United States Department of Energy

Office of Emergency Response

Defense Programs

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- Organization Chart
- Radiological Emergency Response Asset Brochure
- Emergency Response Asset Integration
- Nuclear Emergency Special Operations
- Facilities Emergency Ops
- Emergency Response Technology Assessment & Integration

DP | DOE

Mission

The mission statement is currently being revised.

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PARTNERS IN Emergency RESPONSE

Top

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COORDINATE MONITOR ASSESS

U.S. DEPARTMENT OF ENERGY

FRMAC

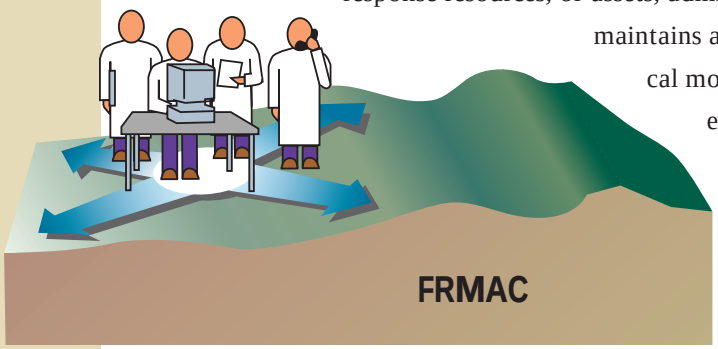
FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT CENTER (FRMAC)

The Department of Energy (DOE) has the world's leading scientists, engineers and technicians from over 50 years of managing the nation's nuclear weapons program. When the need arises, DOE is prepared to respond immediately to any type of radiological accident or incident anywhere in the world with the following seven radiological emergency response assets.

AMS (Aerial Measuring System) detects, measures and tracks radioactive material at an emergency to determine contamination levels. ARAC (Atmospheric Release Advisory Capability) develops predictive plots generated by sophisticated computer models. ARG (Accident Response Group) is deployed to manage or support the successful resolution of a U.S. nuclear weapons accident anywhere in the world. **FRMAC (Federal Radiological Monitoring and Assessment Center)** coordinates Federal radiological monitoring and assessment activities with those of state and local agencies. NEST (Nuclear Emergency Search Team) provides the nation's specialized technical expertise to the Federal response in resolving nuclear/radiological terrorist incidents. RAP (Radiological Assistance Program) is usually the first DOE responder for assessing the emergency situation and deciding what further steps should be taken to minimize the hazards of a radiological emergency. REAC/TS (Radiation Emergency Assistance Center/Training Site) provides treatment and medical consultation for injuries resulting from radiation exposure and contamination, as well as serving as a training facility.

INTRODUCTION

The Federal Radiological Monitoring and Assessment Center (FRMAC) is one of the emergency response resources, or assets, administered by DOE. The Federal government maintains an extensive response capability for radiological monitoring and assessment. In the unlikely event of a major radiological incident, the full resources of the U.S. government can support state, local and Tribal governments. These Federal capabilities need to be effectively coordinated to support state and local response efforts. The efforts of



17 Federal agencies are coordinated under the Federal Radiological Emergency Response Plan (FRERP) to integrate the Federal response to a radiological emergency. The FRERP assigns to DOE the responsibility to set up and initially manage a FRMAC.

MISSION

The FRMAC mission is to coordinate and manage all Federal radiological monitoring and assessment activities during major radiological emergencies within the United States in support of state, local and Tribal governments through the Lead Federal Agency (LFA). The LFA is the agency that is responsible for leading and coordinating all aspects of the Federal response.

STEPS IN THE FRMAC RESPONSE

DOE may respond to a state or LFA request for assistance by deploying a Radiological Assistance Program (RAP) team. If the situation requires more assistance than RAP can provide, DOE will alert or activate a FRMAC. The FRMAC utilizes a phased approach. The FRMAC response begins with deployment of a Phase I team of technical and management personnel who depart from Las Vegas within four hours of notification, and can reach any location in the United States normally within 6-10 hours. This team meets with the LFA and state to review what has occurred and how serious it is, what FRMAC can do to help and how to do it, and to find the best location for a working FRMAC. The team initiates all technical components of a FRMAC response, and is reinforced soon after by additional personnel who enable the FRMAC to operate around the clock. If required, the full FRMAC deploys as soon as possible after the initial phases, to bring the FRMAC to full capability within 24-36 hours after the LFA or state has asked for help. A FRMAC may consist of as few as 60 or as many as 500 people, depending upon the needs of the emergency situation.

A FRMAC field team collects water and soil samples.

FRMAC ACTIVITIES INCLUDE:

- Coordinating Federal offsite radiological environmental monitoring and assessment activities
- Maintaining technical liaison with state, local and Tribal governments
- Maintaining a common set of all offsite radiological monitoring data
- Providing monitoring data and interpretations to the LFA, state, local and Tribal governments

coordinate
monitor
assess

The initial monitoring is focused on the protection of the public and the investigation of the type, amount, and extent of the radiological release. Monitoring continues until all of the area where radioactivity was released is fully evaluated and the effects are known. Any monitoring results that show an immediate threat to public health are promptly reported. All raw data coming into the FRMAC from field teams is quickly reviewed and given to the LFA and state representatives. Then the raw data is processed, evaluated and summarized, and approved by the FRMAC Director for distribution outside the FRMAC. This evaluated technical information is given officially to the LFA and state at the same time.

At some mutually agreeable time following the emergency phase, DOE will transfer responsibility of managing the FRMAC to the Environmental Protection Agency. DOE and other Federal agencies will continue to provide resources for as long as is necessary to complete the Federal response to the emergency.

FRMAC PRODUCTS

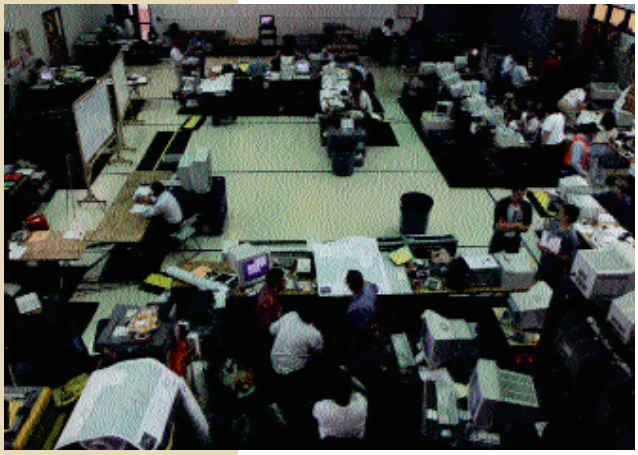
The FRMAC will present the environmental radiological data to the LFA, state and local authorities in a usable format and in a perspective understandable by managers and decision-makers.

FRMAC products include:

- Predictive plots of plume dispersion and dose rates prepared using ARAC

FRMAC

- Aerial survey data provided by AMS
- Reviewed raw data including data from samples of water, air particulates and reactive gases, soil, vegetation, food products, and any other sample media consistent with potential health hazards
- Summarized data such as external exposure rate data taken in certain sectors, districts, or population areas over a given time period



A FRMAC facility is set up to coordinate monitoring and assessment activities.

- Radiation contours showing where the contamination is located and the associated radiation levels, the contour levels may be in exposure rates or isotopic concentrations
- Contour levels applicable for protective action guidance, such as contours of the projected four-day, one-month, first-year, second-year, and fifty-year whole body dose equivalent from external radiation for outdoor locations and/or for sheltered locations
- A comprehensive and traceable compilation of all environmental radiological data
- A geographic information system which provides for the capture, storage, retrieval, analysis and display of spatial data

A GROUP EFFORT

The main DOE emergency response assets that supplement and are integrated into FRMAC capabilities are: RAP, ARAC, AMS, and REAC/TS. These assets are used to detect and monitor radiation, measure the concentration of radiation in the air and on the ground, and to evaluate current weather conditions and forecasts which may affect the radiation impacts. Other Federal agencies provide key professionals specializing in technical areas of importance to the Federal monitoring assessment activities. In addition, state, local and Tribal emergency personnel are invited to work directly with the FRMAC.

FRMAC utilizes specialized equipment to conduct radiological monitoring.

For more information, contact:
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PARTNERS IN Emergency RESPONSE

SEARCH DETECT ANALYZE

U.S. DEPARTMENT OF ENERGY

NEST

NUCLEAR EMERGENCY SEARCH TEAM (NEST)

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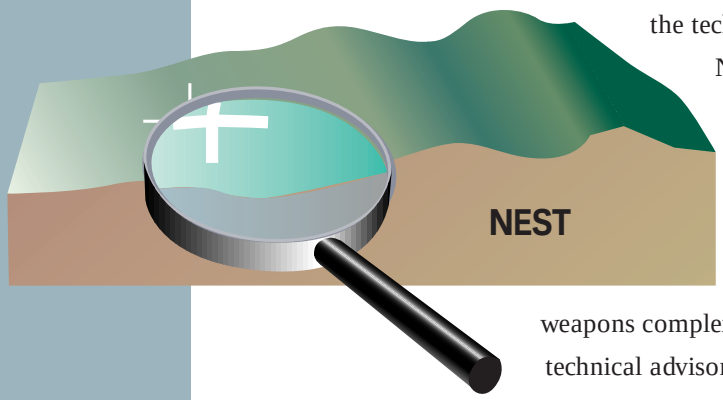
INTRODUCTION

NEST is DOE's program for preparing and equipping specialized response teams to deal with the technical aspects of nuclear or radiological terrorism. NEST capabilities include search and identification of nuclear materials, diagnostics and assessment of suspected nuclear devices, technical operations in support of render safe procedures, and packaging for transport to final disposition. NEST capabilities are drawn from the nation's nuclear weapons complex. Response teams vary in size from a five person technical advisory team to a tailored deployment of dozens of



searchers and scientists who can locate and then conduct or support technical operations on a suspected nuclear device. NEST personnel and equipment are ready to deploy worldwide at all times.

Under the Atomic Energy Act, the Federal Bureau of Investigation (FBI) is responsible for investigating illegal activities involving the use of nuclear materials within the United States, including terrorist threats involving the use of special nuclear materials. The NEST program was initiated in 1974 as a means to provide technical assistance to the FBI. A series of Executive Orders provides authority for DOE to assist the FBI conduct, direct, and coordinate search and recovery operations for nuclear materials, weapons, or devices, and assist in identifying and deactivating an Improvised Nuclear Device (IND) or a Radiological Dispersal Device (RDD). Today's operations are guided by recent Presidential Decision Directives addressing the threat of weapons of mass destruction terrorism. Under this national policy, the FBI is the Lead Federal Agency (LFA) for terrorism response within the United States, the Department of State is the LFA for terrorism response outside the United States, and DOE supports the LFA.

NEST utilizes state-of-the-art equipment to conduct search and recovery operations for nuclear materials, weapons, or devices.

MISSION

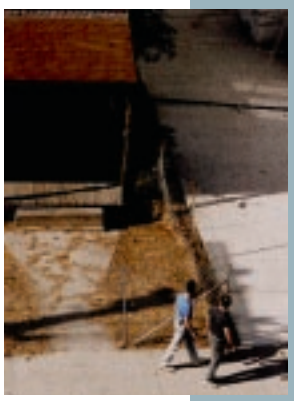
The NEST mission is to provide specialized technical expertise to the Federal response in resolving nuclear or radiological terrorist incidents. This expertise is provided by well-trained personnel who form specialized response teams to work in coordination with teams from other Federal agencies to resolve a nuclear terrorist crisis. NEST experts include engineers, scientists, and other technical specialists from DOE's nuclear weapons laboratories and facilities to include Los Alamos National Laboratory, Sandia National Laboratories, Lawrence Livermore National Laboratory, the Remote Sensing Laboratory and the Pantex plant. The NEST specialized response teams include coordination, liaison, and advisory teams, search teams, technical operations teams and planning support teams. These teams have been structured to provide a rapid, flexible response and to seamlessly integrate with the LFA or the Department of Defense to help resolve all technical aspects of the crisis.

search
detect
analyze

HOW NEST OPERATES

Because a nuclear terrorist incident could arise with little or no warning, NEST response teams are prepared to deploy rapidly upon notification. If the crisis develops over time and information is available from intelligence efforts or other warnings, response teams may be alerted or activated for pre-deployment planning. All response team activations and deployments are directed by DOE headquarters after coordination with other concerned agencies. This interagency process may involve strict operational security to protect classified or sensitive details of the response operation. The FBI or State Department coordinates U.S. government assistance to support the resolution of the crisis with state and local officials or foreign governments.

A Nuclear/Radiological Advisory Team deploys as part of an FBI led Domestic Emergency Support Team (DEST) or as part of a State Department led Foreign Emergency Support Team (FEST) for an incident overseas to provide nuclear scientific and technical advice to the LFA. A Senior Energy Official, responsible for coordinating activities with the LFA, will deploy with the Nuclear/Radiological Advisory Team.



NEST

NEST equipment includes man-portable search systems.

If the location of a suspected nuclear or radiological device is not known, search operations may be required. NEST search teams are routinely configured to detect and locate a radiological source using a variety of methods ranging from hand-carried to vehicle-mounted search equipment. The basic building block team for search operations is the seven person Search Response Team. Manned by full-time emergency response professionals, the Search Response Team stays ready to deploy within four hours of notification on either civilian or military aircraft. Upon arrival on-scene, the Search Response Team can begin searching immediately or can equip and train local responders, already familiar with the search area, to become searchers. Up to sixteen people can become proficient in novice searcher techniques in less than an hour. The addition of local novice searchers, who can speak the language and blend into the local cultural and ethnic environment, greatly facilitates search efficiency and operational security.

If more extensive search efforts are needed, an enhanced Search Augmentation Team can be deployed. NEST search teams deploy with all necessary equipment to conduct search operations. The teams deploy with secure and non-secure communications packages and Geographic Information System (GIS) databases which provide electronic mapping, electronic business information, and demographics.

When a device is located, the specific resolution is dependent upon the political, technical, and tactical situation. The ultimate goal in resolving a nuclear terrorism crisis is to keep the terrorist device from producing a nuclear yield. This involves special explosive ordnance disposal (EOD) procedures conducted by highly-trained technical personnel. DOE Joint Technical Operations Teams have been designated to work with military EOD teams during all phases of the crisis response. These phases include a tactical or time-sensitive phase, a follow-on or deliberate phase, and a final disposition phase. The designation of specific phases for the response operation allows teams to focus their training and equipment needs while keeping enough flexibility to handle a wide range of potential scenarios. This approach also draws upon the personnel and equipment resources of DOE's Accident Response Group. DOE Consequence Management (CM) teams also work for the Senior Energy Official and start planning for possible CM issues in parallel with crisis efforts.

With these tailored and responsive teams, DOE is able to marshal scientific and technical expertise to successfully resolve a nuclear/radiological incident in support of the LFA.

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PREDICT SIMULATE MODEL

U.S. DEPARTMENT OF ENERGY

ARAC

ATMOSPHERIC RELEASE ADVISORY CAPABILITY (ARAC)

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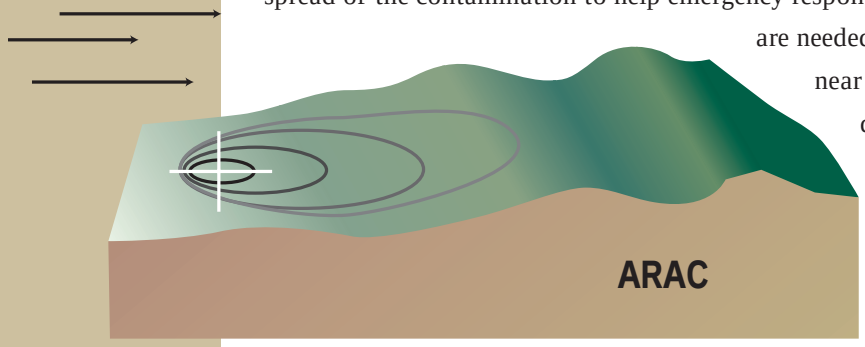
INTRODUCTION

The Atmospheric Release Advisory Capability (ARAC) is one of the emergency response resources, or assets, administered by DOE. ARAC's role in an emergency begins when a nuclear, chemical, or hazardous material is accidentally released into the atmosphere. ARAC, operated by the University of California's Lawrence Livermore National Laboratory, maps the probable spread of the contamination to help emergency response officials decide what response measures are needed. ARAC's main function is to provide near real-time assessments of the consequences of accidental or potential radiation releases by modeling the movement of hazardous plumes. This centralized, worldwide emergency response service provides emergency officials the vital immediate information they need to



rapidly evaluate airborne and ground contamination projections and thus effectively protect people and the environment.

Since 1979, ARAC has responded to more than 150 alerts, accidents, and disasters, and has supported more than 800 emergency response exercises. In addition to accidental radiological releases, ARAC has assessed natural disasters such as volcanic ash cloud and earthquake-induced hazardous spills, manmade disasters such as the Kuwaiti oil fires, and toxic chemical releases from a wide spectrum of accidents.

MISSION

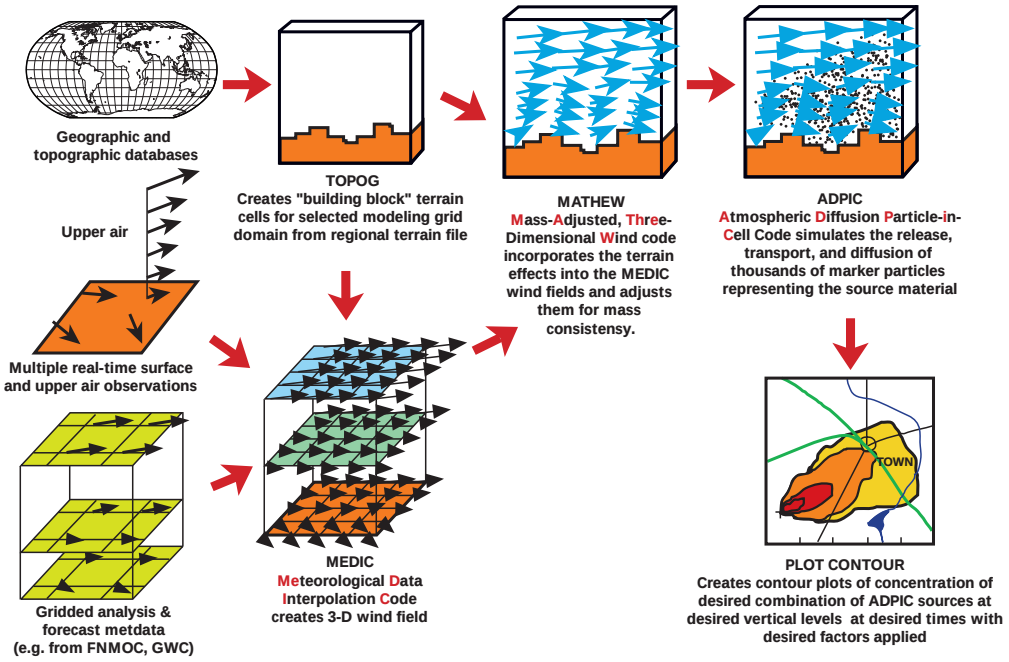
The ARAC mission is to provide timely and accurate real-time assessment advisories to Emergency Managers from actual or potential hazardous, nuclear, or chemical material releases into the atmosphere. ARAC's computer-based system provides realistic plots, or maps, of potential radiation dose and exposure assessments, and estimates of the path of nuclear contaminants released into the atmosphere. For ARAC-supported sites — sites with computers and software for direct interactive service — the time to deliver these first plots can be as short as 10 to 15 minutes after the accident information is received. For non-supported sites, or sites without such computer equipment, the time to deliver these first plots would be no longer than one to two hours.

STEPS IN THE ARAC RESPONSE

Upon receiving a request for support, ARAC's staff begins downloading the most recent regional and site weather data for input into the model calculations. Information is automatically received from a link to the U.S. Air Force Global Weather Center and from the National Oceanic and Atmospheric Administration by satellite broadcast. This information is sent hourly for surface meteorological data and twice-daily for upper air data. Emergency scene officials provide critical information such as the time and exact location of the release and the type of accident or incident causing the emergency.

Responders study an ARAC plot.

After ARAC team members have downloaded the regional weather information and received site input, computer codes simulate the release from the explosion, fire, vent or spill with dispersion models which show the spread of the material. These dispersion models take into consideration the effects from the local terrain or topography and complex meteorology. ARAC staff scientists prepare graphic contour plots of the contamination overlaid on the local maps; ARAC models also include the actual or estimated amount and rate of release of the material. These



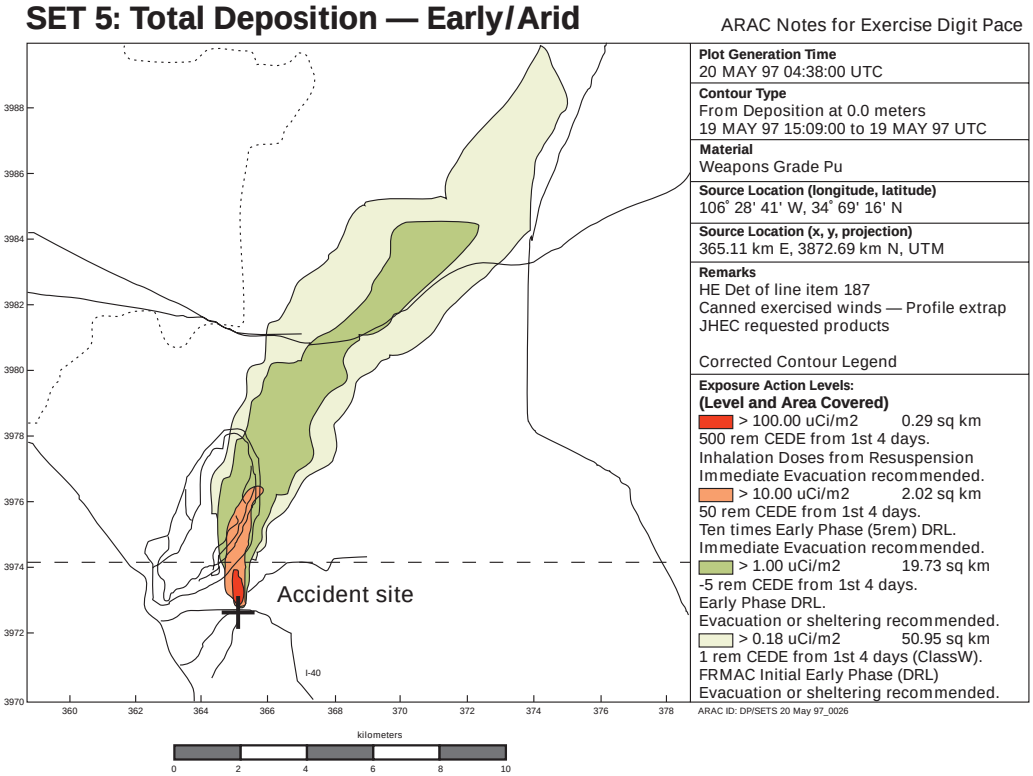
The steps in developing an ARAC plot.

plots can be widely distributed to emergency response officials and will be provided to the AMS, ARG, FRMAC, RAP, REAC/TS, NEST advance elements (frequently even prior to deployment) and on-scene leaders. ARAC continues to refine calculations as measurements are taken until all airborne releases have stopped and the hazardous threats are mapped and impacts assessed. This information is a valuable early aid to emergency managers in determining the scope and potential impact of accidents.

ARAC'S RESOURCES

predict
simulate
model

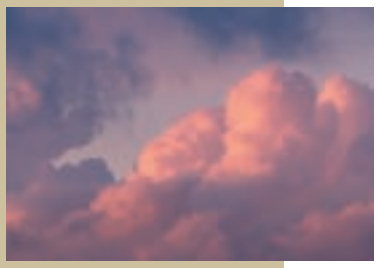
ARAC's specialists are trained in such areas as atmospheric science and modeling; computer science, operations and software development; electrical engineering; health physics; and industrial hygiene. In responding to the emergency, ARAC staff have vast databases at their fingertips. Database files are maintained for all ARAC-supported sites and a worldwide library of potential accident sites is available, including locations such as nuclear power plants and fuel-cycle facilities. A terrain database covers most of the world at a resolution of one-half kilometer. The geographic databases provide mapping information on scales ranging from site-specific buildings and streets to entire countries. ARAC's meteorological database and data services provide data for all standard weather data reporting locations of the world; computer-supported sites provide additional special local weather data for ARAC. ARAC staff can immediately analyze all of this available information and incorporate additional information received from the scene about the emergency event.



A sample ARAC plot.

3-D MODELING

ARAC's transport and diffusion models simulate the release and predict the extent of the hazard. The 3-D modeling system ARAC uses has a regularly-spaced grid with terrain represented as "building block" cells. This grid can readily be selected anywhere in the world and easily scaled to the size of the problem. Mathematical calculations are used to arrive at wind representations which are adjusted over the grid to produce a mass-consistent flow in the terrain setting. Releases of hazardous material are simulated using thousands of "marker particles," each carrying the unique properties of its released material. ARAC team members can model many sources of nuclear or chemical material at the same time. These source "particles" are transported and dispersed in the atmosphere and deposited to the ground. The ARAC program is developing and implementing advanced models which provide state-of-the-art dispersion assessments and forecasts for a broad spectrum of complex accident situations.



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ASSESS STABILIZE RECOVER

U.S. DEPARTMENT OF ENERGY

ARG

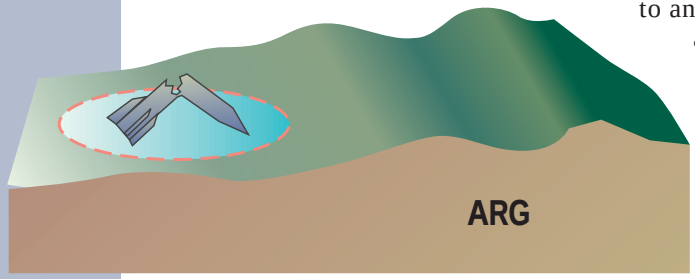
ACCIDENT RESPONSE GROUP (ARG)

The Department of Energy (DOE) has the world's leading scientists, engineers and technicians from over 50 years of managing the nation's nuclear weapons program. When the need arises, DOE is prepared to respond immediately to any type of radiological accident or incident anywhere in the world with the following seven radiological emergency response assets.

AMS (Aerial Measuring System) detects, measures and tracks radioactive material at an emergency to determine contamination levels. ARAC (Atmospheric Release Advisory Capability) develops predictive plots generated by sophisticated computer models. **ARG (Accident Response Group)** is deployed to manage or support the successful resolution of a U.S. nuclear weapons accident anywhere in the world. FRMAC (Federal Radiological Monitoring and Assessment Center) coordinates Federal radiological monitoring and assessment activities with those of state and local agencies. NEST (Nuclear Emergency Search Team) provides the nation's specialized technical expertise to the Federal response in resolving nuclear/radiological terrorist incidents. RAP (Radiological Assistance Program) is usually the first responder for assessing the emergency situation and deciding what further steps should be taken to minimize the hazards of a radiological emergency. REAC/TS (Radiation Emergency Assistance Center/Training Site) provides treatment and medical consultation for injuries resulting from radiation exposure and contamination, as well as serving as a training facility.

INTRODUCTION

The Accident Response Group (ARG) is one of the emergency response resources, or assets, administered by DOE. DOE is steward of the nation's nuclear weapons program, and can call upon the world's premiere nuclear scientists, technicians, and nuclear weapon's designers to respond to an emergency involving U.S. nuclear weapons.



The ARG is managed by the DOE Albuquerque Operations Office and is supported by the Nevada Operations Office, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Sandia National Laboratory, Bechtel Nevada, and Pantex.

MISSION

The ARG mission is to develop and maintain readiness to efficiently manage the resolution of accidents or significant incidents involving nuclear weapons that are in DOE's custody at the time of the accident or incident. The ARG will also provide timely, worldwide support to the Department of Defense (DoD) in resolving accidents and significant incidents involving nuclear weapons in DoD's custody.

Through years of practical experience and conducting joint emergency response exercises, DOE and DoD have developed a system to manage and support each other's efforts during an emergency. Scientists, engineers, technicians, health physics and safety professionals from DOE's national laboratories and production facilities make up the ARG team. These skilled professionals from 30 different areas of technical expertise are ready to respond within two hours of notification. ARG members will deploy with highly specialized, state-of-the-art equipment that will be used in monitoring, assessing or removing nuclear weapons, components or debris.

ARG members focus on weapons recovery, health and safety evaluations of response personnel, and independent safety reviews during weapons recovery operations.

STEPS IN THE ARG RESPONSE

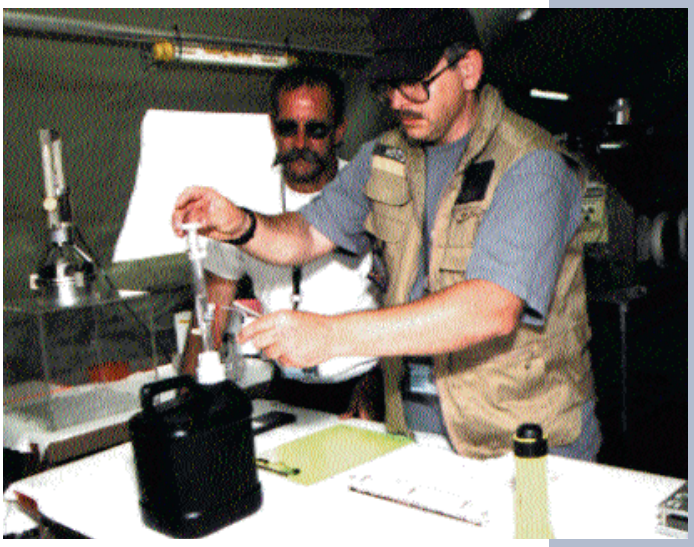
If an accident or incident involving a U.S. nuclear weapon were to occur, all appropriate Federal, state, Tribal, and local organizations are notified of the nuclear weapons accident. ARG deploys on military or commercial aircraft using a time-phased approach. ARG advance elements focus on initial assessment and providing preliminary advice to decision-makers. Once the follow-on elements arrive at the emergency scene, health and safety specialists perform evaluations for the safety and health of emergency response personnel, the public, and the environment. The ARG will also focus on weapons recovery and independent safety reviews during weapons recovery operations.

ASSESSING AND RECOVERING THE WEAPON

assess
stabilize
recover

DOE and DoD work as a team throughout the entire response to an incident involving a nuclear weapon. Recovery of the damaged weapon or weapon components begins with locating the weapon and gaining access to it, with safety the prime consideration. Team members assess the configuration, or structural arrangement, of the damaged weapon so that they can make it safe to work on and pack in special containers. Since nuclear weapons contain chemically reactive materials and radioactive elements, great care must be taken in gaining access to them. Understanding the internal structure of a damaged weapon in detail is necessary before recovery operations may begin.

Radiography can be used to examine the weapon's internal structure. If there is damage to the weapon or weapon's components, special techniques may be used to stabilize internal components. Team members can use specialized equipment to cut away wreckage, open shipping containers or to cut apart the weapon itself. All separate components are recovered and evaluated. The weapon is rendered safe prior to any packaging and shipping. The ARG has special containers for holding weapons and devices, and hardware stabilizers, such as foaming



Specialized techniques, such as radiography, are used to examine the weapon's internal structure.

materials. Special containers can be constructed at the accident site for packing damaged weapon parts and debris.

When the weapons recovery operations are completed, the primary mission of ARG has been accomplished. At that time, the agency (DOE or DoD) responsible for the weapon involved in the accident leads the site restoration operations, and the role of ARG is to support the onsite radiological monitoring, analysis, and assessment.

Once the weapon leaves the site, the ARG mission is complete. DOE's role turns to monitoring and assessment activities conducted by other DOE assets, such as AMS, ARAC, FRMAC, RAP, and REAC/TS.

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MEASURE DETECT TRACK

U.S. DEPARTMENT OF ENERGY

AMS

AERIAL MEASURING SYSTEM (AMS)

The Department of Energy (DOE) has the world's leading scientists, engineers and technicians from over 50 years of managing the nation's nuclear weapons program. When the need arises, DOE is prepared to respond immediately to any type of radiological accident or incident anywhere in the world with the following seven radiological emergency response assets.

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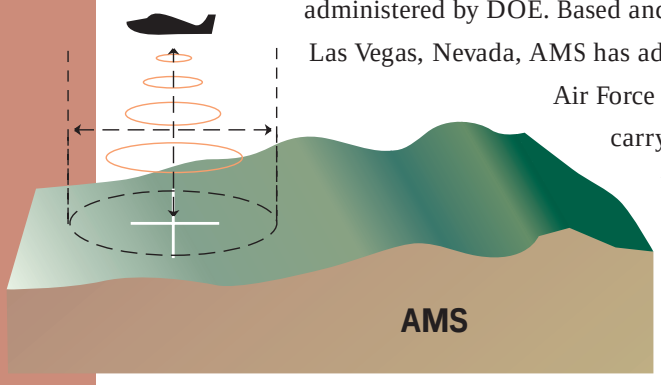
INTRODUCTION

The Aerial Measuring System (AMS) is one of the emergency response resources, or assets, administered by DOE. Based and operated out of Nellis Air Force Base in Las Vegas, Nevada, AMS has additional operational capability at Andrews Air Force Base near Washington, DC. The AMS aircraft carry radiation detection systems which provide real-time measurements of extremely low levels of ground and airborne contamination. AMS can also provide detailed aerial photographs and multi-spectral imagery and analysis of an accident site.



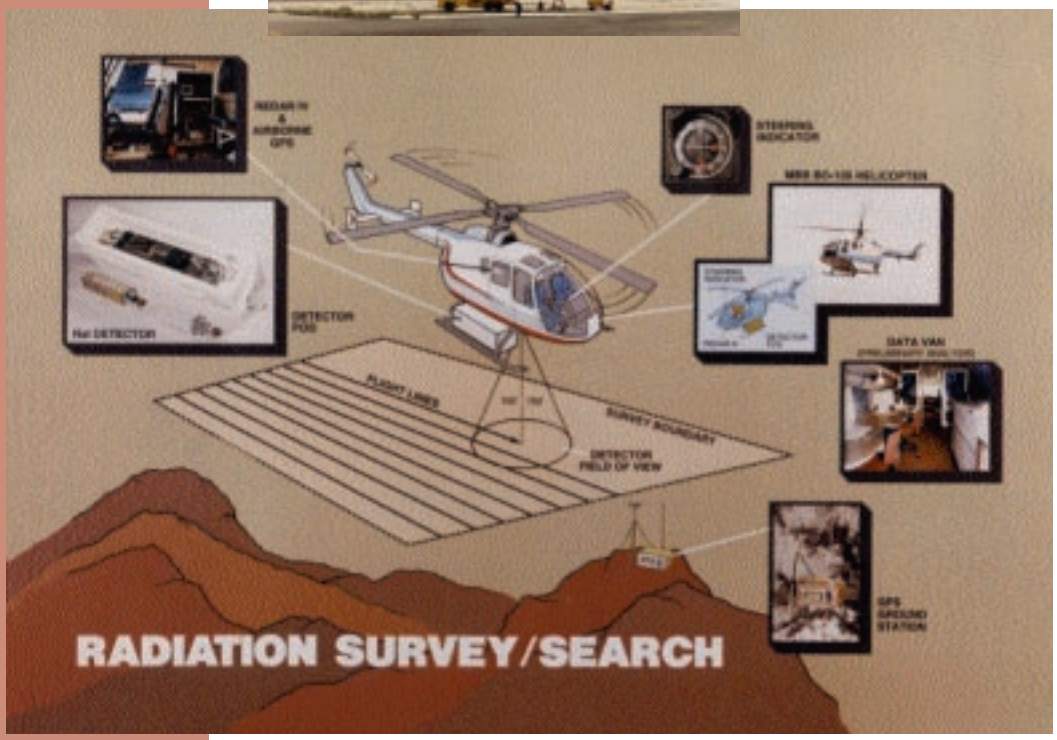
MISSION

The AMS mission is to provide rapid response to radiological emergencies with helicopters and fixed-wing aircraft equipped to detect and measure radioactive material deposited on the ground and to sample and track airborne radiation. The AMS team of scientists, technicians, pilots, and ground support personnel combine their talents and expertise to keep AMS in a constant state of readiness to respond to a major radiological emergency.

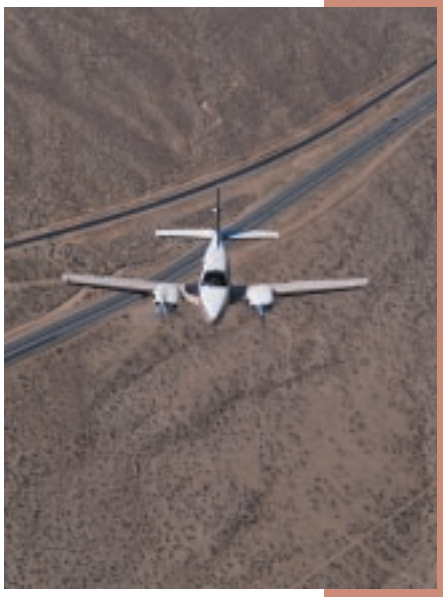
AMS uses a sophisticated radiation detection system to gather radiological information and store it on computers. These computers are used to produce maps of radiation exposure and concentrations. Detecting, tracking, and modeling of radiation is one of the first tools used to decide where to send state, DOE, or other Federal agency ground monitoring teams.

STEPS IN THE AMS EMERGENCY RESPONSE

In the event of an accident or incident involving radiological materials, DOE in consultation with state and/or other Federal partners will deploy AMS immediately to the accident site. The fixed-wing aircraft will normally arrive first.



Helicopters perform detailed surveys of ground contamination at low altitudes.



The fixed-wing aircraft is used to determine the path of the radioactive plume and to determine the location of any ground contamination. The helicopters are used to perform detailed surveys of any ground contamination. A four-wheel drive vehicle-based radiation detection system, named KIWI, can be used to develop highly detailed maps of any ground contamination.

The DOE scientists are then able to rapidly develop maps of the airborne and ground hazards. This enables the scientists to determine ground deposition of radiological materials and to project the radiation dose to which people and the environment are exposed. This information gives officials the information they need to effectively respond to the emergency.

measure
detect
track

ABOUT THE AIRCRAFT

Each type of aircraft has its own specialization. Fixed-wing (Beechcraft B-200 or Cessna Citation) aircraft are faster, so they can arrive at the emergency scene sooner. They provide rapid mapping of the extent and levels of contamination.

Helicopters (BO-105 or Bell 412) are slower and are able to travel at lower altitudes, typically 150 feet. This allows more detail to complete the picture than with fixed-wing aircraft. They provide detailed and highly sensitive quantitative ground data mapping of contamination. Helicopters may be brought in to the emergency scene after the fixed-wing aircraft have gathered the qualitative data to get a closer assessment.

Fixed-wing aircraft provide air sampling and ground surveys.

WHEN THE JOB IS DONE

After measurements of radioactive material depositions and plume tracking and sampling have been completed, the role of AMS in the emergency response is accomplished. At that time, the Manager of the DOE Nevada Operations Office, in charge of activating, deploying, and deactivating AMS elements, as directed by DOE Headquarters, authorizes deactivation of AMS.

OTHER AMS ACTIVITIES

In addition to responding to emergencies, AMS operates on a multi-year survey schedule developed by the DOE Nevada Operations Office. This schedule includes surveys of DOE sites, participation in interagency exercises, and work for other Federal agencies, such as baseline surveys for the Nuclear Regulatory Commission. These activities are coordinated through DOE Headquarters.

Specialized equipment detects and monitors radiation levels.

AMS conducts regularly scheduled surveys to create a baseline of radiological, multi-spectral analysis, thermal imagery, and other remotely sensed data. AMS has performed baseline radiation surveys of most nuclear facilities in the country. In an emergency situation, this baseline information can be compared to current emergency data to help in assessing the amount of contamination. The AMS capability can also be used to locate lost or stolen radiological materials.

For more information, contact:
Office of Emergency Response
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874
301-903-3558
www.dp.doe.gov

RESPOND ASSESS ADVISE

U.S. DEPARTMENT OF ENERGY

RAP

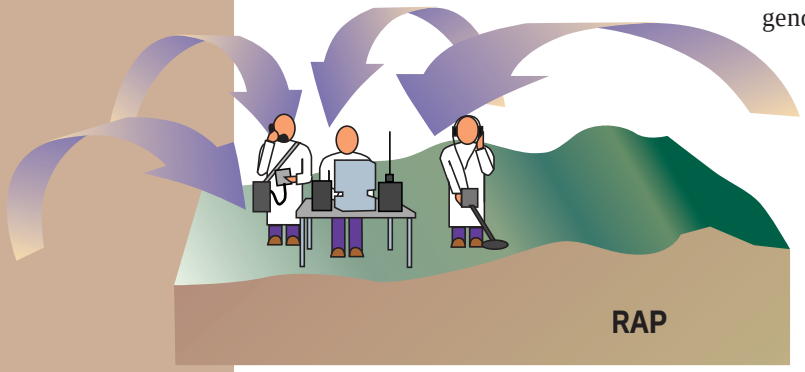
RADIOLOGICAL ASSISTANCE PROGRAM (RAP)

The Department of Energy (DOE) has the world's leading scientists, engineers and technicians from over 50 years of managing the nation's nuclear weapons program. When the need arises, DOE is prepared to respond immediately to any type of radiological accident or incident anywhere in the world with the following seven radiological emergency response assets.

AMS (Aerial Measuring System) detects, measures and tracks radioactive material at an emergency to determine contamination levels. ARAC (Atmospheric Release Advisory Capability) develops predictive plots generated by sophisticated computer models. ARG (Accident Response Group) is deployed to manage or support the successful resolution of a U.S. nuclear weapons accident anywhere in the world. FRMAC (Federal Radiological Monitoring and Assessment Center) coordinates Federal radiological monitoring and assessment activities with those of state and local agencies. NEST (Nuclear Emergency Search Team) provides the nation's specialized technical expertise to the Federal response in resolving nuclear/radiological terrorist incidents. **RAP (Radiological Assistance Program)** is usually the first DOE responder for assessing the emergency situation and deciding what further steps should be taken to minimize the hazards of a radiological emergency. REAC/TS (Radiation Emergency Assistance Center/Training Site) provides treatment and medical consultation for injuries resulting from radiation exposure and contamination, as well as serving as a training facility.

INTRODUCTION

The Radiological Assistance Program (RAP), established in the late 1950's, is one of the emergency response resources, or assets, administered by DOE. RAP is DOE's first-responding resource in assessing the emergency situation and advising decision-makers on what further steps could be taken to evaluate and minimize the hazards of a radiological emergency. Specific areas of expertise include assessment, area monitoring, and air sampling, exposure and contamination control.

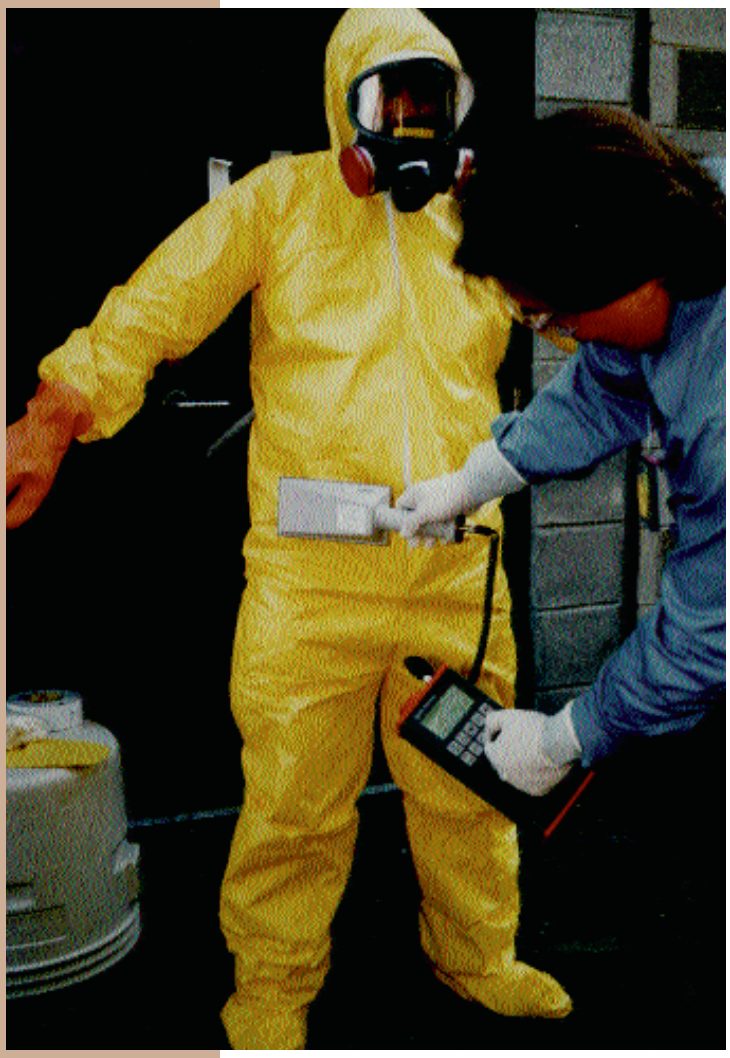


MISSION

The RAP mission is to provide a flexible, around the clock response capability to Federal agencies, state, Tribal, and local governments, and to private businesses or individuals for incidents involving radiological materials. RAP provides around the clock response capability to radiological emergencies.

CAPABILITIES

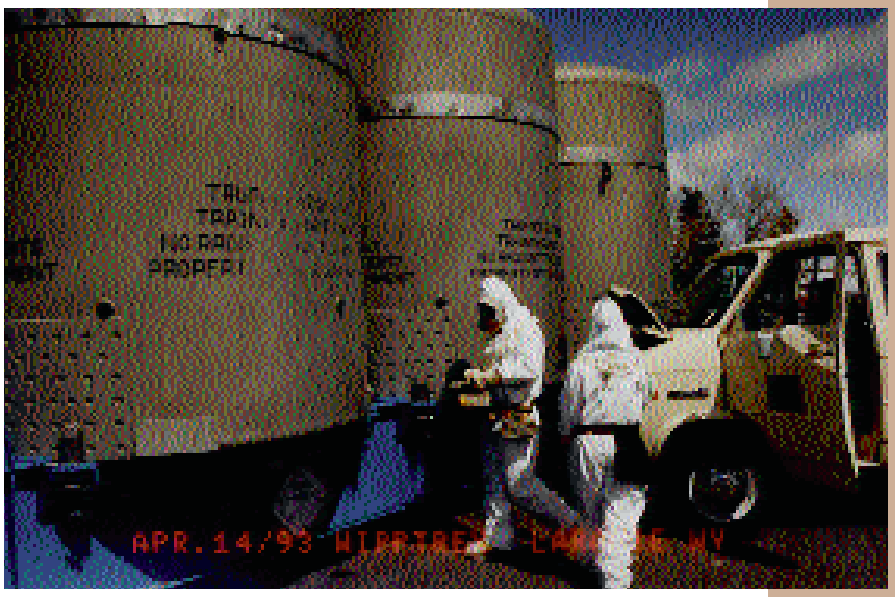
RAP is capable of providing assistance in all types of radiological incidents. Requests for assistance may relate to facility or transportation accidents involving radiation or radioactive material. The accident may involve fire, personal injury, contamination, and real or potential hazards to the public. RAP's support ranges from giving technical information or advice over the telephone to sending highly trained people and state-of-the-art equipment to the accident site to help identify and minimize any radiological hazards.



Survey equipment is used to detect and measure radiation.

RAP is implemented on a regional basis and has eight Regional Coordinating Offices (RCOs) in the U.S. The eight RAP regional offices (Regions 1 through 8, respectively) are: Brookhaven, NY; Oak Ridge, TN; Savannah River, SC; Albuquerque, NM; Chicago, IL; Idaho Falls, ID; Oakland, CA; and Richland, WA. RAP teams from one region can integrate into and assist RAP teams from other regions. Each RCO has a minimum of three RAP teams. A full RAP team consists of seven members: a team leader, a team captain, four health physics support personnel, and a public information officer. RAP teams may deploy with two or more members; one member is the DOE team leader.

STEPS IN THE RAP EMERGENCY RESPONSE



If an emergency occurs, RAP team members normally arrive at the scene within four to six hours after notification and conduct the initial radiological assessment of the area. A RAP response is tailored based on the scale of the event and additional RAP teams and resources can be deployed as necessary. RAP team members are trained in the hazards of radiation and radioactive materials to provide initial assistance to minimize immediate radiation risks to people, property, and the environment. RAP may utilize other DOE assets, such as AMS, ARAC, or REAC/TS in their response. RAP is able to quickly assess the affected area and advise decision-makers on what actions to take and determine if additional resources are necessary to manage the emergency.

respond
assess
advise

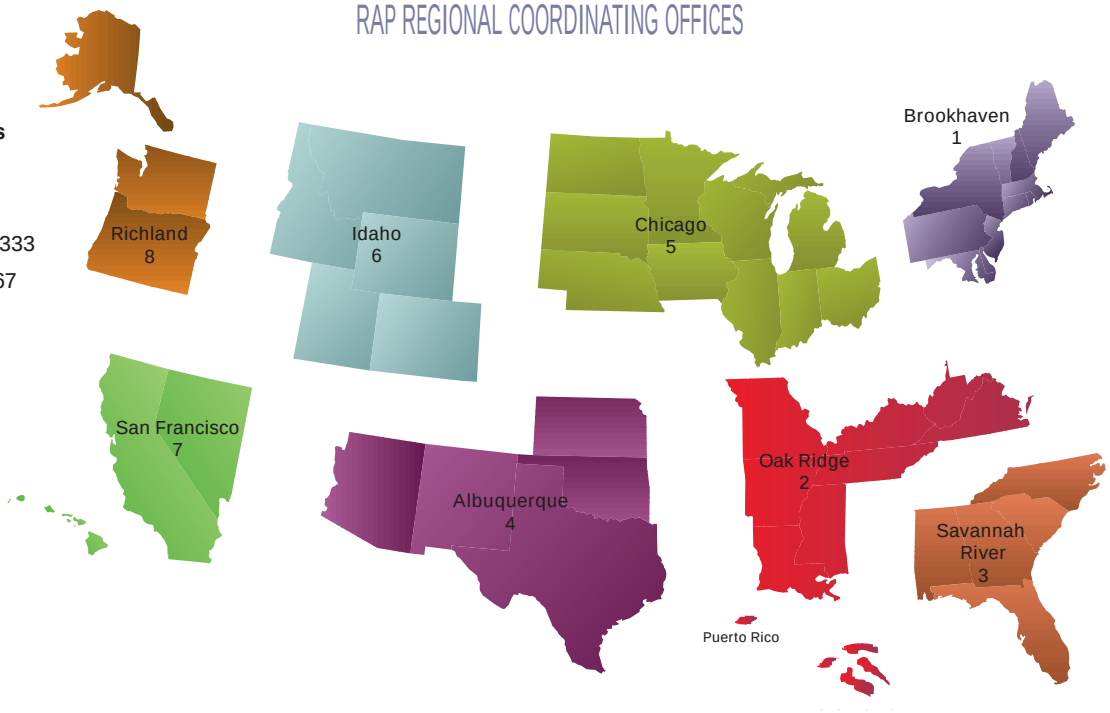
ABOUT THE EQUIPMENT

RAP's highly trained teams have access to the most advanced radiation detection and protection equipment available. The RAP teams' capabilities and resources include portable field radiation monitoring instrumentation (alpha, beta, gamma, and neutron), generators, mobile laboratories, air sampling and decontamination equipment. Communications and personnel protective equipment and supplies are also available to support the response.

U.S. DEPARTMENT OF ENERGY

RAP

RAP REGIONAL COORDINATING OFFICES



Regional Offices — 24 hour numbers

1. Brookhaven, NY — (516) 344-2200
2. Oak Ridge, TN — (423) 576-1005
3. Savannah River, SC — (803) 725-3333
4. Albuquerque, NM — (505) 845-4667
5. Chicago, IL — (630) 252-4800
6. Idaho Falls, ID — (208) 526-1515
7. Oakland, CA — (510) 637-1794
8. Richland, WA — (509) 373-3800

WHEN THE JOB IS DONE

RAP's mission is complete when the need for assistance ends or when there are other resources (state, local, Tribal, or commercial services) able to handle the situation. The primary responsibility for an emergency involving radioactive materials remains with the party responsible for the material. Assistance provided by RAP teams does not preempt state, Tribal, or local authority.

OTHER RAP ACTIVITIES

In addition to providing radiological emergency assistance, RAP is ideally suited to providing emergency response training to state and local first responders. In 1996, RAP became involved in the Weapons of Mass Destruction First Responder Training Program with the objective of preparing the United States for responding to a terrorist attack involving nuclear, biological or chemical weapons of mass destruction. In a "train-the-trainer" approach, DOE RAP personnel assist in the training of additional responders, such as fire fighters, police officers, and emergency medical providers in their communities. RAP's unique qualifications make it an integral partner in the success of this program.

For more information, contact:
Office of Emergency Response
U.S. Department of Energy
19901 Germantown Road
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PARTNERS IN Emergency RESPONSE

U.S. DEPARTMENT OF ENERGY

REAC/TS

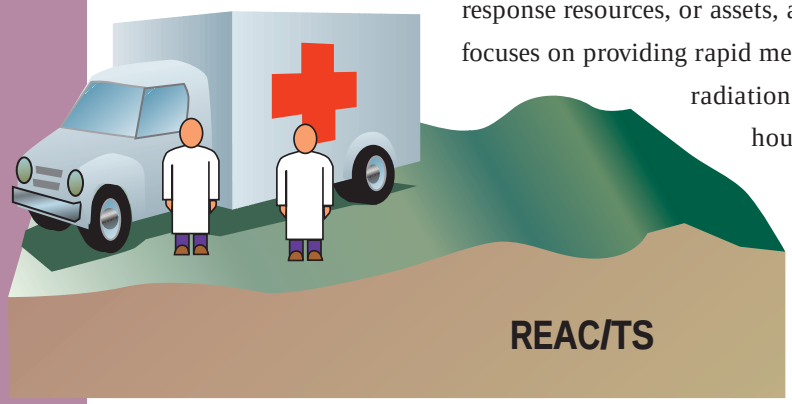
RADIATION EMERGENCY ASSISTANCE CENTER/ TRAINING SITE (REAC/TS)

The Department of Energy (DOE) has the world's leading scientists, engineers and technicians from over 50 years of managing the nation's nuclear weapons program. When the need arises, DOE is prepared to respond immediately to any type of radiological accident or incident anywhere in the world with the following seven radiological emergency response assets.

AMS (Aerial Measuring System) detects, measures and tracks radioactive material at an emergency to determine contamination levels. ARAC (Atmospheric Release Advisory Capability) develops predictive plots generated by sophisticated computer models. ARG (Accident Response Group) is deployed to manage or support the successful resolution of a U.S. nuclear weapons accident anywhere in the world. FRMAC (Federal Radiological Monitoring and Assessment Center) coordinates Federal radiological monitoring and assessment activities with those of state and local agencies. NEST (Nuclear Emergency Search Team) provides the nation's specialized technical expertise to the Federal response in resolving nuclear/radiological terrorist incidents. RAP (Radiological Assistance Program) is usually the first DOE responder for assessing the emergency situation and deciding what further steps should be taken to minimize the hazards of a radiological emergency. **REAC/TS (Radiation Emergency Assistance Center/Training Site)** provides treatment and medical consultation for injuries resulting from radiation exposure and contamination, as well as serving as a training facility.

INTRODUCTION

The Radiation Emergency Assistance Center/Training Site (REAC/TS) is one of the emergency response resources, or assets, administered by DOE. REAC/TS focuses on providing rapid medical attention to people involved in radiation accidents. REAC/TS is on call 24 hours a day to provide direct or consultative help with medical and health physics problems from local, national, and international incidents. REAC/TS also provides medical support to other DOE emergency response assets.



TREAT ADVISE TRAIN

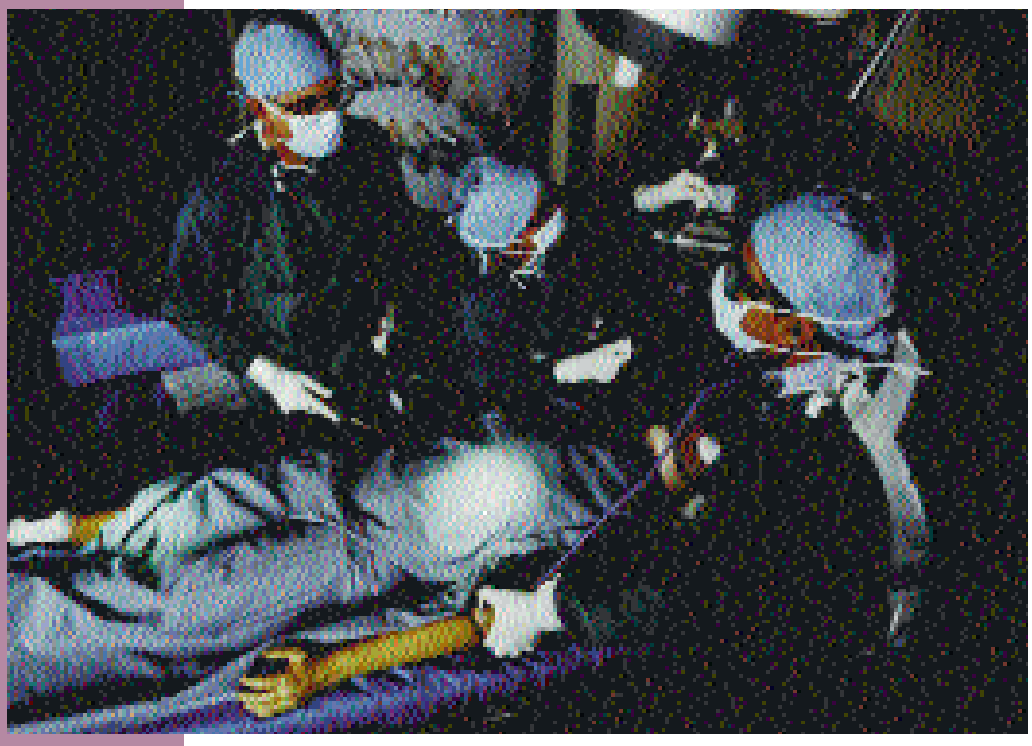
REAC/TS, located in Oak Ridge, Tennessee, was started in 1976 and has assisted in more than 1,000 incidents involving radiation. REAC/TS handles many calls for assistance each year from all over the world. These calls come from state health departments, commercial nuclear power facilities, Federal agencies, hospitals, the World Health Organization (WHO), the International Atomic Energy Agency, foreign governments, and physicians in private practice.

MISSION

REAC/TS' mission is to maintain an around the clock response center to provide direct support, including deployable equipment and personnel trained and experienced in the treatment of radiation exposure, to assist Federal, state, Tribal and local organizations, and DOE Radiological Emergency Response Assets. REAC/TS provides medical advice, specialized training, and the unique capability of on-site assistance for the treatment of all types of radiation exposure accidents.

STEPS IN THE REAC/TS RESPONSE

REAC/TS' radiation experts are on call 24 hours a day for consultations or to give direct medical and radiological advice to people at the REAC/TS facility or accident site. If needed, additional REAC/TS physicians and other team members can be deployed to the accident scene. This highly trained and qualified team can



Physicians, nurses, paramedics, and physicists receive training in the treatment of radiation exposure.

provide advice regarding assessment and treatment of contamination, conduct radiation dose estimates, diagnose and provide prognosis of radiation-induced injuries, conduct medical and radiological triage, perform decontamination procedures and therapies for external and internal contamination, and calculate internal radiation doses from medically induced procedures.

REAC/TS RESOURCES AND EQUIPMENT

REAC/TS has physicians, registered nurses, EMT-paramedics, health physicists, radiation biologists, nuclear medical technicians, coordinators, and support staff on its emergency response team. Sophisticated state-of-the-art laboratory facilities are among REAC/TS' resources. Facilities include a health physics laboratory; numerous laboratories for chemical, radiological, and cytogenetic analysis; clinical and diagnostic imaging laboratory services; equipment for radiation assessment and treatment; a whole body counter capable of detecting extremely low levels of internal contamination; and a dual-detector counter, capable of measuring low to extremely high levels of radioactivity, designed for patient use in emergencies.

treat
advise
train

REAC/TS maintains a Radiation Accident Registry System and conducts medical follow-up of radiation accident patients. Information from the REAC/TS Registry System is used to track treatment procedures and trends in radiation-induced medical conditions. A cooperative agreement with a local 300-bed regional medical facility with more than 130 staff physicians representing 33 specialties and access to complete diagnostic and treatment facilities also adds to REAC/TS' resources. Among the advanced specialty departments are an emergency department on call 24 hours a day, intensive care units, a cardiac surgery unit, a laser surgery center, a magnetic resonance imaging center, and a radiation oncology center.

TRAINING CENTER

The REAC/TS facility is also a central training and demonstration facility where national and foreign medical, nursing, paramedical, and health physics professionals receive intense training in the treatment of radiation exposure. REAC/TS conducts regularly scheduled courses for the occupational health physician and nurse, the emergency physician and nurse, physicians and nurses involved in long term patient care, and health and medical physicists. Training courses are conducted in the handling of radiation accidents by emergency staff;

medical planning and care in radiation accidents; health physics in radiation accidents; occupational health in nuclear facilities; occupational internal dosimetry; and radiopharmaceutical internal dosimetry.

In addition to providing radiological medical assistance, REAC/TS is ideally suited to provide medical emergency response training. REAC/TS has been working with state and local groups to train medical providers. In 1996, REAC/TS became involved in the Weapons of Mass Destruction First Responder Training Program with the objective of preparing the United States for responding to a terrorist attack involving nuclear, biological or chemical weapons of mass destruction. In a "train-the-trainer" approach, DOE RAP personnel assist in the training of medical personnel in their communities. REAC/TS' unique qualifications make it an integral partner in the success of this program.

REAC/TS training programs are available for offsite presentation, and REAC/TS also conducts radiation accident management training courses at the request of the WHO. In addition, REAC/TS conducts a series of international conferences titled, "The Medical Basis of Radiation Accident Preparedness."

COLLABORATING WITH THE WORLD HEALTH ORGANIZATION

In August 1980, REAC/TS was named a WHO Collaboration Center for Radiation Emergency Assistance. As a WHO Collaborating Center, REAC/TS is prepared to serve as a central point for advice and possible medical care in cases of radiation injuries; set up a network of available equipment and staff specializing in radiopathology; develop medical emergency plans in the event of a large-scale radiation accident; develop and carry out coordinated studies on radiopathology; prepare radiation documents and guidelines; and provide consultation or direct medical assistance to foreign governments if an actual radiation accident occurs.

For more information, contact:
Office of Emergency Response
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874
301-903-3558
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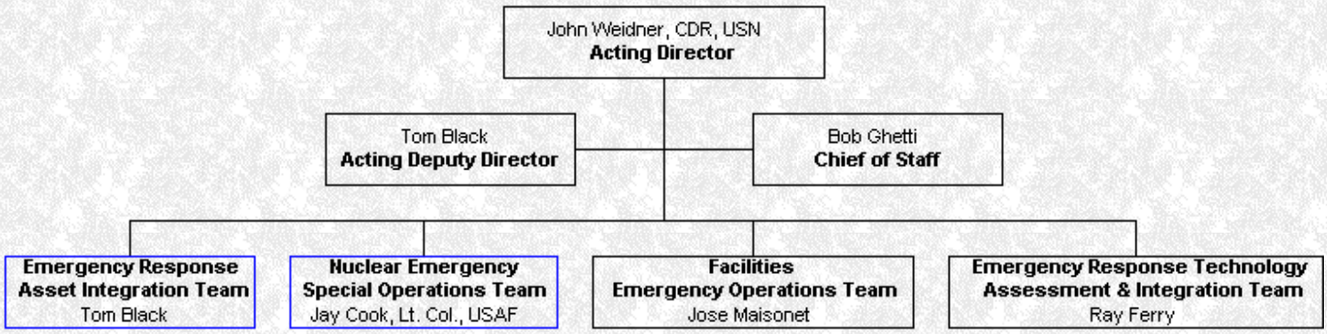
Office of Emergency Response
Defense Programs

Organization Chart



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Office of Emergency Response
Defense Programs

Emergency Response Asset Integration

DOE is prepared to respond immediately to any type of radiological accident or incident anywhere in the world with seven radiological emergency response assets. The fact sheets listed below describe each of the emergency response assets in detail. The fact sheets are in PDF format and require the latest version of Adobe Acrobat Reader to display and print. See What's This?

AMS (Aerial Measuring System) fact sheet

Detects, measures and tracks radioactive material at an emergency to determine contamination levels.

Photographs
Related Links

ARAC (Atmospheric Release Advisory Capability) fact sheet

Develops predictive plots generated by sophisticated computer models.

Photographs
Related Links
http://www.llnl.gov/ees/NARAC/

ARG (Accident Response Group) fact sheet

Deployed to manage or support the successful resolution of a U.S. nuclear weapons accident anywhere in the world.

Photographs
Related Links

FRMAC (Federal Radiological Monitoring & Assessment Center) fact sheet

Coordinates Federal radiological monitoring and assessment activities with those of state and local agencies.

Photographs
Related Links

http://www.nv.doe.gov/programs/frmac/default.htm

NEST (Nuclear Emergency Search Team) fact sheet

Provides the nation's specialized technical expertise to the Federal response in resolving nuclear/radiological terrorist incidents.

Photographs
Related Links

RAP (Radiological Assistance Program) fact sheet

Is usually the first responder for assessing the emergency situation and deciding what further steps should be taken to minimize the hazards of a radiological emergency.

Photographs
Related Links
Region 1
http://www.doe.bnl.gov/RAP/rap.htm
Region 2
http://www-external.ossd.ornl.gov/rap/
Region 4

http://www.doeal.gov/erp/Internet/emergency%20response%20program.html

REAC/TS (Radiological Emergency Assistance Center/Training Site) fact sheet

Provides treatment and medical consultation for injuries resulting from radiation exposure and contamination, as well as serving as a training facility.

Photographs
Related Links
http://www.orau.gov/ehsd/reacts.htm

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ARAC
Atmospheric Release Advisory Capability

Site Navigation

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- Services
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- Notable Responses
- Future Directions
- Availability
- Contact Information
- Links
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- LLNL Atmospheric Research
- Energy & Environment Directorate
- LLNL Home

Overview

When a hazardous material is accidentally released into the atmosphere, the Atmospheric Release Advisory Capability (ARAC) can map the probable spread of contamination in time for an emergency manager to decide if taking protective action is necessary. Located at the University of California's Lawrence Livermore National Laboratory, ARAC is a national emergency response service for real-time assessment of incidents involving nuclear, chemical, biological, or natural hazardous material. ARAC's primary function is to support the Department of Energy (DOE) and the Department of Defense (DoD) for radiological releases. Under the auspices of the Federal Radiological Emergency Response Plan and the Federal Response Plan, ARAC also assists several other federal agencies.

National Atmospheric Release Advisory Center (NARAC)
Livermore, CA

Since 1979, ARAC has responded to more than 70 alerts, accidents, and disasters, and supported more than 800 exercises. Besides accidental radiological releases, ARAC has assessed natural disasters such as volcanic ash cloud and earthquake-induced hazardous spills, manmade disasters such as the Kuwaiti oil fires, and several toxic chemical accidents.

National Atmospheric Release Advisory Center (NARAC) Facility Elements

- A validated 3-D atmospheric dispersion modeling system
- A team of skilled operational assessment meteorologists and support staff
- An Emergency Operations Center (EOC) equipped with:
  - Uninterruptible Power
  - Robust operational computer cluster
  - Worldwide meteorological data communications
  - Links to over 40 emergency centers around the U.S.
- A team of atmospheric modeling research scientists and advanced computer systems developers
- An emergency response training facility

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ARAC
Atmospheric Release Advisory Capability

Mission

Site Navigation	ARAC's Mission
• Overview • **Mission** • Services • Modeling System • Notable Responses • Future Directions • Availability • Contact Information • Links • Privacy & Legal Notice	ARAC's mission is to deliver expert advice and graphical dose assessments to emergency decision makers and thus assist in protecting the populations at risk for releases of hazardous material to the atmosphere.

• ARAC Home
• LLNL Atmospheric Research
• Energy & Environment Directorate
• LLNL Home

Privacy & Legal Notice

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Services

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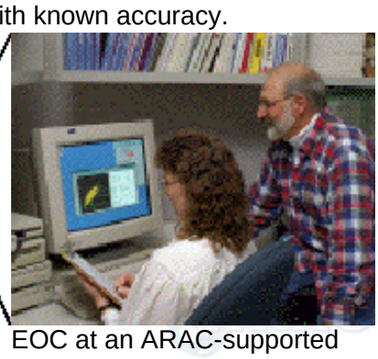
ARAC Services

ARAC's concept is to provide federal facilities and organizations throughout the country with a *timely and credible* centralized multi-scale dispersion modeling emergency response service. ARAC receives and processes the accident information into consequence plots which are then distributed back to the site and other agencies. Timeliness is achieved through automation between the ARAC Central Modeling System and the ARAC Site Workstation System (SWS) which resides at over 40 Federal Emergency Operations Centers around the country. Easy-to-use, menu-driven software allows sites to quickly notify ARAC and transmit the time, location, and type of release. An unlimited number of default accident scenarios can be stored by each facility to enhance the response time. Credibility is achieved through a robust modeling system with known accuracy.

EOC at NARAC



EOC at an ARAC-supported site

Real-time emergency response

ARAC's primary service is to respond to requests by DOE and DoD sites and agencies for real-time assessments of the consequences of accidents involving hazardous releases. In addition to these supported organizations, ARAC responds to a variety of requests by other federal agencies or state agencies which request federal assistance. The typical roles that ARAC plays in emergency response are listed below:

Roles that ARAC plays in Emergency Response

Early-Time (first few hours)

- Determine source location and release time if unknown
- Provide immediate guidance for dose-avoidance or protective actions
- Vector initial field measurement resources

Mid-Time (first 2 days)

- Provide framework to screen and evaluate field measurements
- Develop quantatative estimate of total release

Late-Time (after first 2 days)

- Provide mass-budget reconciliation assistance
- Develop area-contamination & population dose estimates

Post-accident analyses

Using more detailed information collected during or after an accident, ARAC can perform more precise analyses in a non time-intensive mode after the event. If any measurements of the release were taken, ARAC can recreate a source term to match those values.

Routine assessments and safety analyses

If a detailed dispersion model analysis is required, ARAC can provide "what-if" or worse case calculations for risk assessments, environmental impact statements, hazard or safety analysis reports.

Exercises

Emergency responders perform how they practice. ARAC supports several full exercises with each site and agency each year from planning through field play including after-action reporting.

Training

ARAC provides centralized training for users of the ARAC system at NARAC and on-site

training at supported sites. In addition, the ARAC system provides users unlimited training using the Totally Automated Hands-Off Exercise (TAHOE) capability of the ARAC SWS.

Site support

ARAC maintains the Site Workstation operating system, hardware, software, and meteorological towers located at supported sites.

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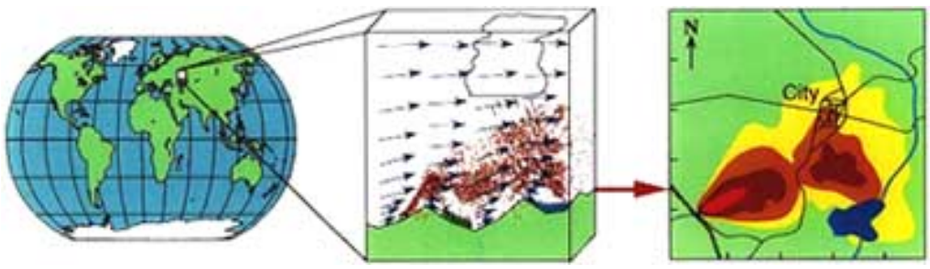
Modeling System

Modeling System

Time, location, and type of release are the minimum information needed to initiate an ARAC response. When entered into ARAC's computer system this information immediately triggers a paging system that alerts ARAC's staff and sets in motion the acquisition of all available regional and site weather data for input into the model calculations. Meteorological data are collected hourly from the surface and twice daily from the upper air, via ARAC's dedicated link to the U.S. Air Force Global Weather Center, and via the National Oceanic and Atmospheric Administration's Domestic Data Plus satellite broadcast. ARAC also receives gridded analyses and forecasts twice daily from the U.S. Navy Fleet Numerical Meteorological and Oceanographic Center. Within minutes, all data are available at NARAC.



Worldwide Coverage: Map and terrain databases, real-time and forecasted weather data	3-D Atmospheric Models: Complex wind flows, multiple sources, detailed particle dispersion, wet & dry deposition	Consequence Plots: Radiological dose, ground deposition, air concentration

ARAC personnel then use 3-D transport and diffusion models to simulate the hazardous release and predict the extent of its spread. The modeling domain can readily be selected anywhere in the world and easily scaled to the size of the problem. Wind observations are interpolated and adjusted over the domain to produce a mass-consistent flow in the topographic setting, using a terrain database that covers most of the world at 0.5-kilometer resolution.

A variety of default source terms are maintained for nuclear power plants and fuel-cycle facilities worldwide, as well as for many potential chemical accident scenarios. Online databases support the calculation of time-varying release rates, source geometries, and plume rise for explosion, fire, vent, and spill release mechanisms. Releases of hazardous material are simulated using thousands of “marker particles,” each carrying the unique properties of its released material. Multiple sources of nuclear or chemical material can be simultaneously treated. These sources are transported and dispersed in the atmosphere and deposited to the ground using a Lagrangian Monte Carlo diffusion method, which has been validated against numerous tracer studies.

A dose-factor database contains dose-conversion factors for internal and external exposure to all radionuclides. A toxicological database includes Emergency Response Planning Guidelines or

equivalents for hundreds of chemicals. Typical model results include plots of material deposited on the ground, instantaneous and time-integrated doses, or air concentrations at selected levels above the ground. Contours are overlaid on maps with features proportional to scale—from buildings to streets to cities to countries.

Emergency managers can use ARAC's plots and expertise to develop the best response strategy in order to minimize hazards to life or health as well as property in the affected regions. For ARAC-supported sites, the time to create and deliver initial plots to the site's computer can be as short as 10 to 15 minutes. For non-supported sites, the response time is typically 30 minutes to 2 hours for initial plots, depending upon location and available ARAC staffing. ARAC continues providing support until all airborne releases are terminated, the hazardous threats are mapped, and the impacts assessed.

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Responses

Site Navigation

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Notable ARAC Responses

- Chernobyl Nuclear Power Plant - April 26, 1986
- Kuwait Oil Fires - May-November 1991
- Richmond Sulfuric Acid Cloud - July 26, 1993
- Sacramento River Spill - July 14, 1991
- Mount Pinatubo - June 12-20, 1991

Example Nuclear Incidents/Alerts/Support Activities

Nuclear Power Plants	1979 Harrisburg, PA - Three Mile Island 1986 Chernobyl, USSR
Atmospheric Nuclear Tests	1978 China 1980 China
Nuclear Weapons Accidents	1980 Damascus, AR - Titan II missle explosion
Nuclear Processing Facilities	1986 Gore, OK - Sequoyah Fuels - uranium hexafluoride 1988 Mound Lab, OH - tritium release 1989 Pantex Plant, TX - tritium release 1993 Soviet Union, Tomsk-7 - waste tank explosion 1997 Tokai, Japan - nuclear fuels plant fire
Nuclear-powered Satellite Re-entries	1978 Canada - USSR Cosmos 954 1981 Indian Ocean - USSR Cosmos 1402 1996 Chile - Russian Mars-96 spacecraft
Space Shuttle missions with Radioisotope Thermoelectric Generators	1989 Galileo 1990 Ulysses 1997 Cassini
Battlefield Environment	1991 Persian Gulf - Desert Storm contingency calculations for Iraqi reactor bombing

Example Toxic Chemical Incidents

Railroad tank car spills and fires	1986 Miamisburg, OH - white phosphorus

	1991 Sacramento River, CA - metam sodium 1993 Richmond, CA - oleum 1995 Bogalusa, LA - nitrogen tetroxide 1996 Cajon Pass, CA - multiple chemicals
Industrial Accidents	1988 Henderson, NV - rocket fuel plant explosion
Battlefield environment	1991 Persian Gulf - Desert Storm contingency for chemical SCUDS 1991 Persian Gulf - Kuwaiti oil fires

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Future of ARAC

Site Navigation	Future Directions

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In the next few years, ARAC's goal is to become a 24-hour national and international emergency response and assessment service for all atmospheric hazards, including nuclear, chemical, and biological accidents/events and natural disasters. A major component of our service is our capability to provide training and drilling on demand for emergency managers and responders, an important aspect of preparedness. ARAC can also support non- and counter-proliferation assessments and training in a secure environment.

DOE's Defense Programs, Office of Emergency Response is supporting a complete upgrade and modernization of the ARAC program. This multi-year effort includes the development of a new “continuous terrain” modeling framework with variable resolution model grids, and an adaptation of the U.S. Navy's NORAPS and COAMPS forecast models. These models will permit consequence assessment predictions out to two days for emergency managers. Also, ARAC is upgrading its computer environment to high-performance UNIX systems and incorporating state-of-the-art object-oriented programming standards, a graphical user interface, and advanced graphical displays.

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Availability

Site Navigation	ARAC Availability
• Overview • Mission • Services • Modeling System • Notable Responses • Future Directions • **Availability** • Contact Information • Links • Privacy & Legal Notice	Authorization to use the ARAC service for hazardous materials accidents and emergency preparedness must be arranged through DOE, Office of Emergency Response (DP-23); DoD, Defense Special Weapons Agency/Office of Nuclear Operations; or by contacting the program office listed on the Contact Information page.

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  Lawrence Livermore National Laboratory
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  Livermore, CA 94551, USA
  Fax: (925) 423-5167

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Links

Other Sites of Interest

ARAC Sites

- ARAC-3 Regional and Local Forecasts: Current weather conditions and forecasts.
- ARAC Model Evaluations: Model performance of ARAC as compared to actual tracer studies conducted.

LLNL Sites

- LLNL Atmospheric Research Home Page
- LLNL Earth and Environmental Sciences
- LLNL HomePage

Related Papers

To view these documents, you must have Adobe Acrobat Reader.

- **Project Reviews**

Document Title	Author	Year	Download
ARAC and its Modernization	Ellis J S, et al.	1996	PDF Format
Atmospheric Release Advisory Capability: Real-time Modeling of Airborne Hazardous Materials	Sullivan T J, et al.	1993	PDF Format
ARAC: Early Phase Dose Assessment for the DOE FRMAC	Sullivan T J, et al.	1989	PDF Format
Modeling, Simulation and Emergency Response	Sullivan T J	1985	PDF Format
Optimization Aspects of the ARAC Real-time Radiological Emergency Response System	Taylor S S, et al.	1985	PDF Format
ARAC Feasibility Study for the NRC Phase 1	Rosen L C, et al.	1979	PDF Format
Atmospheric Release Advisory Capability (ARAC), Update 1977	Dickerson M H	1977	PDF Format

- **Modeling System**
  - ARAC-2

Document Title	Author	Year	Download
Expansion of ARAC for Chemical Releases	Baskett R L, et al.	1997	PDF Format

ARAC Portable System for Real-time Monitoring/Emergency Response	Lawver B S, et al.	1997	PDF Format
Transferability of a Three-dimensional Air Quality Model Between Two Different Sites in Complex Terrain	Lange R	1988	PDF Format
ADPIC, A Three-Dimensional Particle-in cell Model For the Dispersal of Atmospheric Pollutants and its Comparison to Regional Tracer Studies (Published in Journal of Applied Meteorology, Vol. 17, March 1978, P. 320-329)	Lange R	1977	PDF Format
Particle-in-cell Vs. Straight-line Airflow Gaussian Calculations of Concentration and Deposition of Airborne Emissions out to 70 km for Two Sites of Differing Meteorological and Topographical Character	Lange R, et al.	1976	PDF Format

- ARAC-3

Document Title	Author	Year	Download
User's Manual for MC_Wind: a new Mass-consistent Wind Model for ARAC-3	Chan S T, et al.	1997	PDF Format
ARAC-3, a new Modeling System for Real-time Responses and Assessments of Atmospheric Releases	Lee R L, et al.	1997	PDF Format
ARAC-3, a new Generation Emergency Response Modeling System	Lee R L, et al.	1996	PDF Format
First Look at the new ARAC Dispersion Model	Leone J M, et al.	1996	PDF Format

Responses

Document Title	Author	Year	Download
Description of ARAC's Real-time Modeling Support to the Mars Pathfinder and Cassini Missions	Pace J C	1997	PDF Format
Modeling the 17 January 1997 Delta-II Explosion by ARAC, ADORA, and REEDM	Pace J C, et al.	1997	PDF Format
ARAC Dispersion Modeling Support for January-March 1995 Vandenberg AFB Launches	Baskett R L, et al.	1995	PDF Format
Utilization of the Atmospheric Release Advisory Capability (ARAC) Services During and After the Three Mile Island Accident	Knox J B, et al.	1980	PDF Format
Atmospheric Release Advisory Capability (ARAC) Response to the Three Mile Island Accident	Dickerson M H, et al.	1979	PDF Format

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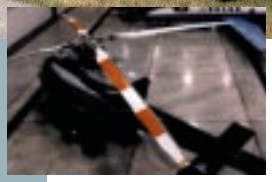
UCRL-MI-116408 | Monday, February 26, 2001

U.S. DEPARTMENT OF ENERGY
OFFICE OF EMERGENCY RESPONSE

PARTNERS IN *Emergency* RESPONSE

Protecting people and the environment is our number one concern.

The Department of Energy (DOE) has the world's leading scientists, engineers and technicians from over 50 years of managing the nation's nuclear weapons program. When the need arises, DOE is prepared to respond immediately to any type of radiological accident or incident anywhere in the world with seven radiological emergency response assets.



The professional scientists, engineers, pilots, medical personnel, technicians and other leading nuclear experts that comprise the assets use extremely sophisticated laboratories, detection, measuring, and monitoring equipment.

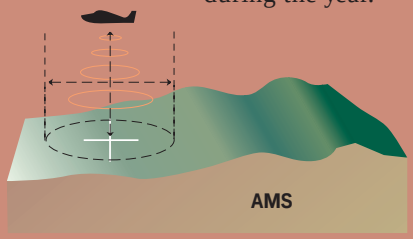
DOE has the best people and technology on hand to carry out its critical mission of protecting people and the environment.

DOE has the world's leading scientists, engineers and technicians from over 50 years of managing the nation's nuclear weapons program.

AERIAL MEASURING SYSTEM (AMS)

AMS is a vital radiation accident assessment tool. Using fixed-wing aircraft, helicopters and state-of-the-art detectors, AMS can respond quickly to an emergency event at any time of the day or night. AMS aircraft are equipped to detect and measure radioactive material deposited on the ground, even at extremely low radiation levels, and can conduct real-time air sampling and tracking of airborne radiation. This information helps determine how fast contaminants are moving and in what direction. In addition, AMS provides detailed aerial photographs of an accident site, including multispectral imaging.

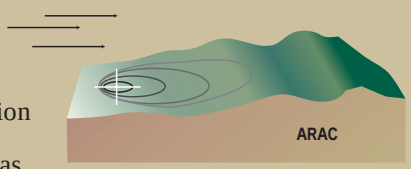
Along with its rapid response to emergencies, AMS surveys DOE sites and other nuclear facilities, and works for other Federal agencies as scheduled during the year.



ATMOSPHERIC RELEASE ADVISORY CAPABILITY (ARAC)

When an emergency occurs, ARAC predicts the probable spread of nuclear, chemical or hazardous material contamination into the atmosphere to help officials and Federal agencies react quickly. It also assesses natural disasters such as volcanic ash clouds and earthquake-induced hazardous spills, manmade disasters like the Kuwaiti oil fires, and toxic chemical releases.

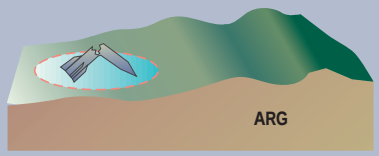
For ARAC-supported sites, critical information can be delivered as quickly as 10 to 15 minutes after accident information is received. For non-supported sites, it usually takes no longer than one to two hours.



ARAC

ACCIDENT RESPONSE GROUP (ARG)

ARG is an integral part of the DOD and DOE's emergency response system. Comprised of more than 250 scientists, engineers, and technicians from DOE's laboratories and production facilities, the ARG team is ready to respond to any U.S. nuclear weapon accident in the world.



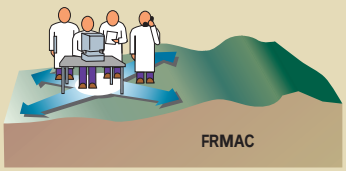
Once at the accident site, ARG focuses on three key areas: assessment, recovery and disposal of damaged nuclear weapons and components. The teams also provide vital health and safety, logistics, communications, and public affairs support.

ARG

FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT CENTER (FRMAC)

FRMAC coordinates the Federal radiological monitoring, assessment, and evaluation of data when a radiological emergency has occurred. Established as needed, it is fully operational within 24-36 hours after assistance is requested.

The FRMAC gathers radiological information such as plume and deposition predictions, air and ground concentrations, exposure rates and dose projections, assurance of data quality, and current meteorological conditions and weather forecasts and provides the results of the data collection, sample analysis, evaluations, assessments, and interpretations to the Lead Federal Agency and state officials. Monitoring continues until all of the surrounding areas where radioactivity was released are fully evaluated.



NUCLEAR EMERGENCY SEARCH TEAM (NEST)

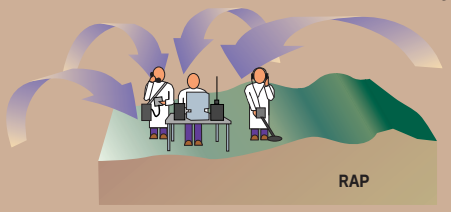
NEST is DOE's program for preparing and equipping specialized response teams to deal with the technical aspects of nuclear or radiological terrorism. NEST capabilities include search and identification of nuclear materials, diagnostics and assessment of suspected nuclear devices, technical operations in support of render safe procedures, and packaging for transport to final disposition.

The NEST program provides technical assistance to the Federal Bureau of Investigation (FBI) in conducting, directing, and coordinating search and recovery operations for nuclear materials, weapons, or devices, and assisting in identifying and deactivating an Improvised Nuclear Device (IND) or a Radiological Dispersal Device (RDD).

RADIOLOGICAL ASSISTANCE PROGRAM (RAP)

RAP is capable of providing assistance in all types of radiological incidents. It provides trained personnel, equipment, monitoring and assessment assistance to DOE program elements, other Federal agencies, state, Tribal and local governments. It is usually the first-responding resource in assessing a radiological emergency, and advises on what further steps should be taken to minimize hazards.

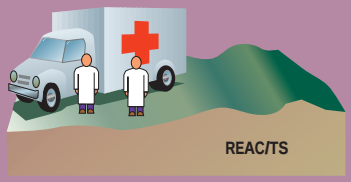
RAP teams arrive at the scene within four to six hours after notification of an emergency to conduct the initial radiological assessment of an affected area and determine, along with the state and LFA, what actions to take and if additional resources are needed.



RADIATION EMERGENCY ASSISTANCE CENTER/TRAINING SITE (REAC/TS)

REAC/TS has assisted in more than 1,000 incidents involving radiation from local, national, and international incidents. Its physicians, registered nurses, EMT-paramedics, health physicists, radiation biologists, nuclear medical technicians, coordinators, and support staff are on call 24 hours a day for consultations or direct medical care to people at the REAC/TS facility or the accident site.

This highly trained and qualified team helps assess and treat contamination, conduct radiation dose estimates, diagnose and provide prognosis of radiation-induced injuries, conduct medical and radiological triage, perform decontamination procedures and therapies for external and internal contamination, and calculate internal radiation doses from medically induced procedures.



DOE's radiological emergency response assets include the Aerial Measuring System (AMS), the Atmospheric Release Advisory Capability (ARAC), the Accident Response Group (ARG), the Federal Radiological Monitoring and Assessment Center (FRMAC), the Nuclear Emergency Search Team (NEST), the Radiological Assistance Program (RAP), and the Radiation Emergency Assistance Center/Training Site (REAC/TS).

DOE's assets are ready to respond to any type of radiological accident or incident anywhere in the world. Our job is to protect people and the environment.

Through many years of training and experience, DOE has perfected a system of emergency response including initial notification, monitoring and assessment of the situation, and working with other agencies to resolve the emergency.

Each asset handles certain aspects of the radiological emergency and performs a comprehensive, integrated response. All of the DOE assets are designed for rapid response. AMS detects, measures and tracks radioactive material at an emergency to determine contamination levels. ARAC develops predictive plots generated by sophisticated computer models. ARG is deployed to manage or support the successful resolution of a U.S. nuclear weapons accident anywhere in the world. FRMAC coordinates Federal radiological monitoring and assessment activities with those of state and local agencies. NEST provides the nation's specialized technical expertise to the Federal response in resolving nuclear/radiological terrorist incidents. RAP is usually the first DOE responder for assessing the emergency situation and deciding what further steps should be taken to minimize the hazards of a radiological emergency. REAC/TS provides treatment and medical consultation for injuries resulting from radiation exposure and contamination, as well as serving as a training facility.

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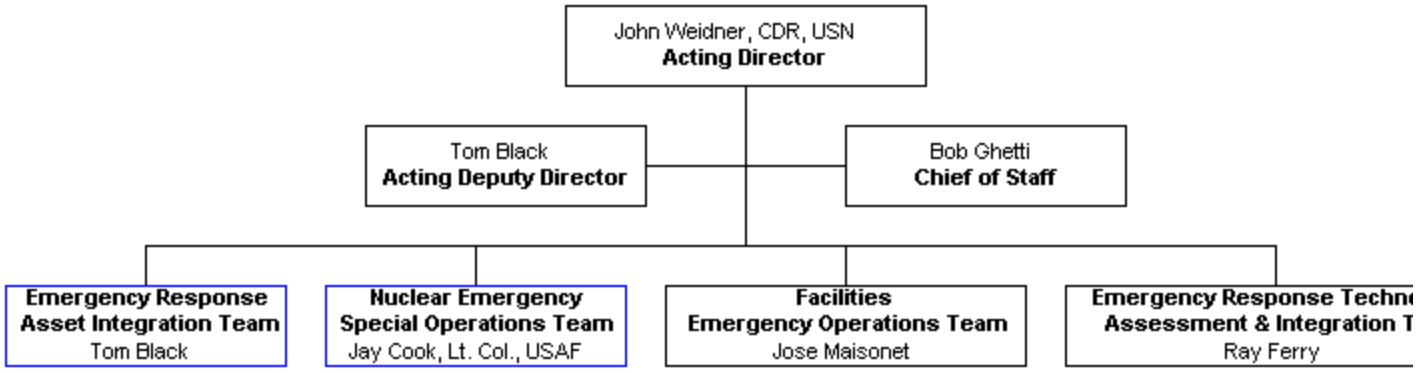
Organization Chart



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Direct questions regarding this program to
emergency.response@ns.doe.gov

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