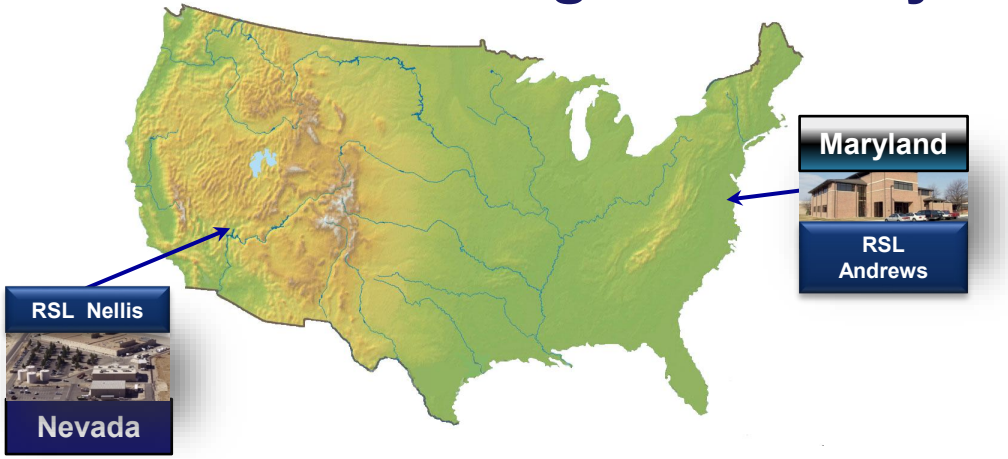
Nuclear Response Division

Alexis Reed
Director, NRD
February 2021

Remote Sensing Laboratory Locations



Remote Sensing Laboratory History

- Originated from the need to track radioactive plumes during weapons testing at the NNSS (Test Site) – initially called ARMS (Aerial Radiological Measuring Systems) – 1960

- Later became known as the Aerial Measurements Office (AMO) located at McCarran Airport in Las Vegas, NV

- AMO moved to Nellis AFB in 1989 and was renamed the Remote Sensing Laboratory (RSL)

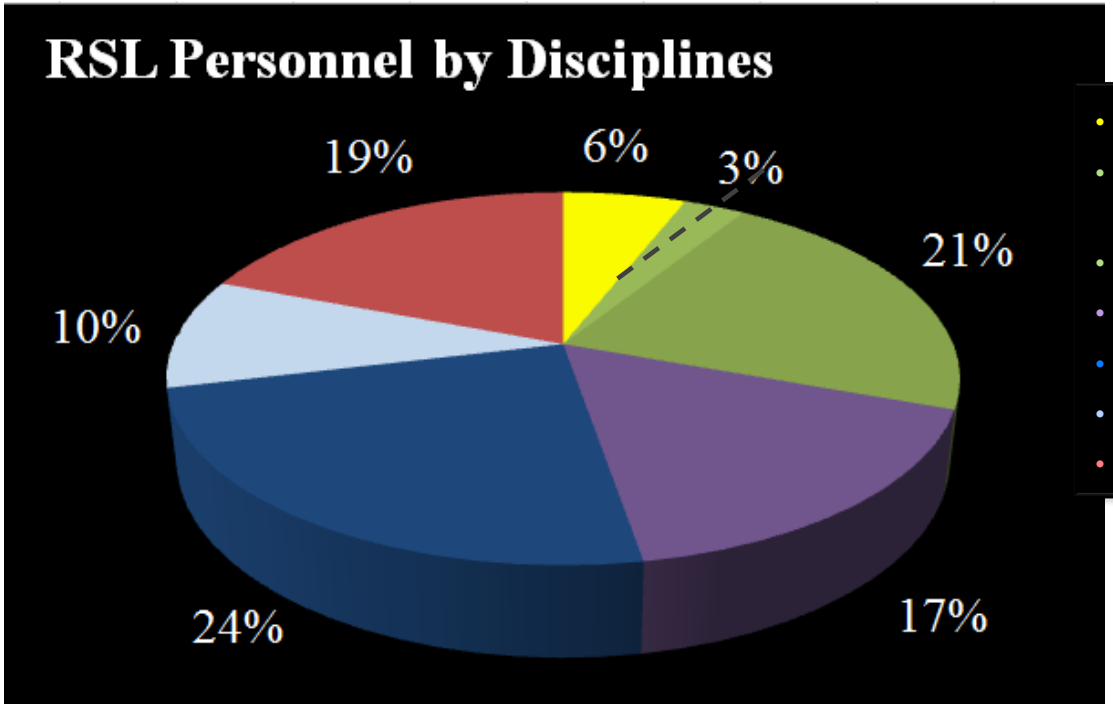
- 1976 Bicentennial events in Washington, DC created the need for RSL - Andrews

- RSL is home to a number of the US Government's nuclear emergency support teams (NEST)

RSL - Nellis Air Force Base and Joint Base Andrews

- 24/7/365 Nuclear Incident Response Assets
- On-Call Teams for Radiological Emergencies
- Deployable Field Teams / Home Team Reachback
- Aircraft – Unique Aerial Detection Capabilities

RSL Personnel Demographics



		Total
• Management	6%	10
• Management (*Scientific*)	3%	5
• Scientific	21%	36
• Engineering	17%	28
• Technical	24%	40
• Aviation	10%	16
• Operations	19%	32
		167

Advanced Degrees: 33 Masters Degrees, 24 PhD's

NRD Support to National Security

Training and Exercises

- Interoperability – WINGS, etc.
- National Level Exercises
- Monthly proficiency exercises
- Regular exercises with interagency partners
- Advanced training for RAP

Real World Events

- Lost or Stolen Sources
- Nuclear Power Plant accident – Fukushima Japan Response
- Disasters – Hurricane Katrina, Cerro Grande Fire, Woolsey Fire

National Special Security Events (NSSE) and high-SEAR events

- Presidential Inaugurations
- Annual State of the Union
- Political Conventions
- Super Bowl
- Boston Marathon

International Outreach

- Training events
- Technical exchanges
- CONUS or OCONUS locations
- Over 800,000 miles traveled in a typical year
- Interaction with 20+ countries per year

Nuclear Response Division Support to NA-80

- Aerial Measuring System
- Nuclear Search Program
- Consequence Management Response Team / Home Team
- Nuclear Incident Policy and Cooperation
- Operations and Exercises
- Disposition Forensics Evidence Analysis Team (DFEAT)
- Render Safe Programs – ARG, JTOT, Stabilization

Preventive Mission

DOE RAP Teams

AMS

Coordination with Law Enforcement Partners

NSP

- New Year's Eve – Las Vegas
- Presidential Inauguration
- Super Bowl
- RNC/DNC Conventions
- State of the Union

- Background mapping
- Remediation of all signatures
- Real-time event engagement through:
  - RSL software/hardware
  - Data analysis
  - Classified/unclassified communications via the Emergency Communications Network (ECN)

● RAP: Radiological Assistance Program ● AMS: Aerial Measuring System ● NSP: Nuclear Search Program

Threat-Based Mission

Intel or Law Enforcement (LE)

NSP

DOE RAP Teams

Access

Render Safe

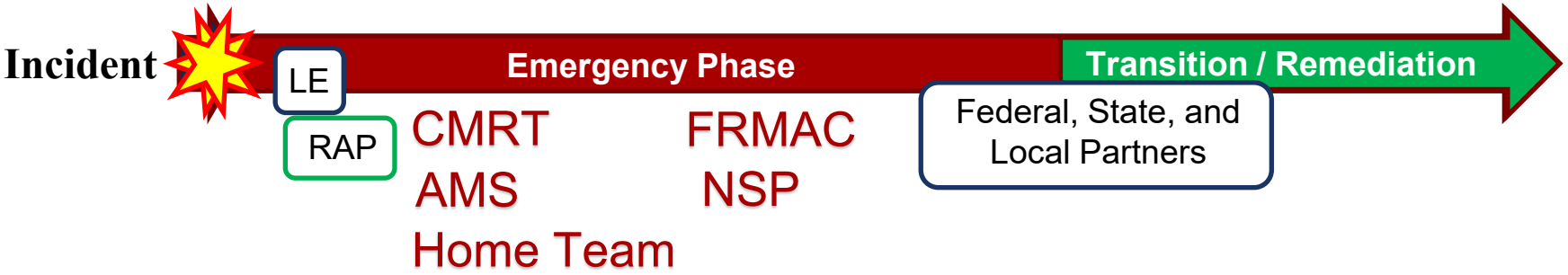
RSL and other NNSA Groups / Labs

DFEAT

- Threat information from Intel or Law Enforcement (LE)
- Using RSL-developed hardware, software, and techniques to assist LE
- Classified communications via ECN
- Access assistance for Render Safe
- DFEAT: Provide scientists + analysis
  - Classified communications to National Lab Home Teams via ECN

● RAP: Radiological Assistance Program ● AMS: Aerial Measuring System ● NSP: Nuclear Search Program
● DFEAT: Disposition Forensic Evidence Analysis Team ● ECN: Emergency Communication Network

Nuclear Power Plant, Radiological Dispersal Device, Improvised Nuclear Device



- Two-hour response, four-hours wheels up
- Aerial measurements utilizing air platforms, sensors, NRD-developed software and technology
- Analysis via NRD Consequence Management scientists who in turn provide information to state, local, and federal stakeholders
- Communications via Emergency Communications Network

● RAP: Radiological Assistance Program ● AMS: Aerial Measuring System ● NSP: Nuclear Search Program
● CMRT: Consequence Management Response Team ● FRMAC: Federal Radiological Monitoring and Assessment Center

Federal, State and Local Partners

NEVADA NATIONAL NNSS SECURITY SITE

Department of Energy
NNSA

National Nuclear Security Administration

The Intelligence Community

Department of Defense

Law Enforcement Community

Department of Homeland Security

MSTS
MISSION SUPPORT AND TEST SERVICES LLC

Nuclear Search Program

Michael P. Taylor, Ph.D.
Principal Scientist, RSL

Nuclear Search Program

Mission

Anywhere, anytime anomaly detection and operational awareness. Technical expertise leading the development and deployment of anomaly detection for dynamic and unpredictable environments.

Vision

The right capability forward. NSP leads others to the fight by first finding the fight and then getting the right data in austere, uncertain conditions; NSP then supports others to communicate critical information and to advise on courses of action to decision makers.

NEST Review

Mission

Counter nuclear terror threats, respond to nuclear incidents and accidents, and sustain readiness in support of DOE's “all-hazards” emergency management capability.

Efforts

Providing an operational response, the science of nuclear threat devices and potential nuclear terrorist capabilities; informing USG policies, agencies, and key commands; providing targeted training.

Structure of Search

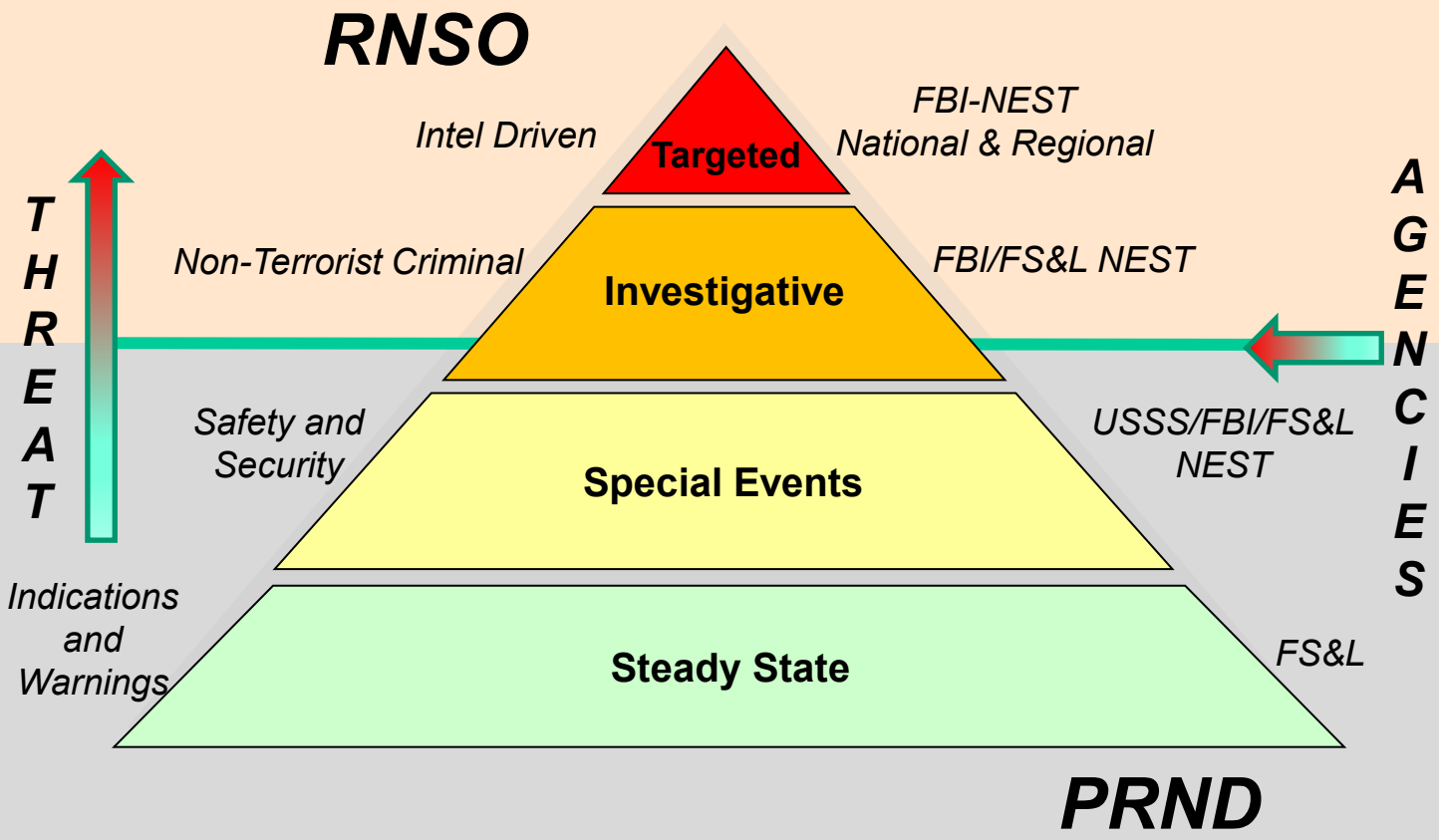
Advisory Support

The Nuclear Search Program (NSP) is the primary radiological and nuclear technical and advisory support to the DOS, FBI, FEMA and USCG.

Reachback

NSP provides scientific and technical reachback support to federal, state and local governments.

Search Environments (CONUS)



NSP Assets

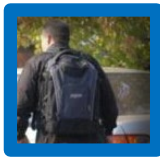
National Search Team

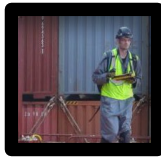
Maritime Support Team

Local Response Teams

Nuclear/Radiological Advisory Team

Search Home Team





NUCLEAR SEARCH PROGRAM

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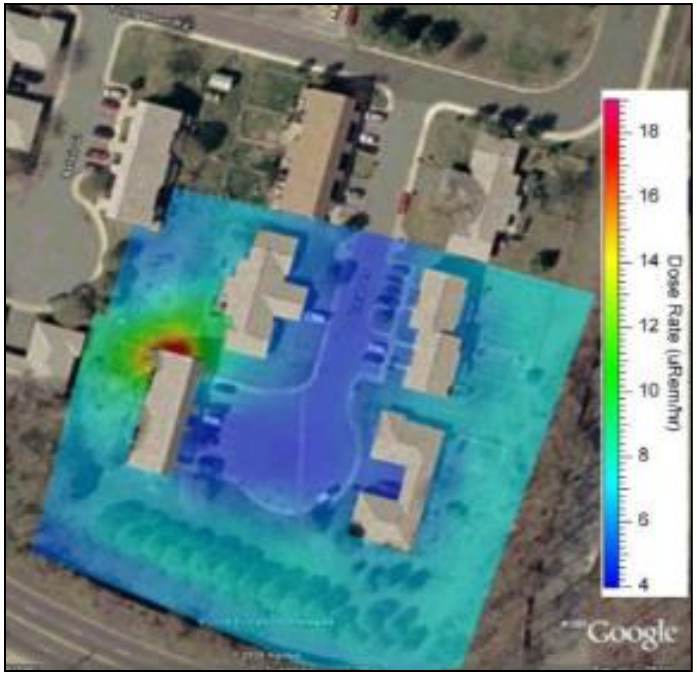
NSP Assets :: National Search Team (NST)

Scientific & Technical Support

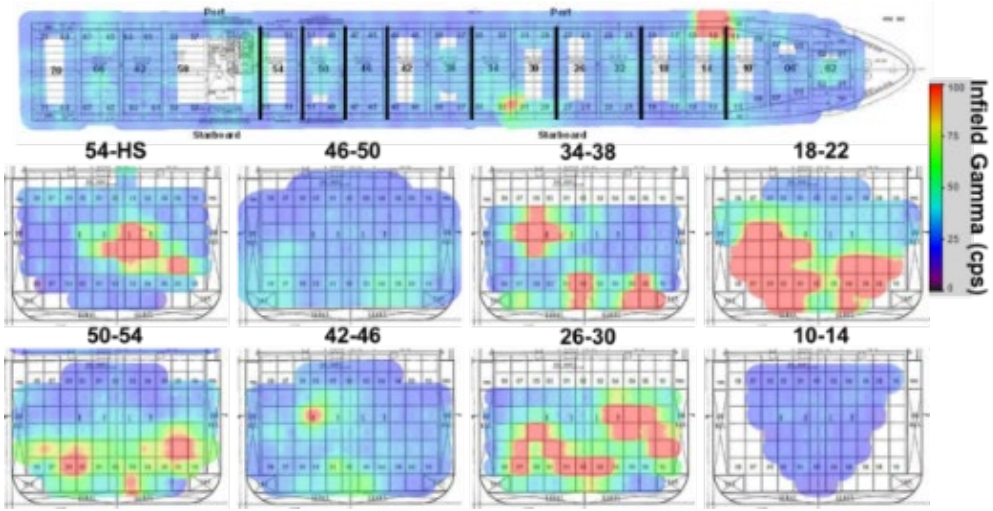
NST is a rapidly deployable scientific and technical search team with a wide range of expertise in anomaly detection and assessment of data for dynamic and unpredictable environments

Operational Support

NST provides strategic advice, intelligence integration, technical reachback, mission planning, the conduct of search operations with critical advice to decision makers on appropriate courses of action.



NSP Assets :: Maritime Support Team



Advanced Maritime Search

MST is a rapidly deployable scientific and technical search team, capable of conducting advanced search operations in complex maritime envorinments.

NSP Assets :: Maritime Support Team

Preparation

MST provides advanced maritime training, drills, exercises and maintains rigorous maritime safety training.

Advanced Tools

MST develops and employs specialized equipment and advanced techniques & analysis.

NSP Assets :: Local Response Teams

NCR & LVR Teams

National Capital Response (NCR) and Las Vegas Response (LVR) teams are a tailored search response teams that respond at the request of law enforcement.

Support

Primary support lies with the FBI Washington and Las Vegas Field Offices.

Major Public Events

NCR and LVR teams support the USSS and the FBI, during special events, with technical assistance to field operations, data assessment and reachback.

NSP Assets :: Nuclear/Radiological Advisory Team

Tailored Response

NRAT is an all-purpose radiological response advisory team for national and international incidents, capable of short-notice deployments.

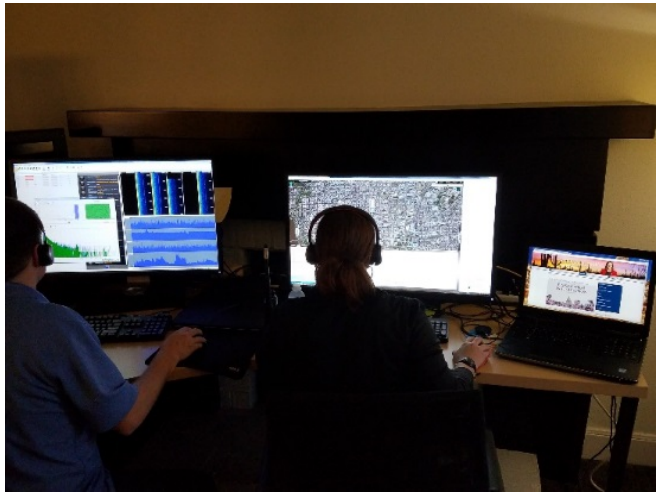
Subject Matter Expertise

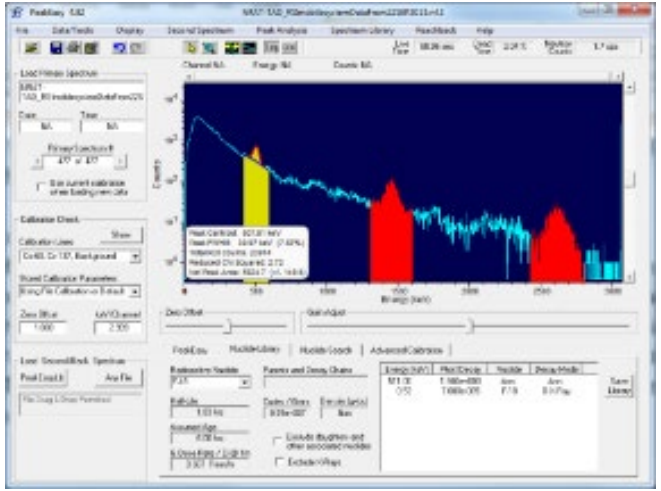
maintains expertise in scientific, technical and national policy areas, fields subject matter expertise and communication equipment.

NSP Assets :: Search Home Team

Reachback Capabilities

Search Reachback conducts technical analysis and provides assessments through a collaborative process using scientific and technical capabilities from the Remote Sensing Laboratory.





NSP Additional Support Functions

RAP Outreach and Training

- RAP Training for Emergency Response (RAPTER)
- Advanced Equipment training (AEQ)
- Regional Targeted Search Operations (TSO)

Exercise Planning and Support

- National Level Exercises

Support to Capability Assurance Program (CAP)

- Participate in the determination of shortfalls, and needs
- Participate in workgroups, reviews and T&E efforts

Supported Events

National Level Exercises

Real World Responses

National Special Security Events (NSSE)

- Inaugurations & Political Conventions
- Presidential Funerals
- State of the Union Address (SOTUA)
- NATO, G8, G20 and Nuclear Security Summits

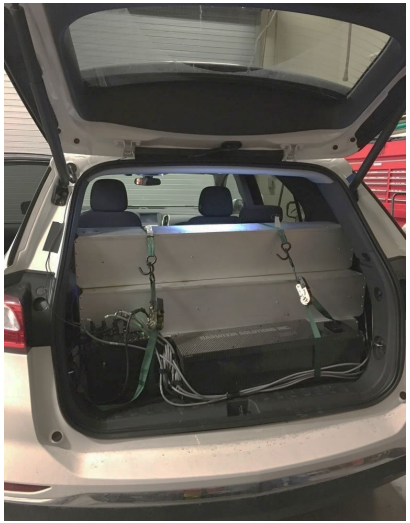
Special Event Assessment Rating (SEAR) 1 & 2 Events

- Super Bowl
- Independence Day (DC)
- New Year's Eve (LV)
- Army-Navy games (Baltimore & DC)
- UN General Assembly (UNGA)
- Rose Parade

Vehicle Sensor (Mobile)

Gamma and neutron detection

Large-volume detectors



Man-Portable Sensor (Gemini)

Customizable for sensitivity

Backpack size (maneuverable)

Gamma and neutron detection

Smaller, modular detectors

High Resolution Detection Systems

High resolution

Vastly improved signal-to-background

Low efficiency

Limitation on detector volumes

Cooling requirement

Must be operated at cryogenic liquid nitrogen temperature

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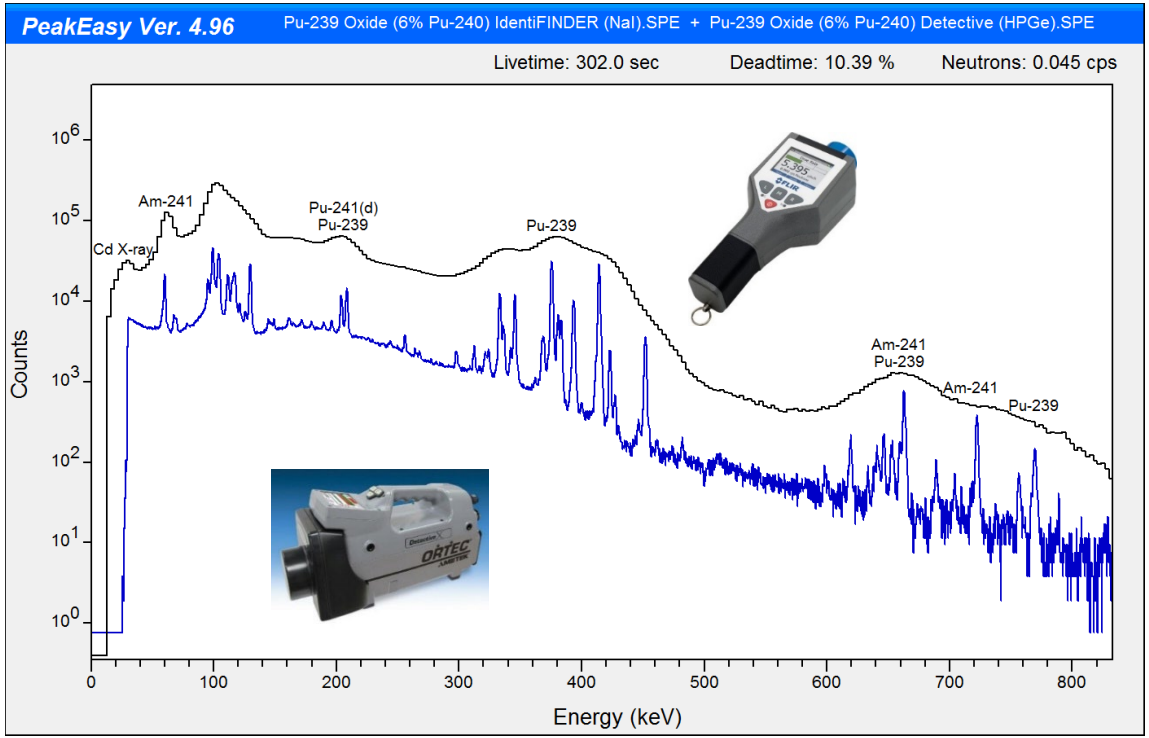
Spectral resolution – low versus high



Other Equipment

- Communications
- Health Physics
- Other

Aerial Measuring System (AMS)

Mark Norsworthy
Supervisor, AMS

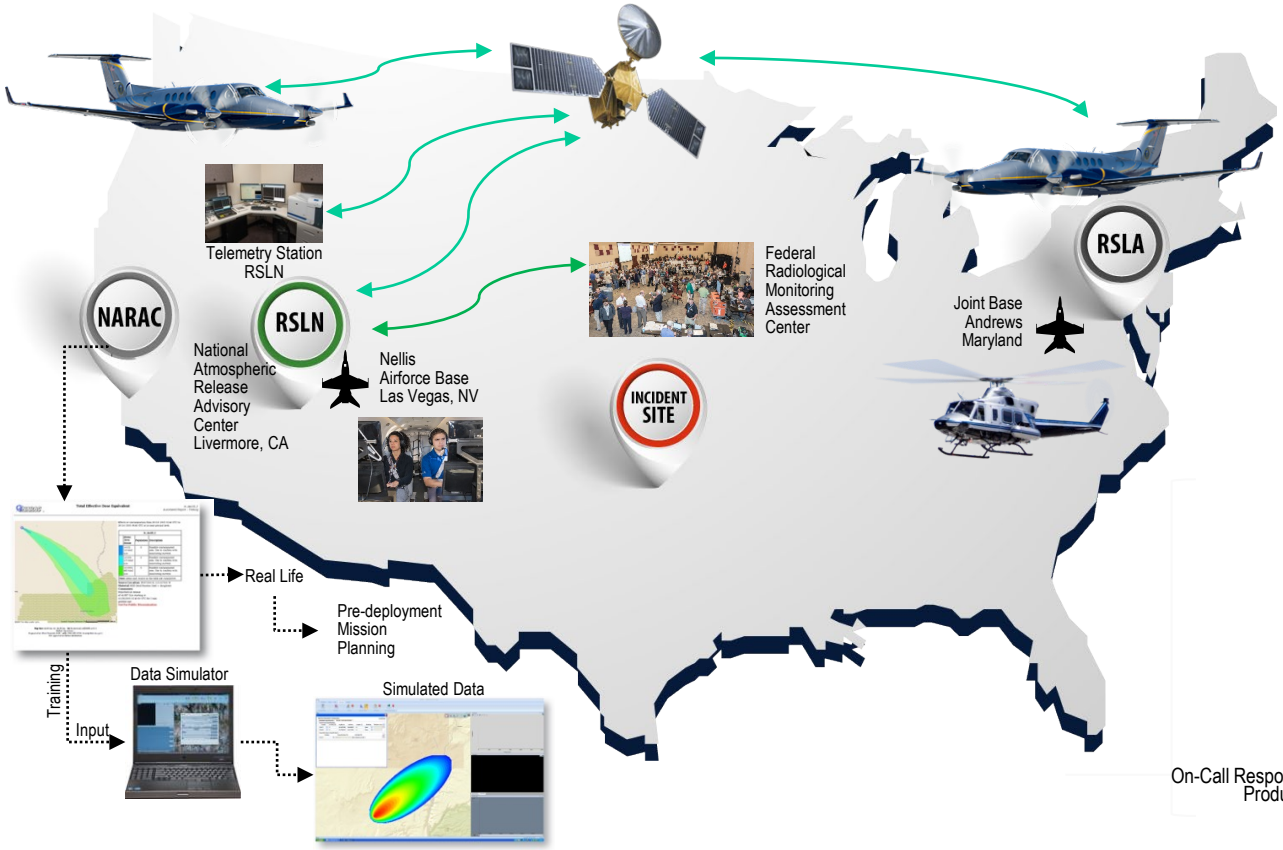
AMS Mission Statement

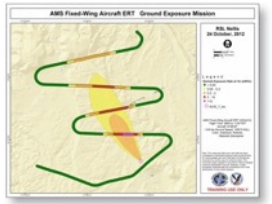
- Provide a rapid and comprehensive worldwide aerial measurement, analysis, and interpretation capability in response to a nuclear/radiological emergency
    - This includes Mission Planning, Acquisition, Post-Analysis, and Reporting.

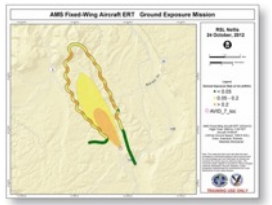
Aerial Measuring System

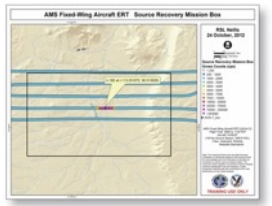
- Established in 1960s.
- Originally supported the Nuclear Test Program.
- Expanded Mission
  - Provides initial data to RAP Teams and FRMAC,
  - Confirm NARAC predictive computer models,
  - Give initial assessment of ground deposition,
  - Search for lost radioactive sources or scattered fragments.
  - Preventative radiological/nuclear detection

AMS Emergency Response Deployment







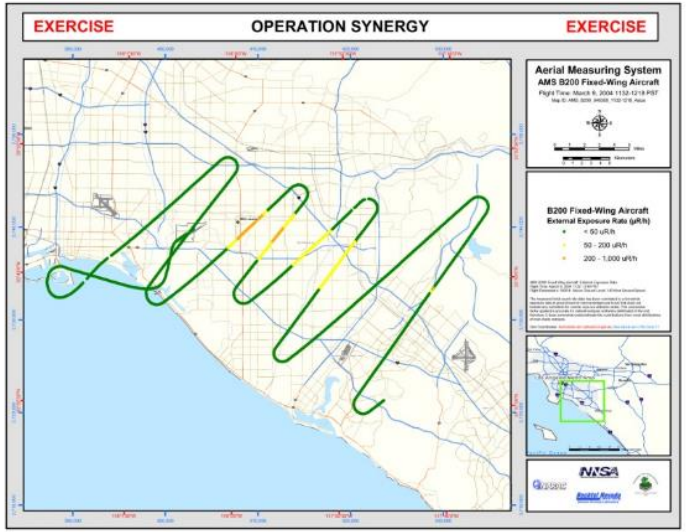


AMS Emergency Response Missions

- **On Call Response (OCR):** uses a fixed-wing aircraft system designed to produce rapid results for the decision makers dealing with evacuation and shelter-in-place issues related to high radioactivity levels (areas where the natural background radiation can be ignored).
  - Provides radiation exposure rate surveys and radiation deposition mapping over large areas around an accident or incident scene.
  - The results from these systems can be quickly presented as maps or images.

Large Area (>25 mi²)

- Altitude: 500–1,000 feet
- Spacing: 1–5 miles
- Speed: 160 knots
- Fixed-wing Aircraft



AMS Emergency Response Missions (cont.)

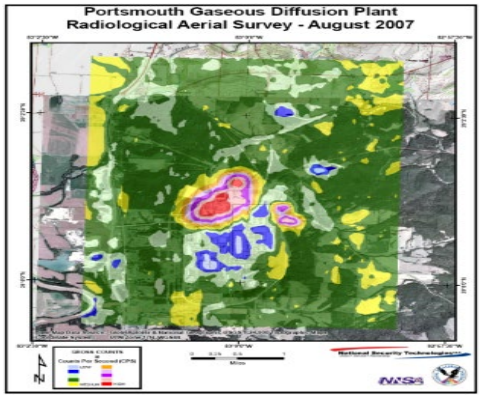
- **Radiological Mapping (RM):** uses a helicopter-based system to obtain dispersed radiation measurements closer to the natural background levels (low activity areas) needed, for example, to assess crop ingestion issues and to characterize the affected area for future remediation.

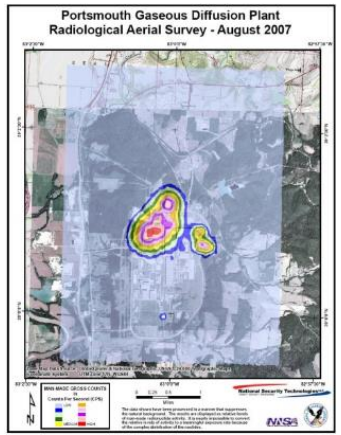
Rapid Overview – Emergency Response

- Altitude: 500 feet
- Spacing: 0.5 mile
- Speed: 70 knots
- Helicopter

Small Area (<25 mi^2) – Detailed Survey

- Altitude: 50–300 feet
- Line Spacing: 100–500 feet
- Speed: 70 knots





AMS Mission Response Personnel

- AMS Home Team Scientist
- AMS Data Analyst
- GIS Scientist

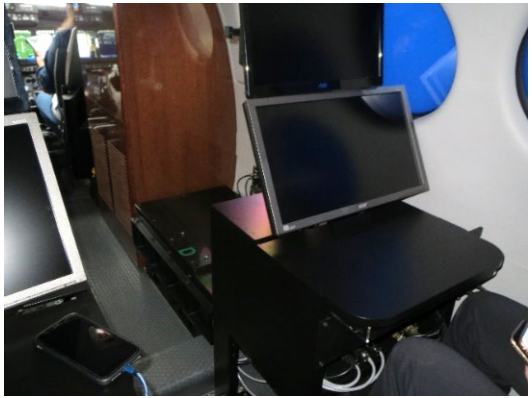
- Pilot in Command (PIC)
- Co-Pilot
- AMS Mission Manager
- AMS Equipment Specialist

On-Call Response Standby

- Two 7-person on-call response teams at both RSL-Nellis and RSL-Andrews
  - 24/7 duty
  - 2-hour recall, 4-hours wheels up
- Three aircraft always on standby
  - Two at RSL-Andrews
    - Eastern Region
    - National Capital Region
  - One at RSL-Nellis
    - Western Region

Mission Equipment - Fixed Wing

- NaI-based gamma radiation detection system 2 per aircraft
- On the King Air B350ER:
  - Two redundant RSX-3 systems
  - ORTEC Transpec or Detective 200
  - Health Physics Kit



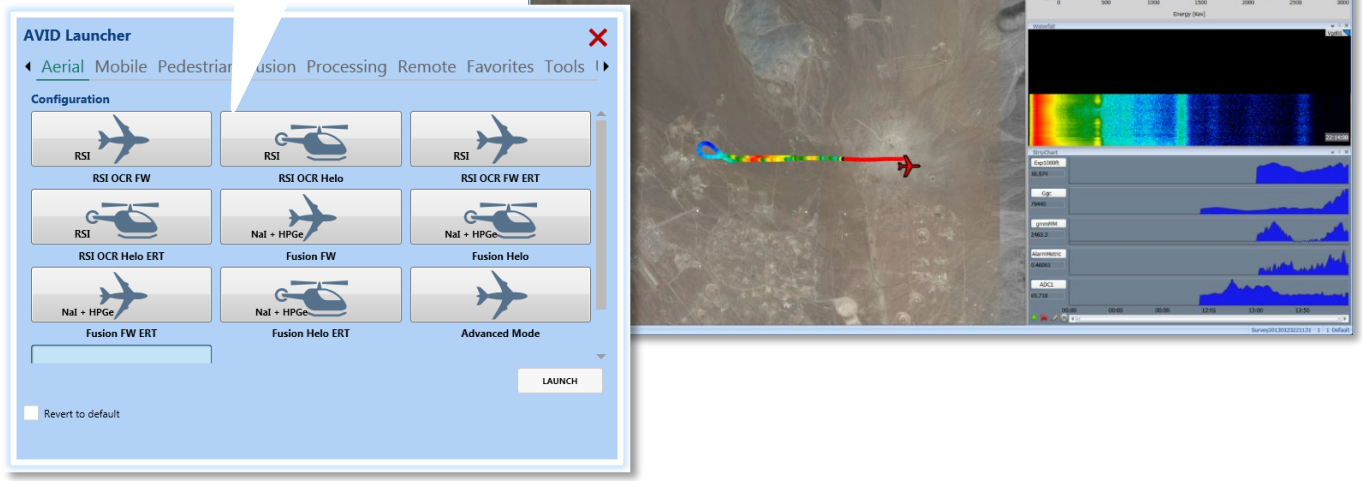
Mission Equipment - Rotary Wing

- 12 NaI(Tl) logs – 2- x 4- x 16-inch (each having about 2 liter volume)
- Styrofoam for thermal insulation
- Shock mounted
- Carbon fiber enclosures

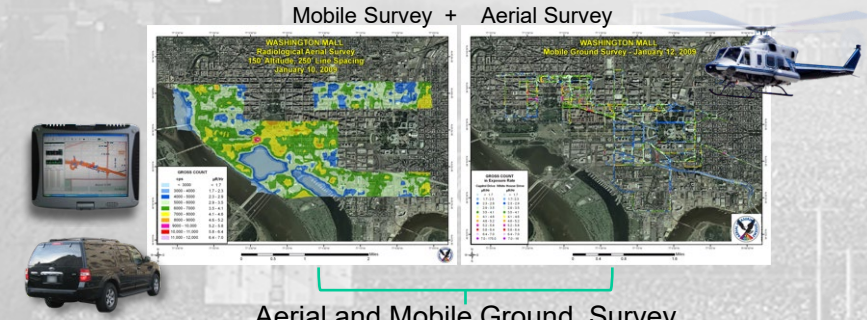
Software for Aerial Systems:

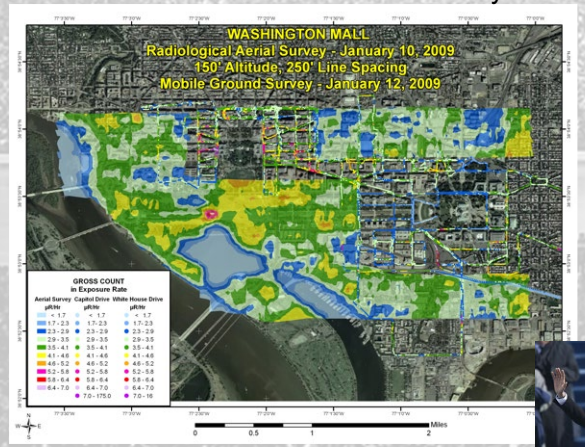
Advanced Visualization and Integration of Data (AVID)

Mission dependent configuration

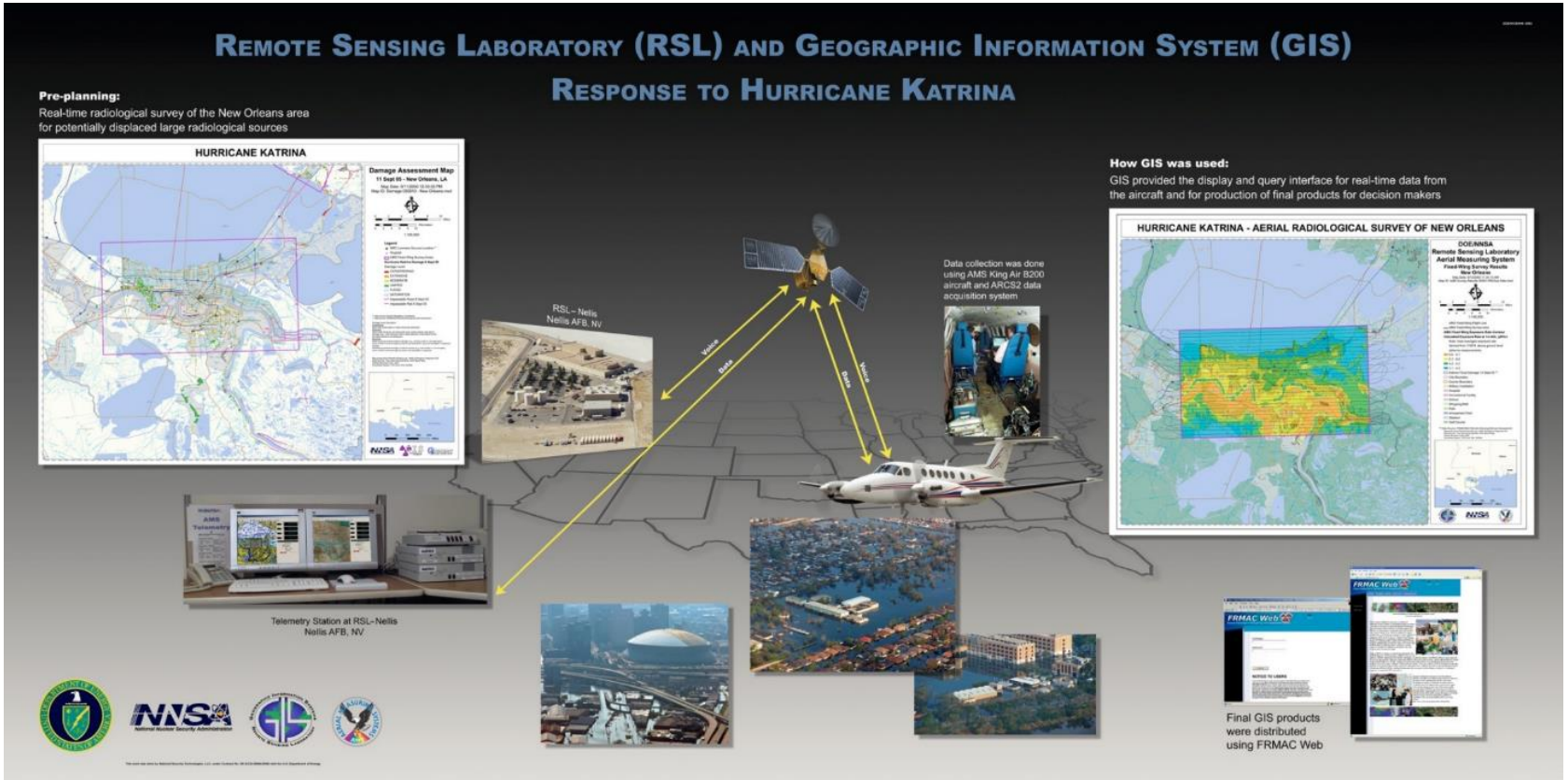


Pre-Event and Background Surveys



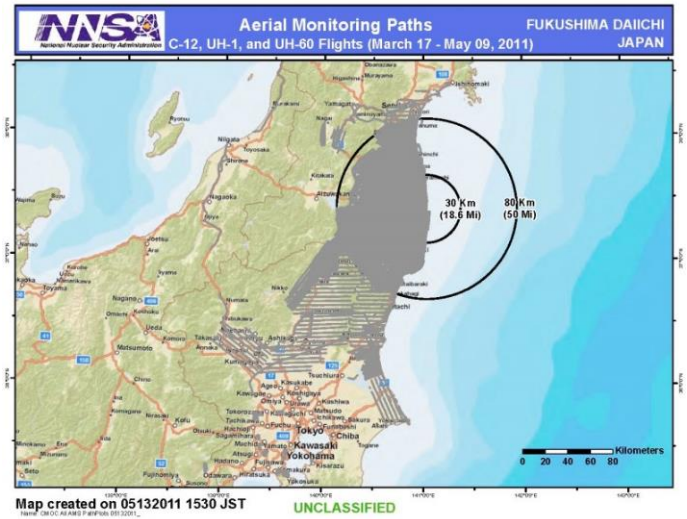


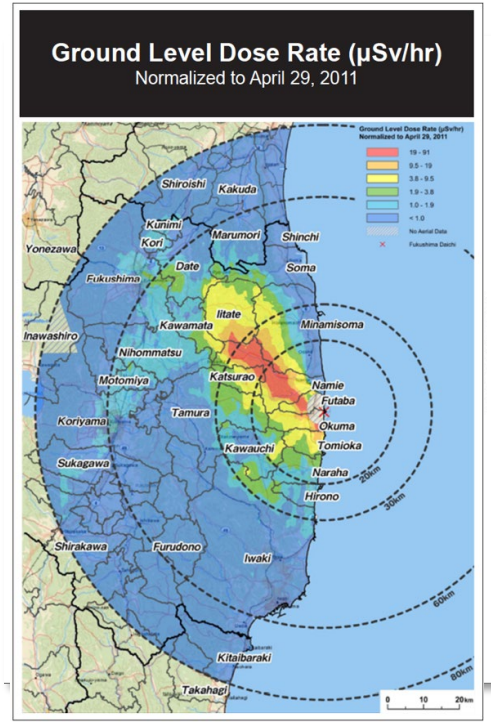
AMS Deployments: Hurricane Katrina 2005



AMS Fukushima Deployment Summary

- Daily aerial measuring missions over US installations and in the area around the Fukushima Daiichi Nuclear Power Plant
  - 85 flights
  - 507 flight hours





Questions?


AERIAL MEASURING SYSTEM
AMS
MANDALAY BAY
MANDALAY BAY
MGM
THE CITY OF ENTERTAINMENT
NEW YORK
NEW YORK

Consequence Management

RaJah Mena
Program Manager, CM

Federal Radiological Monitoring and Assessment Center

Mission Statement

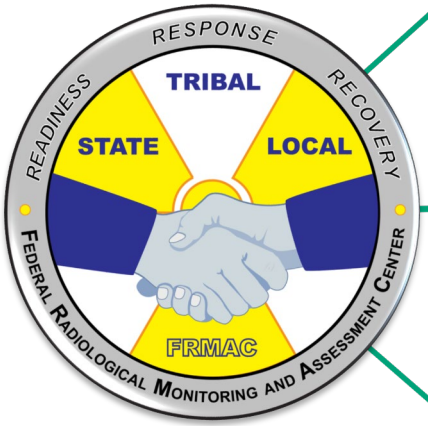
Provide timely, high-quality predictions, measurements, analyses, and assessments to promote efficient and effective emergency response for the protection of the public from the consequences of nuclear or radiological incidents.

- Technical Expertise
  - Health Physics
  - Atmospheric Modeling
  - Aerial Measurements
  - Environmental Monitoring & Sampling
- Technical Assistance
  - Data Visualization
  - Sample Control & Management

FRMAC Support Includes…

- Coordination of
  - Radiological monitoring and assessment activities
  - Support for medical service providers
  - Interactions with Advisory Team for Environment, Food, and Health
  - Laboratory analysis capabilities and activities (fixed off-site labs & on-site mobile labs)
- Liaison with state, tribal and local agencies
- Management of all off-site radiological monitoring data
- Development of visualization products and assessment reports to support protective action decisions, evaluation of potential impacts of radiological contamination, and maintaining situational awareness
- Additional resources to augment local radiological monitoring and assessment activities

NRD Response Elements that Support the FRMAC



CMHT

- Scalable support
- Near immediate response
- Technical support

CMAC

- 6 - 7 person deployed team
- Early planning, leadership, and logistics

CMRT

- Full field support
  - (50 – 100 people)
- Additional technical and leadership resources

Consequence Management Home Team (CMHT)

- Scientific Support
  - Atmospheric Modeling
  - Assessment Scientists
  - Health & Safety
  - Aerial Measurements
  - Laboratory Methods
- Communications Support
  - Bridge Lines & Coordinators
  - Data Management
- Product Support
  - GIS Specialists
  - Product development and interpretation
- Logistics Support
  - Personnel
  - Field Samples & Off-Site Laboratory support

Consequence Management Response Team (CMRT)

- Assessment scientists to support data evaluation and visualization and support public & responder safety
- Geographical Information Systems (GIS) equipment and personnel for creating map products to visualize data
- Health & Safety specialists to support responders
- Field teams to assist with data and sample collection and contamination control
- Sample control personnel to catalog and manage sample collection and analysis
- Laboratory analysis personnel and equipment to support field deployable instrumentation (Fly-Away Laboratory)
- Logistics support for FRMAC teams

Responses and Training

Real World Participation

- National/International Scale Events
  - Chernobyl, World Trade Center, Fukushima Daiichi
- Regional/Small Scale Events
  - Average of 3-5 responses per year

Exercise Participation

- Large Scale Exercises (Full FRMAC, 100 + participants)
  - About 1 large scale drill every 18 months
  - Recent Drills include:
    - Cobalt Magnet 2019, Northern Lights 2016, Southern Exposure 2015, Vibrant Response, Diablo Bravo, NUWAIX, Empire 09
- Small Scale Exercises/Drills (CMAC level) at least annually
- Home Team Support Drills/Exercises: 6 – 10 per year

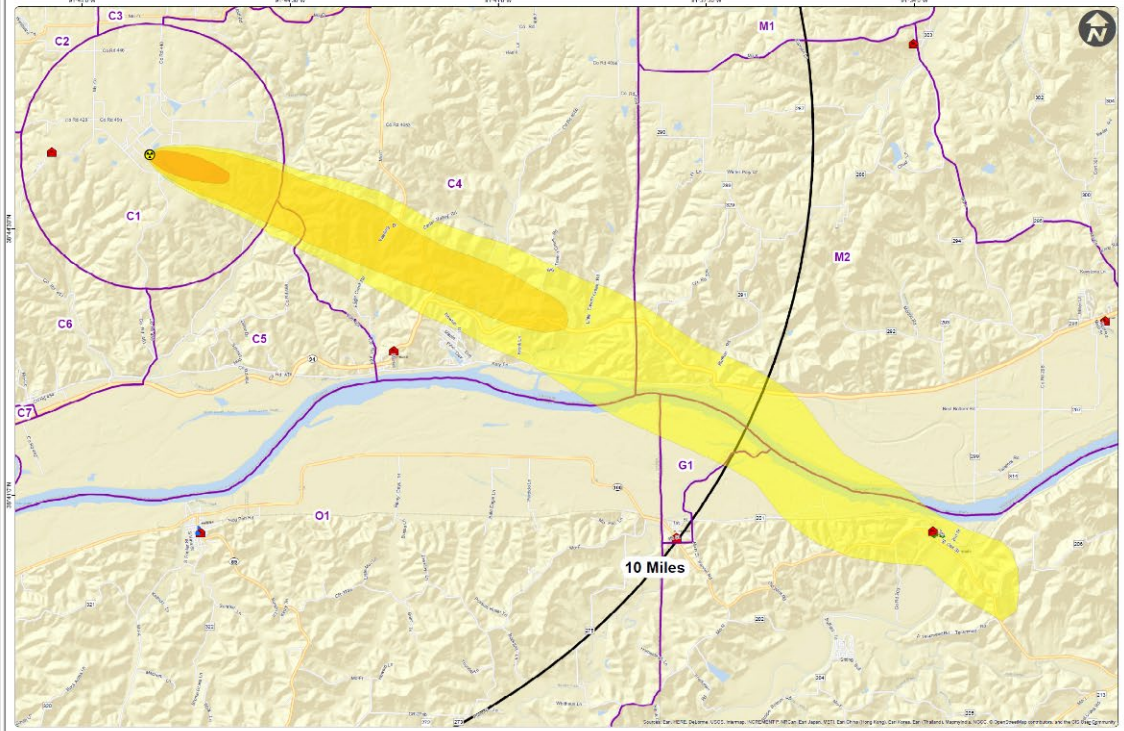
Examples of CMRT Products

- Protective Action Guidance Products
  - Evacuation/Shelter Guidance Map
  - Relocation Guidance Map
  - Potassium Iodide Guidance Map
  - Worker Protection Dose Rate /Stay Time Map
  - Agricultural Impacts (Mature Produce or other)
  - Dairy/Beef Impacts
- Situational Awareness Products
  - Monitoring Status Map
  - Planning Maps

IPX

PREDICTED RELOCATION AREAS

BASED ON EPA 400-92 PROTECTIVE ACTION GUIDELINES



FRMAC APPROVED

NNSA Consequence Management Home Team
Contact (702) 794 - 1665

FRMAC APPROVED

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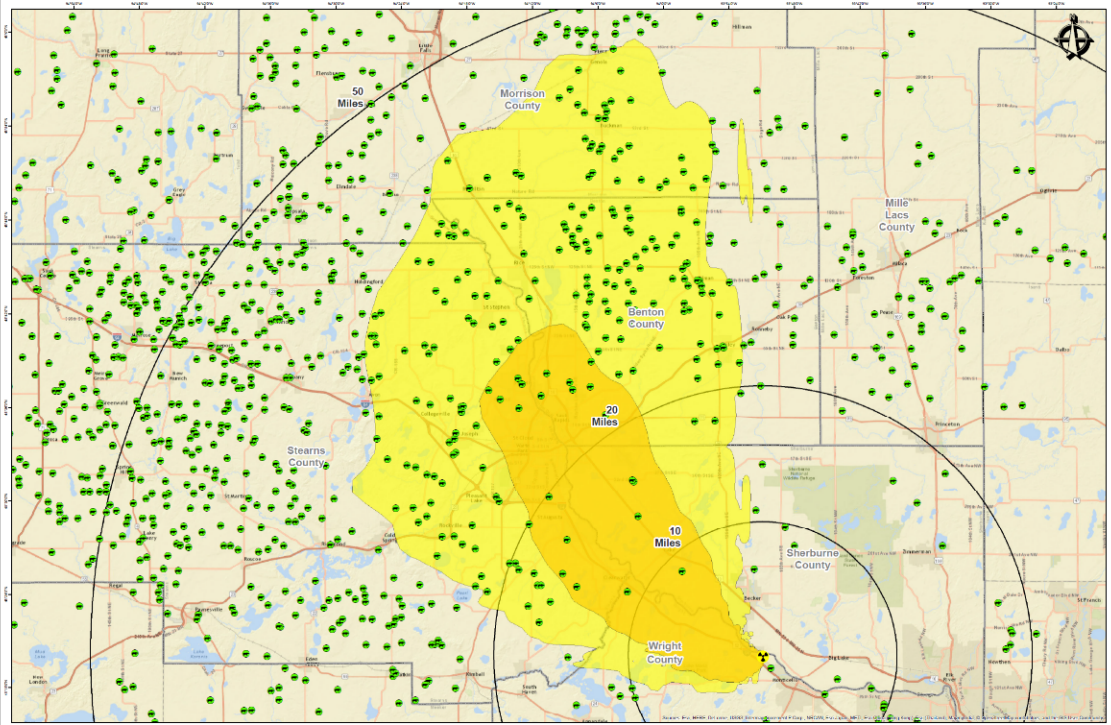
EXERCISE

Areas of Concern for Dairy Products

Predicted I-131 and Cs-137 Contamination at T+7 Days



Release Point
Dairies
> 130,000 pCi/m2 Cs-137
> 8,800 pCi/m2 I-131
Potentially exceeds FDA Derived Intervention Level for milk (grass-cow-infant). Further analysis recommended to determine if any embargo is required.

Assumes no protective actions for livestock feed and water.

This map was produced by the Geographic Information Systems department of NNSA's Remote Sensing Laboratory (RSL) at Nellis AFB, Las Vegas, Nevada. HISP Gold 2015, ESRI World Street Map, and FRMAC databases were used for map generation.

RSL map identification number is: NL_II31_Cs137_Standard_Day7_Dairy

1:280,000

0 4 8 Kilometers
0 4 8 Miles

Map created on 10/2/2016

FRMAC APPROVED

NNSA Consequence Management Home Team
Contact (702) 794 - 1665

FRMAC APPROVED

NARAC

Instruments

Health Physics Kits

3002 with Attachments
For detecting gamma emitting sources or contamination

9DP-1 Ion Chamber
Handheld ion chamber for dose rate measurements

26-1 Frisker with Dose Equivalent Filter
For performing quick contamination surveys

Instruments (cont.)

High Purity Germanium (HPGe)

- ORTEC Detective (electronically cooled)
- HPGe measurements are used for:
  - Radionuclide ID
  - Determining radionuclide concentrations deposited on the ground

Instruments (cont.)

Air Samplers

High Volume

Low Volume

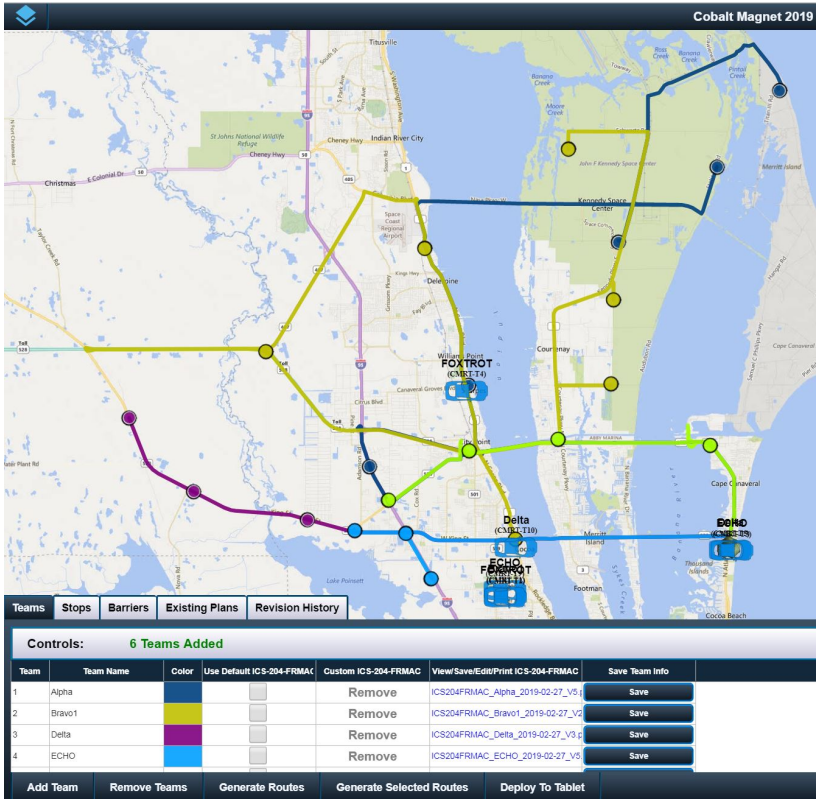
Instruments (cont.)

Proportional Counters

Ludlum 3030P
for operational swipe counting

Mirion iSOLO (Fly Away Lab)
for counting swipes or air filters
with radon subtraction

Consequence Management Center (CMC)



- Capabilities
  - Create field teams.
  - Place sample locations.
  - Create field team instructions.
  - Send sample locations instructions to the tablet.
  - Track and chat with field teams in the field.
  - Review incoming data.
  - Import kmz or csv files to view on map.
  - Plan for the next shift.
  - Review previous instructions and sample locations.

Office of Nuclear Incident Policy and Cooperation

Richard Maurer
Senior Principal Scientist, NIPC

Office of Nuclear Incident Policy and Cooperation

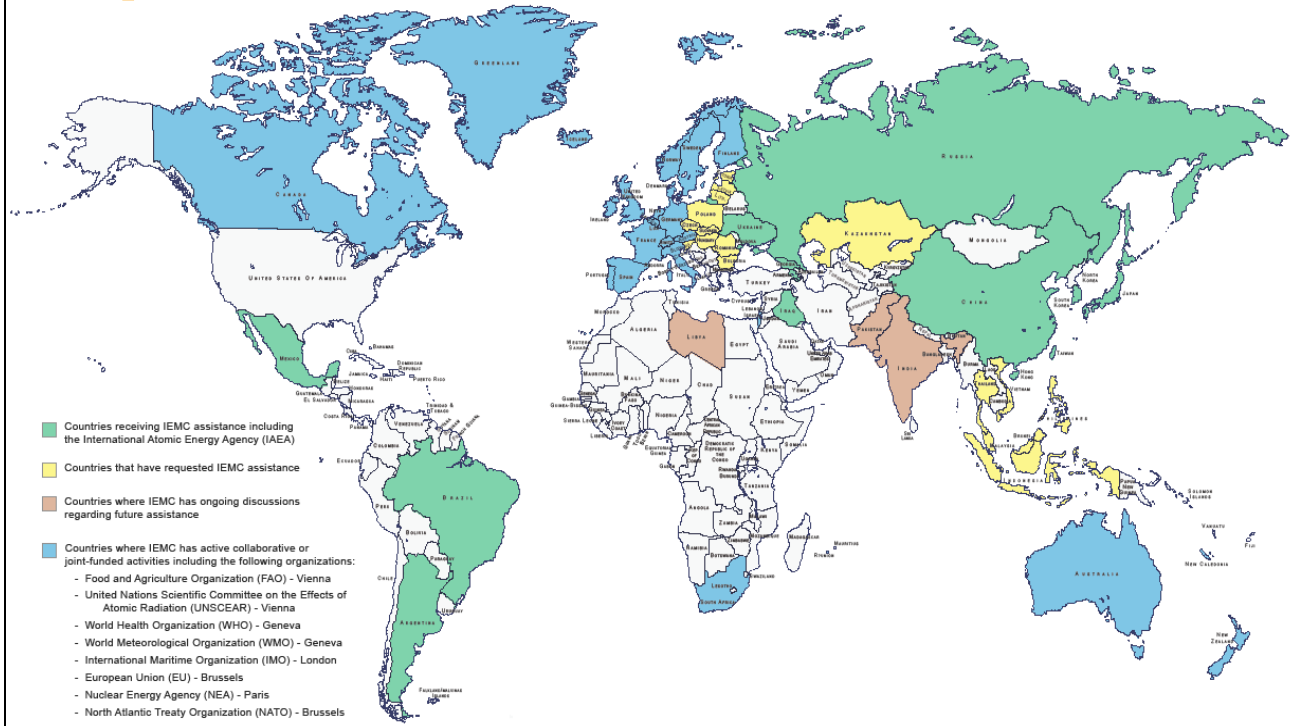
Provides specialists and technical equipment for workshops, exercises and advanced training in radiological emergency response to partner nations

NIPC Overview

- An effective International Emergency Management System must:
  - be built on practical experience
  - provide a common understanding of regional emergency response needs and facilitate enhancement of regional and international capabilities for assistance
  - enhance radiation emergency response capabilities worldwide and provide a harmonized and timely response to regional and world wide nuclear and radiological events
  - utilize bilateral, multilateral and international arrangements and agreements, conventions and statutes as its legal basis

NIPC is fully integrated
into the International Community

Nuclear Incident Policy and Cooperation



RSL has participated in activities in over 37 countries

RSL NIPC Annual Statistics

- 27 International deployments and 6 National workshops
- 12,000 lbs. of equipment shipped internationally
- ~ 800,000 flight miles traveled
- 51 SPARCS systems (38 OCONUS loans) – parts for 10 more
- 325 radiation detectors in inventory
- 6 IAEA workshops/consultancies/conferences
- 2 bilateral meetings/workshops
- 13 International courses
- 2 Major Public Events
- *Zero international safety or security incidents*

I-RAD-Basic Course Examples

Taiwan

Slovenia (with IAEA)

Jordan

Thailand

Malaysia

Vietnam

I-RAD-Major Public Event Course Examples

Pan American Games
Mexico

World Ice Hockey Championships
Belarus (with IAEA)

FIFA World Cup
Brazil (with IAEA)

FIFA World Cup
South Africa

FIFA Confederations Cup
Brazil (with IAEA)

Asia Pacific Economic Conference
Philippines (with IAEA)

I-RAD-Ports Course Examples

Taiwan

Bangladesh

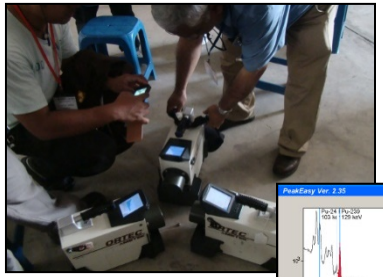
Djibouti

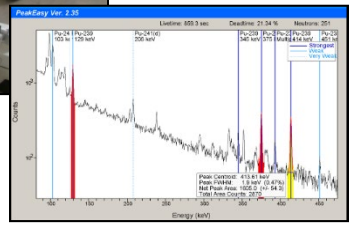
United States (with IAEA)

Bangladesh

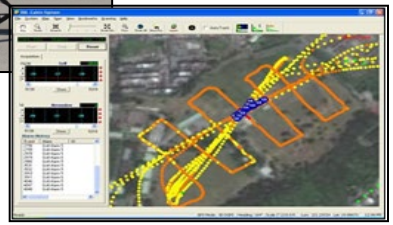
Djibouti

I-RAD-Advanced Courses

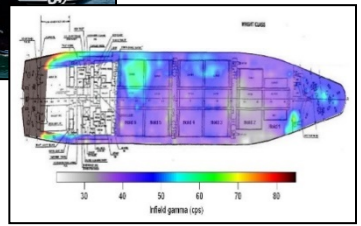




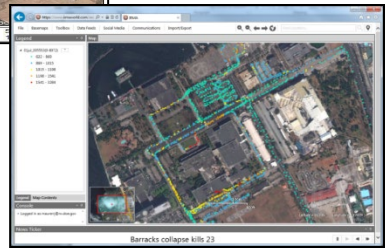
Gamma Spectroscopy



Aerial Measurements



Maritime Search



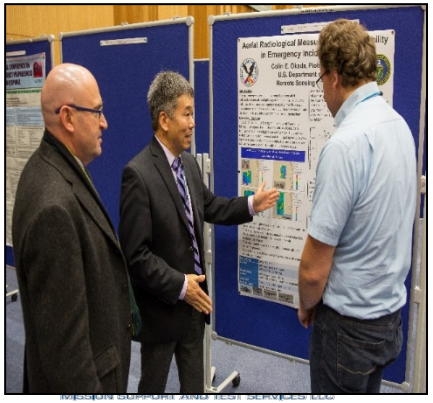
Consequence Management

Annual courses co-hosted with the IAEA in US

I-RAD Major Public Event
Washington, DC
June

I-RAD-Ports
Las Vegas, Nevada
November

International Conference on Global Emergency Preparedness and Response (IAEA, Vienna, Austria)



AMS International Cooperation

AMS-NR Canada Technical Exchange

Atomic Weapons Establishment AWE
AMS Joint Survey

Joint US/Japan Aerial Radiological
Measurement Exercise

AMS International Cooperation

NORDIC AMS Technical Exchange

Advanced SPARCS
Aerial Radiological Response Training

Joint AMS/CEA Helinuc Survey

Completing an Internship with NNSS!

- All of our internships are designed to engage you in hands-on, meaningful, paid work while applying classroom theories to live work conditions in support of the NNSS mission.
- The work environment, together with the NNSS Student Program experience, will give you a better view of what a future career might look like in both technical and professional fields.
- The NNSS Student Program is designed to acclimate students with relevant work conditions, mentorship, student activities, knowledge and skill-based experiences, training and development sessions, along with peer-to-peer social and work group interactions with our own Early Career Employee Resource Group (ECERG).
- Each intern is given a specific project to work on for the summer, along with other day-to-day activities. Every intern will give a project presentation at the end of their internship to their department team and Sr. Director. One intern from each NNSS Directorate will be nominated to present to President Mark Martinez and his leadership team at the conclusion of the summer program.
- **NNSS Summer Student Program timeline:**
  - September 2020: Application process opens
  - November 2020 – March 2021: Interviews are completed
  - January – April 2021: Offers are made
  - May: Summer Student Program begins
  - August 2021: Summer Student Program ends

How to apply for an Internship position

- Visit our job site at www.nnss.gov/jobs to apply online!
- **Engineering Internships**
  - Electrical, Nuclear, Mechanical, Chemical and Fire Protection Engineering
- **Science Internships**
  - Math, Chemistry and Health Physics
- Engineering and Science Internships Available:
  - Undergraduate Associate in Engineering – Job ID: 2020-2952
  - Undergraduate Associate in Science – Job ID: 2020-2954
  - Graduate Associate in Engineering – Job ID: 2020-2958
  - Graduate Associate in Science – Job ID: 2020-2959

Questions?

Thank you for attending!