



LAWRENCE  
LIVERMORE  
NATIONAL  
LABORATORY

UCRL-JC-153904-ABS

# **Multi-agency Support for the TOPOFF2 Exercise by the National Atmospheric Release Advisory Center (NARAC)**

*John S. Nasstrom, Ronald L. Baskett,  
James S. Ellis and Donald L. Ermak*

**November 2003**

American Nuclear Society Global 2003 Winter Meeting,  
New Orleans, LA, November 16-20, 2003.

# Multi-agency Support for the TOPOFF2 Exercise by the National Atmospheric Release Advisory Center (NARAC)

John S. Nasstrom, Ronald L. Baskett, James S. Ellis and Donald L. Ermak

Lawrence Livermore National Laboratory, PO Box 808, L-103, Livermore, CA 94550, [jnasstrom@llnl.gov](mailto:jnasstrom@llnl.gov)

## INTRODUCTION

The National Atmospheric Release Advisory Center (NARAC) at Lawrence Livermore National Laboratory provided plume modeling and consequence assessment predictions for multiple agencies during the Top Officials 2 (TOPOFF2) exercise in May 2003. NARAC provides a national resource to emergency responders and managers for timely and credible assessments of harmful airborne releases of radiological, nuclear, chemical or biological material in order to minimize human exposure [1]. (Additional information on NARAC can be found at <http://narac.llnl.gov>.) This paper will describe the new tools and procedures used by NARAC to simultaneously support local, state, regional and federal agencies, and the lessons learned from support of TOPOFF2.

## TOPOFF2 EXERCISE SUPPORT

NARAC staff played actively in the exercise through the NARAC central operations center at Lawrence Livermore National Laboratory, specifically in support of a terrorist radiological dispersal device (RDD) scenario in Seattle. The exercise was continuous for 36 hours starting around noon on Monday, May 12, through midnight Tuesday, May 13. In addition, NARAC supported additional exercise play in various local, state and federal emergency operations centers the rest of the week. NARAC had an unprecedented role in this exercise because it supported first responders and the City of Seattle under a Department of Energy and Department of Homeland Security program called LINC—Local Integration of NARAC with Cities—and under the Department of Energy/National Nuclear Security Agency (DOE/NNSA) Office of Emergency Response regional and national nuclear incident response teams. NARAC provided authorized emergency responders and managers with NARAC predictions of the downwind areas of contamination using Web- and Internet-based tools that access NARAC's three-dimensional meteorological flow and

dispersion models. Recent collaborations with Sandia National Laboratory provided new integrated NARAC-Sandia capabilities for estimating the airborne aerosol characteristics from RDD events, the prompt blast effects, and the dose/risk to population in downwind areas [2].

Initial plume predictions were made based on reports of an explosion involving unknown material. These initial predictions indicated the direction and spread of material, and were used by first responders to make decisions on safe approach routes and incident command posts. Plume predictions were also used to guide decisions on sheltering population. As more information on radioactive contamination levels became known during the exercise, more refined predictions were generated. Working with the Federal Radiological Monitoring and Assessment Center (FRMAC) and DOE/NNSA's Aerial Measurement System (AMS) field monitoring data, the NARAC team was able to use simulated measurements of ground contamination downwind of the explosion to estimate source amounts, and better predict the down wind areas affected by EPA Protective Action Guidelines. As measurement data improved with time, the accuracy of the estimates of the consequences increased.

Model predictions were distributed according to established protocols via a NARAC Web site, a wireless link, e-mail and fax. The Seattle incident commander obtained NARAC predictions from the Seattle Fire Department Hazmat team through a wireless Internet link to a laptop running the *NARAC iClient* plume modeling and geographical information display software. The Seattle EOC, DOE/NNSA operations center, and DOE/NNSA regional and national nuclear incident response teams obtained plume predictions through a password-controlled Web site and the *NARAC Web* software. NARAC predictions were reviewed and released through the Joint Operations Center (JOC). Plume predictions were distributed to authorized local, state, and federal responders working in the Seattle region and to various participating government agencies in

Washington D.C., including the Department of Homeland Security.

## **LESSONS LEARNED FROM THE TOPOFF2 EXERCISE**

The TOPOFF2 exercise showed that NARAC tools and services can be invaluable for quickly mapping potentially affected areas, guiding deployment of emergency response and field monitoring teams, and predicting health risks, evacuation zones. A deployable laptop-based system with NARAC iClient software provided critical data for decision making by the Incident Commander. Web-based tools greatly aided information sharing with emergency managers and multiple agencies. The *NARAC Web* system allowed nearly simultaneous distribution of information to twenty local, state and federal agencies, which resulted in 35,000 hits for information on the NARAC Web site during the exercise. Because single communications paths may fail, it was important to keep multiple communications options available, including Web, e-mail, dial-up, wireless, and fax, which were all used during the exercise.

One of the lessons re-learned from previous exercises, was that decision makers need easily interpreted products that represent the best summary of current information. This can be greatly aided by having subject matter experts in plume prediction and hazard effects available. It was also important to back up recommended actions with the details of the plume prediction and field monitoring data used to make those predictions, so that justification for the recommended actions can be verified. Users of plume modeling tools continue to need pre-defined sets of scenarios to select from based on minimal information and observable evidence, especially for terrorist scenarios in which very little information may be available.

The exercise benefited from previous efforts to automate and streamline the integration of measurements, model predictions and geographical information in the FRMAC. The continuation of these efforts will allow faster incorporation of field monitoring data to update plume predictions, and the generation of more accurate predictions earlier during an incident.

The large number of agencies utilizing NARAC during TOPOFF2 provided an invaluable learning experience. Based on this experience, NARAC has learned how to improve

staffing and procedures to better coordinate distribution of products for major events.

## **ACKNOWLEDGEMENTS**

This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

## **REFERENCES**

1. R.L. BASKETT, F.J. ALUZZI, B.M. BOWEN, C.S. FOSTER, J.S. NASSTROM, B.M. POBANZ, P.J. VOGT., "Multi-agency Utilization of the National Atmospheric Release Advisory Center", American Nuclear Society Meeting, Washington, D.C., November 18-21, 2002
2. J.S. NASSTROM, W. RHODES, III, J. FULTON, J. ELLIS, F. HARPER, J. TULL, K. FOSTER, R. BASKETT, G. SUGIYAMA, W. WENTE, S. HOMANN, B. BUDDEMEIER, "LLNL and SNL Dispersion Modeling and Assessment Tools", American Nuclear Society Meeting, Washington, D.C., November 18-21, 2002