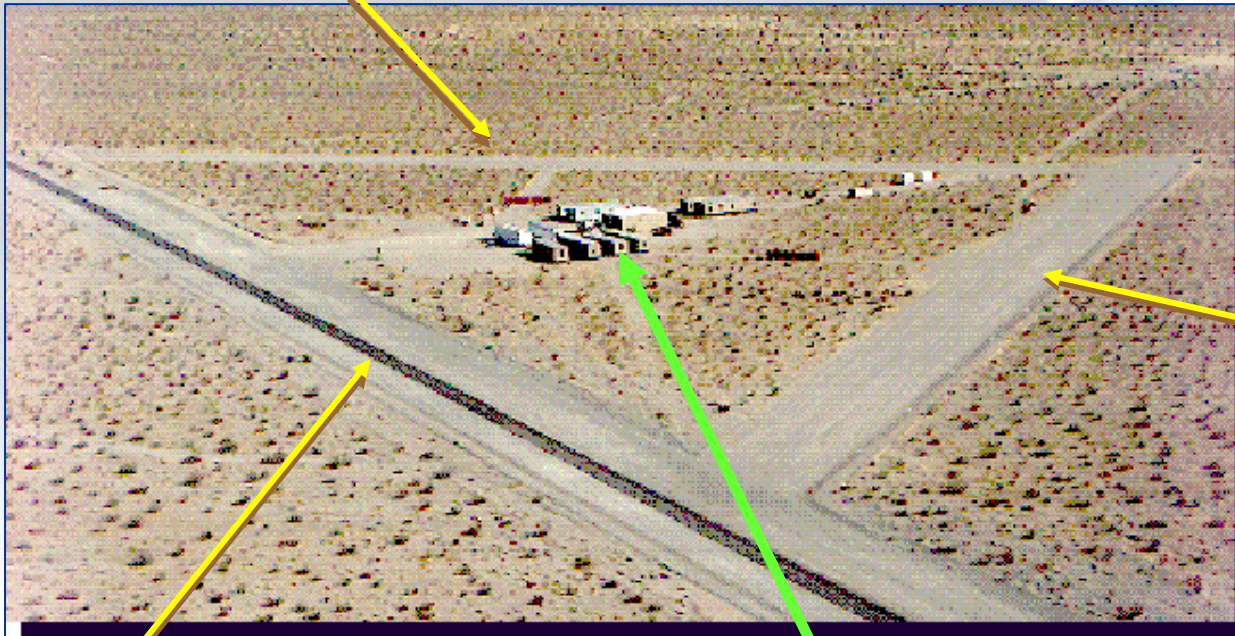
- LAND AND AIRSPACE
- AIRSPACE
SCHEDULED &
CONTROLLED



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ECR UAV FACILITY

DIRT RUNWAY #1



DIRT RUNWAY #2

MAIN RUNWAY



HANGER

OFFICE SPACE

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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.

NAV  AIR