

# Obtaining Models and Simulations for Radiological/Nuclear Trainings and Exercises



It is critical for first responders and emergency planners to have access to realistic plume models and simulations when conducting radiological emergency preparedness activities. The Department of Homeland Security Science and Technology Directorate funded the development of three new tools, available through the Federal Emergency Management Agency's (FEMA) Interagency Modeling and Atmospheric Assessment Center (IMAAC), that offer emergency managers, first responders, and exercise coordinators several options to access plume models and interactive simulations for exercises, trainings, and emergency planning activities.

Plume dispersion models include GIS-compatible graphics, which can be displayed on a map and are incorporated into briefing products (see Figure 1).<sup>1</sup> Simulation files are the output from atmospheric dispersion models that may be used in RadResponder's Simulation Tool to enable first responders to interact with simulated radiation readings in real-time (see Figure 2).

## SNAPSHOT OF OPTIONS

Depending on users' access to the tools listed below, federal, state, local, tribal, and territorial (FSLTT) partners have the following options to acquire plume models and interactive simulation files:

1. **RadResponder<sup>2</sup> Simulation Tool:** The simulation capability is a training and exercise tool that allows users to create radiological simulations from the RadResponder website using an underlying custom simulation file (e.g., RASCAL, HotSpot) or one of five pre-set templates, which are described on the next page. Users can view simulated readings for alpha, beta, and gamma radiation from the CBRNResponder mobile application.
2. **Consequence Management Website (CMWeb)<sup>3</sup> Simulation Planning Scenario Tool:** This tool enables existing CMWeb users to generate custom GIS-compatible plume models and standard briefing product reports for more tailored scenarios, as well as simulation files that can be uploaded into RadResponder's Simulation Tool (see option 2).
3. **IMAAC Exercise Support:** CBRNResponder users can request IMAAC support through the IMAAC Portal (part of the CBRNResponder Network) to create specialized models and simulations for training and exercises (see option 3).

The first option, using a custom simulation file or one of the five template scenarios in RadResponder, should provide sufficient information for most trainings and exercises. The second and third options, using CMWeb and requesting IMAAC support, allow the user to customize parameters like nuclide mix, release type, duration, and weather, but they also require more expertise and support from federal partners and not all requests may be accommodated. Figure 3 shows the three options for acquiring radiological simulations.

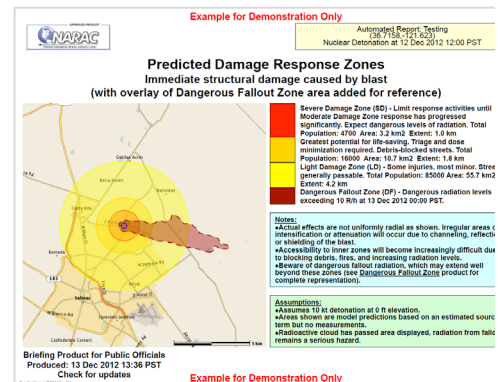


Figure 1. A briefing for public officials features a plume dispersion model with GIS-compatible graphics.

Image credit: Lawrence Livermore National Laboratory

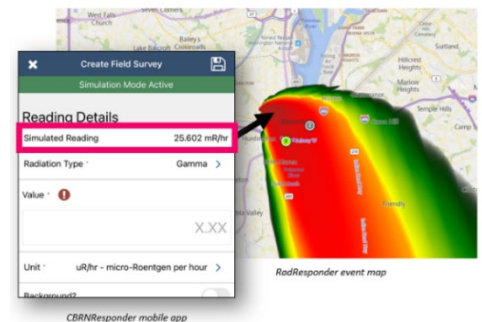


Figure 2. Simulation models are available for first responder use through RadResponder and CBRNResponder.

Image credit: Chainbridge/FEMA

<sup>1</sup> National Atmospheric Releasee Advisor Center (NARAC) provides information on these types of products. <https://narac.llnl.gov/products/briefing-products>

<sup>2</sup> RadResponder is the national standard and whole of community solution for the management of radiological data during an emergency. RadResponder is provided free to all FSLTT organizations, allowing users to uniformly establish a flexible, efficient and networked approach to the management of radiological data. RadResponder can be accessed on smartphones/tablets via the CBRNResponder iOS, Android, Windows applications and via the web at [www.radresponder.net](http://www.radresponder.net).

<sup>3</sup> CMweb is a web-based, data dissemination application used to assist FSLTT decision making during a radiological incident. The system provides a convenient method of sharing consequence management information, such as event status, plume model, deposition predictions, measurement data, and protective action recommendations. <https://cmweb.llnl.gov/web/signIn.html>

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## DETAILED OPTION DESCRIPTIONS

### 1. TEMPLATES IN CBRNRESPONDER

The RadResponder Simulation Tool can be used to display GIS-compatible plume models or run simulation files to support trainings and exercises. Users can upload simulation files derived from various modeling tools, such as Rascal and Hotspot. Additionally, the tool contains five templated scenarios: small and large nuclear power plant (NPP) accidents, simple and complex radiological dispersal device (RDD) detonations, and a nuclear detonation. When the simulation feature is enabled, first responders using the mobile version of CBRNResponder will be presented with simulated radiation measurements, which display the value, units, and type of radiation, based on their current GPS location.

Responders should use the provided templates when a training or exercise does not require a tailored scenario or specific release conditions (e.g., actual local weather data). These templates can be used by anyone with a CBRNResponder account. Users may adjust the location, wind direction, and date/time of the release to fit their training or exercise scenario.

When a simulation is run, first responders who are part of the “event” will see simulated measurements on the CBRNResponder mobile app. To collect a simulated reading, the user enters the equipment type/model, radiation type, and height of the reading in the mobile app. Then, the application will generate a simulated survey reading based on their location and the scenario chosen. The location is determined by either automatically using the phone’s GPS or manually selecting on the map. If the responder changes locations, the survey reading will also change in real time depending on their proximity to the source of contamination. From the perspective of the responder looking at simulated readings on their phone, it will appear as if they are standing in a wide area radiation field—but they are not. Jobs aids, instruction manuals, and training videos are available in the [CBRNResponder Resource Library](#).

### 2. CMWEB SIMULATION PLANNING TOOL

The CMWeb Simulation Planning Scenario Tool provides more options to customize scenario inputs like weather and isotopes to create materials for trainings and exercises that involve very specific parameters or response objectives. A simplified user interface was developed in the CMWeb portal to assist FSLTT users with generating realistic plume models and briefing products on their own, along with simulation files that are compatible with the RadResponder Simulation Tool (discussed in Option 1). The CMWeb Simulation File instructional video and the accompanying Job Aid describe the necessary steps to create custom simulation files for use in RadResponder (available for users with an existing CMWeb account).

A CMWeb account is required to access the Simulation Planning Scenario Tool and generate customized plume models (including briefing products), and the simulation files that can be uploaded to the RadResponder Simulation Tool. Authorization for a CMWeb account is provided on an individual basis, with further restrictions on accessible information based on need-to-know. If you want to use this tool, but do not have access to CMWeb, contact a representative of your State Radiation Control Program or IMAAC directly. FSLTTs can contact the IMAAC Technical Operations Hub for exercise support by emailing [IMAAC@fema.dhs.gov](mailto:IMAAC@fema.dhs.gov) or submitting a request through the IMAAC Portal in CBRNResponder.

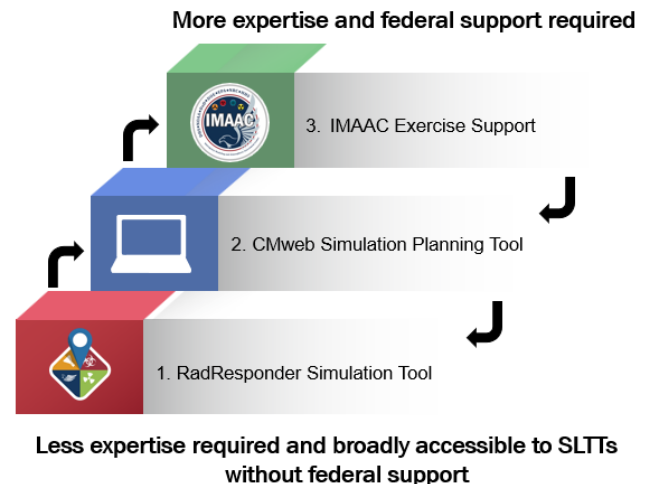


Figure 3. Moving up the graphic, the need for expertise increases, though first responder access decreases.

Image credit: NUSTL



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## 3. REQUESTING MODELING AND SIMULATION SUPPORT THROUGH IMAAC

IMAAC produces models and briefing products for all radiological and nuclear incidents. IMAAC provides a single point for the coordination and dissemination of federal modeling products and can assist first responders and emergency managers with critical health and safety decisions during a radiation emergency. IMAAC is also available to provide support for exercises and training.

If the templated and customized modeling and simulation capabilities described for Options 1 and 2 above do not meet the training and exercise needs, FSLTT emergency response planners should submit a request to IMAAC for non-emergency support. To do this, login to CBRNResponder and use the IMAAC Model Request Form, which requires the user to fill out key pieces of information (e.g., scenario, location, materials). If the user does not have a CBRNResponder account, they can also email [IMAAC@fema.dhs.gov](mailto:IMAAC@fema.dhs.gov) to request support. The user must indicate in the request form if they want to use the IMAAC product as a simulation, because the simulation component requires a specific file type. IMAAC will review the request and determine how it will be supported. This option is intended to be used for large exercises and events that require a significant amount of time and resources for planning.

Desired Exercise/Planning Resource	Options to Obtain this Resource (Start with #1)
A GIS-compatible shapefile of a plume model displayed on a map	<ol style="list-style-type: none"><li>1. Use RadResponder's Simulation Tool. Use a template scenario or upload a custom file; OR</li><li>2. For custom simulation files, use CMWeb's Simulation Tool (if you have access); OR</li><li>3. For something highly customizable, contact IMAAC.</li></ol>
Simulate radiation measurements for an RDD, NPP, or nuclear detonation scenario in real-time	<ol style="list-style-type: none"><li>1. Use RadResponder's Simulation Tool. Use the provided template scenarios, or upload your own simulation files; OR</li><li>2. For custom simulation files, use CMWeb's Simulation Tool (if you have access); OR</li><li>3. For something highly customizable, contact IMAAC.</li></ol>
A briefing product	<ol style="list-style-type: none"><li>1. Use CMWeb's Simulation Tool (if you have access); OR</li><li>2. Contact IMAAC</li></ol>

## FOR MORE INFORMATION

- [RadResponder Simulation Manual](#)
- [How to Use the Sim Files on the CBRNResponder App](#)
- [CBRNResponder Simulation Webinar](#)
- CMWeb Job Aid (available for users with a CMWeb account)
- CMWeb Instructional Video (available for users with a CMWeb account)



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