Group 3: Recovery

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Introduction

Breakout group three began by defining the scope of the modeling that would be needed in the aftermath phase of any weapon of mass destruction event. It was determined that in this phase the evaluation was not as time sensitive as the other two phases considered and, therefore, sophisticated modeling could be employed in order to obtain the best estimate of impact for the four scenarios presented. This was later amended in the session to recognize that, while the final answers could take on the order of years to complete, intermediate answers within the 1-2 month time frame would be needed by decision makers. This complex modeling effort would involve collection of as many available local meteorological and effluent measurements as possible as well as a detailed source characterization. Time scales are important. The calculations would be completed by experts, so ease of code use and computer platform are not issues.

It was assumed that the audience for the products in this phase will have the luxury of time and thus results can and should be detailed and complex, involving the following:

- Forensics for chemical release
- Long term monitoring
- Decontamination and clean up
- Back calculations are necessary for some scenarios where the source location and magnitude are not known.

The group agreed on the following primary issues of interest for this modeling effort:

- Dose reconstruction
- Resuspension
- High accuracy (not knowingly biased toward conservative values)
- Calibration of instrumentation
- Specific weather data at the time of the event at appropriate scales
- Probablistic answers
- Multi-scale problems
- Some types of sources require multimedia models
- Intermediate answers - "best guess" answers may be needed before extensive study is completed

- Indoor/outdoor problem - infiltration from outside to inside and vice versa
- Runoff
- Health effects
- Long-range transport
- Some types of releases require decay correction (e.g., radioactive materials), other releases are insensitive to decay (e.g., anthrax).

In addition, for urban applications, there is a specific need to have urban-scale models. These models will require inputs for parameters important to urban modeling, such as evaporation, surface roughness, urban geometry, infiltration from outdoors to indoors and vice versa, and utilization of complex meteorology. These parameters provide more realism to the modeling and more accurately characterize the total impact in the urban environment.

Having established the end customer and the model needs, it was decided to then look at the individual scenarios and come up with lists of high and medium criteria important for each scenario. "Low" was originally dropped as a category, but ultimately a few low criteria were identified.

Each of the four scenarios was evaluated independently, but it soon became apparent that there were similarities among the scenarios with only small, but significant, differences between them. For the nuclear power plant scenario, it was assumed that a direct impact by a plane would not be expected to affect the core directly but might cause a melt down by affecting mechanical functions that control the core. This assumption would lead to a meltdown of the core at some time estimated to be between 1 hour and 1 day after the impact. Such a scenario would allow time for evacuation and monitoring to be set up by an emergency response team and would dramatically change the role of first responders.

Clean-up could take weeks, months, or years. While the site is being detoxified, residual pollutants/chemicals involved in the initial event may still be present, as well as new chemicals formed (e.g., by photochemistry or radioactive decay). On-going modeling would be important to assess human exposure during the clean-up phase.

Results

Scenario 1 – Urban Sarin Release

Criterion	Priority
Source	H
Surface Characteristics/Properties	H
Micrometeorology	H
Turbulence Characterization	H
High Resolution (DX, DZ = 1m; Dt=60 sec)	H
Interaction with Surface Geometry	H
Range	H (10 m – 30 Km)
Trained Response Personnel	H

Scenario 2 – Dirty Nuke

Criterion	Priority
Incident Characteristics	H
Source Location	H
Wind Direction and Speed	H
Particle Sizes and Deposition	H
Precipitation	H
Quick Runtime	H
Simple Inputs	H
Wind Variability	M
Resuspension	M
Plume Rise	M
Stability	M
Accuracy	M
Building Morphology	L
Terrain	L

Scenario 3 – Nuclear Power Plant Attack

Criterion	Priority
Temporal Source Characterization	H
Long Range/Long Duration	H
Wet/Dry Deposition	H
Terrain	H
Weather Transitions and PBL	H
Observed and Forecast Weather(Meso-scale features)	H
On-site Met (Mobile Backup)	H
Mixed Fusion and Daughter Products	H
Quick Runtime (3 hrs)	H
GIS Mapping	H
Buoyancy/Plume Rise	M
Land Use/Boundary Layer Interaction	L
Building Wake Effects	L

Scenario 4 – Crop Duster - Anthrax

Criterion	Priority
Source Characterization (Location/Time/Virility)	H
Long Range/Long Duration	H
Deposition (Land Use; Buildings)	H
Terrain	H
Weather Transitions and PBL	H
Observed and Forecast Weather (High Resolution)	H
On-site Met (Mobile Backup)	H
Range (100+ km)	H
Multiple Time Scales	H
Measure of Uncertainty	H
Continual Update/Reanalysis	H
Quick Runtime (3 hrs)	H
GIS Mapping	H