

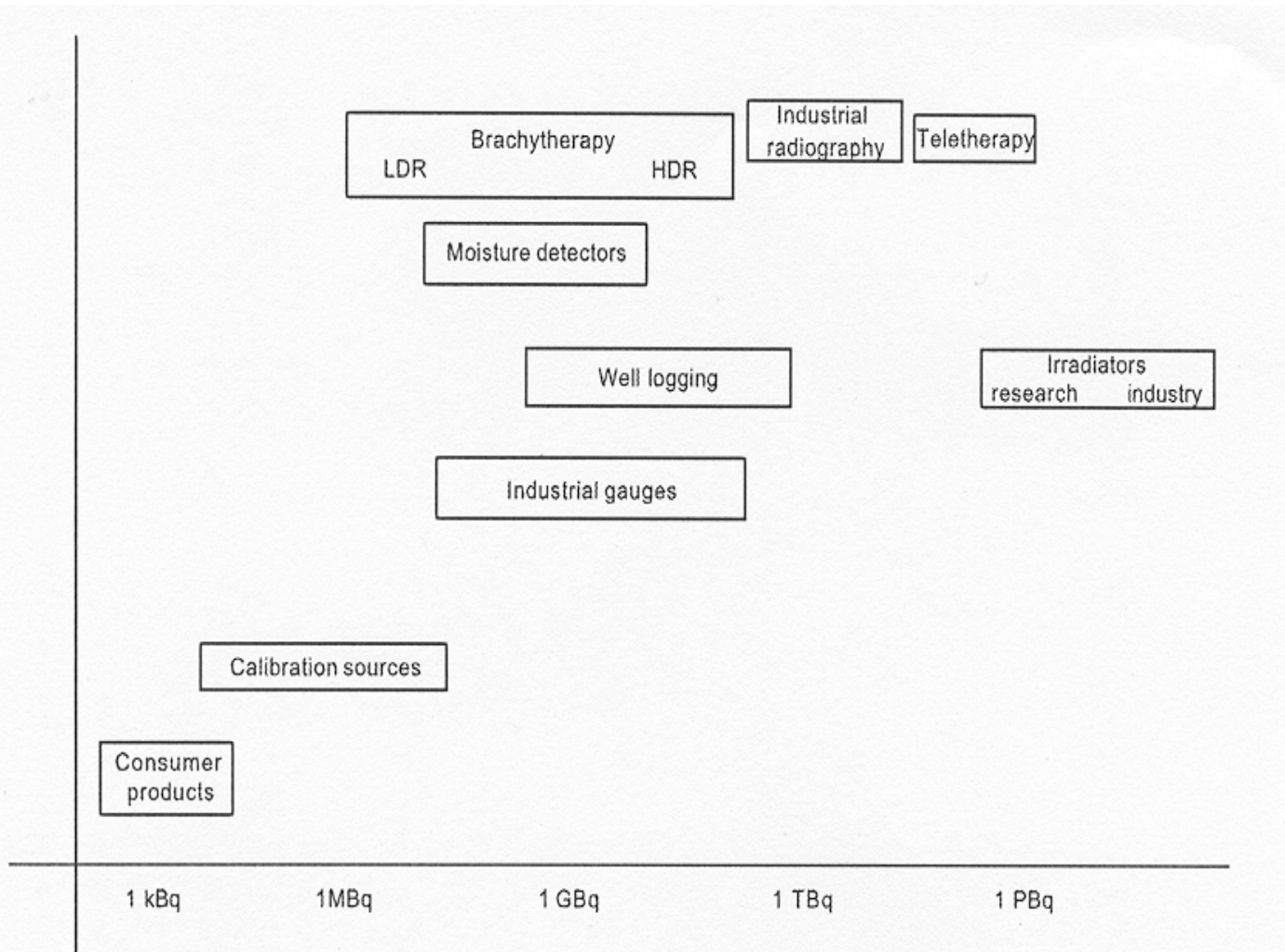
# **Mobile Radiation Detection for Military and Civil Defense**

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# Abstract

The Mobile Detection System (MDS) was first designed in partnership with Thermo Electron and WIS, the German Military Institute for NBC Protection, for the purpose of reconnaissance and discovery of smuggled and lost gamma radiation sources. The system has been beta tested by the 2<sup>nd</sup> WMD CST and has now been revised for fully integrated GIS deployment. The system objective is to rapidly detect lost or stolen sources which could be used as components in a radiological dispersal device. The most probable components are highly energetic gamma sources, used in large numbers in medical and industrial facilities with minimal security. The system integrates NBR technology, which instantly distinguishes between varying levels of natural background radiation and anything that is artificial or enhanced, with a Map Objects application. The MO application was designed for ease of use by any NATO soldier and is compatible with any type of military or civilian map. The system also has the ability to bring a real time data feed into ArcView 3.3 and CATS-JACE with Tracking Analyst and into ArcView 8, Arc9 and with customized ArcEngine applications.

# What is the nature of the RDD threat?

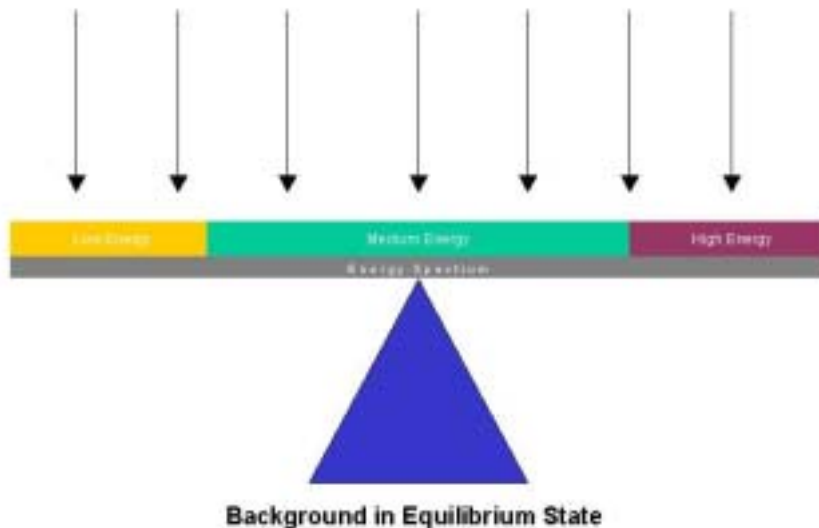


# Most Probable RDD Components

- Highly energetic gamma sources
- Widely used in medical and industrial applications
- More easily stolen due to less stringent security measures for use, transportation and application
- Detectable even with heavy shielding (by obvious nature of shielding and properly selected detectors)
- Significant Quantities for an RDD include sources of 10Ci to 100 Ci; higher activity sources are already subject to higher levels of security and accountability
- Cs137, Co60, Ir-192, I-125 are most probably threats, given their common use in industrial/medical facilities

# Mobile Detection Challenges

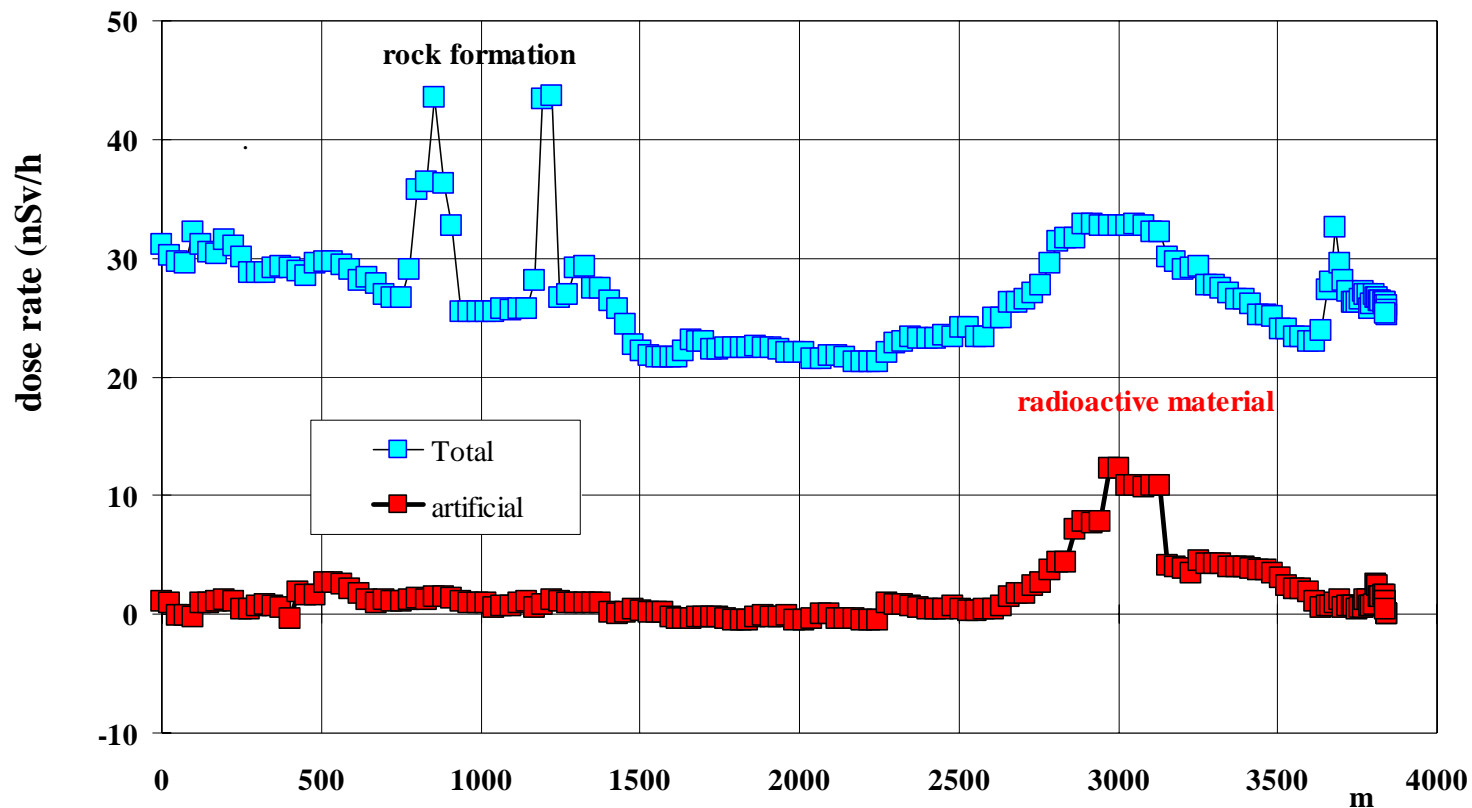
- How can a shielded source in a moving vehicle be distinguished from natural background when natural background is always changing with location?
  - *NBR Technology*
  - *Measuring=balancing, not counting*



Low Energy Ratios  
Middle Energy Ratios  
Gross channel  
High Energy Ratios

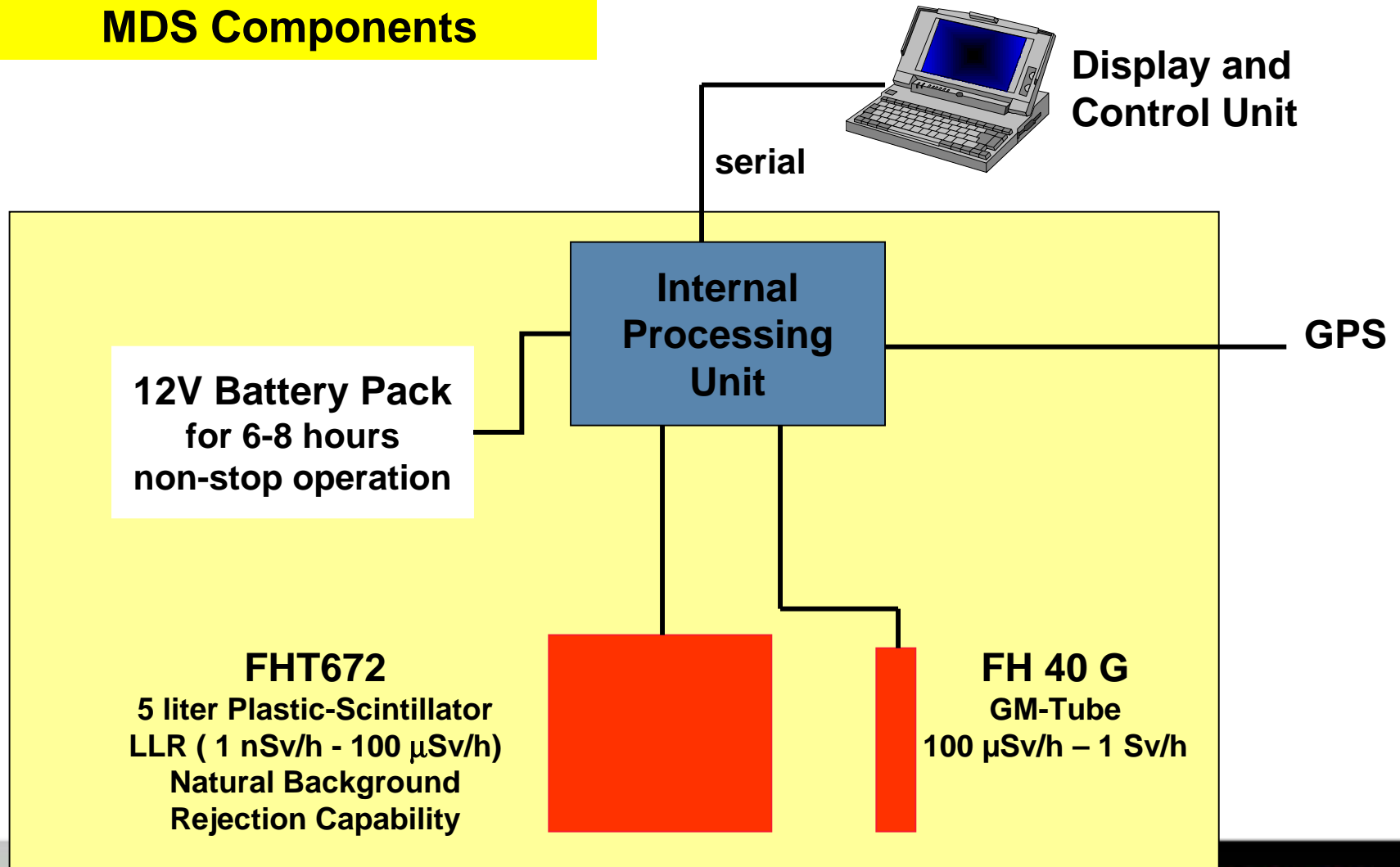
# Where is the artificial source?

Passing a nuclear facility with 70 km/h, NBR signal included



# Mobile Detection System (MDS) for the Use in Helicopters and Vehicles

## MDS Components

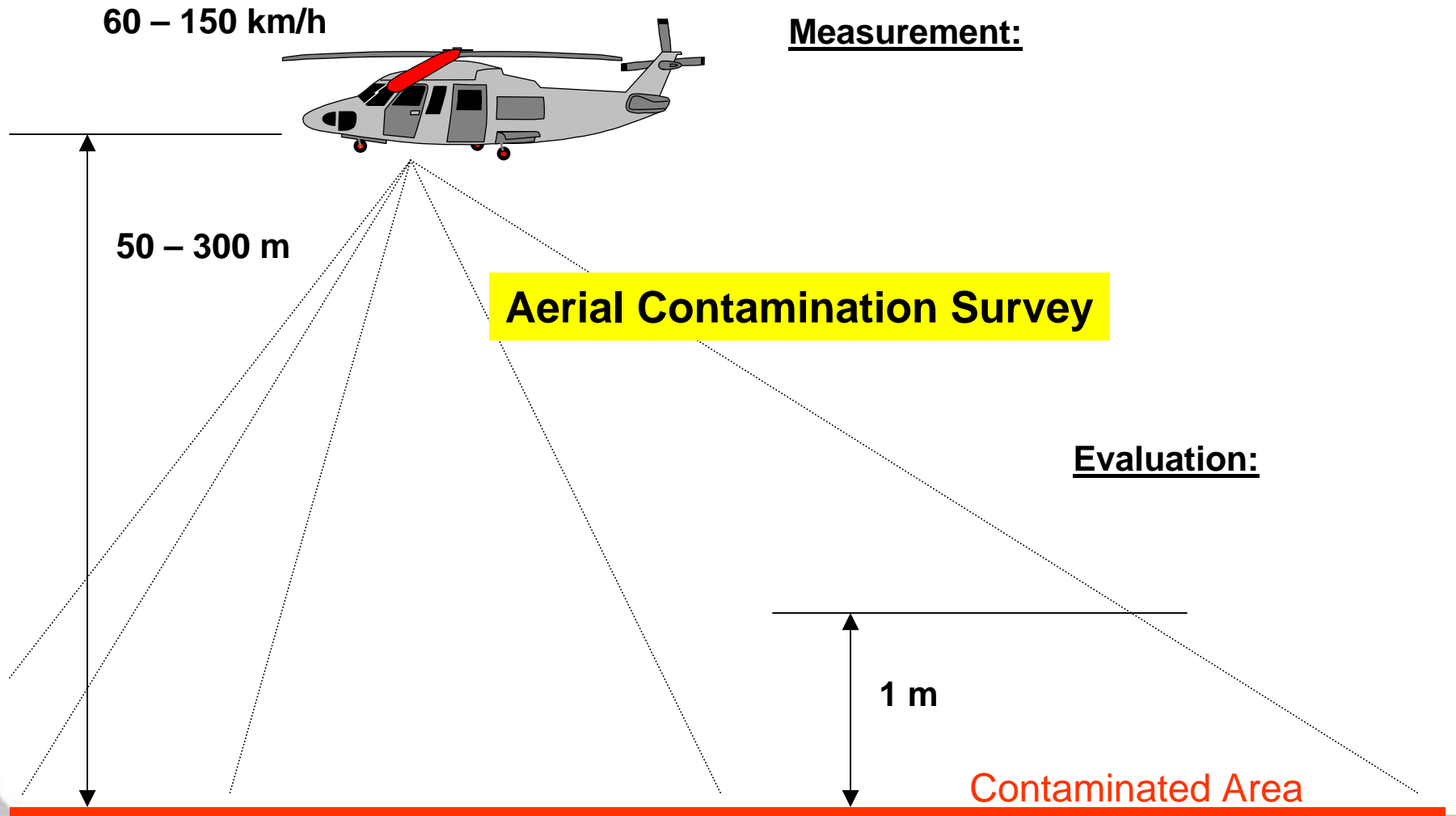


# Main Features of Mobile Detection System (MDS) for Gamma Radiation

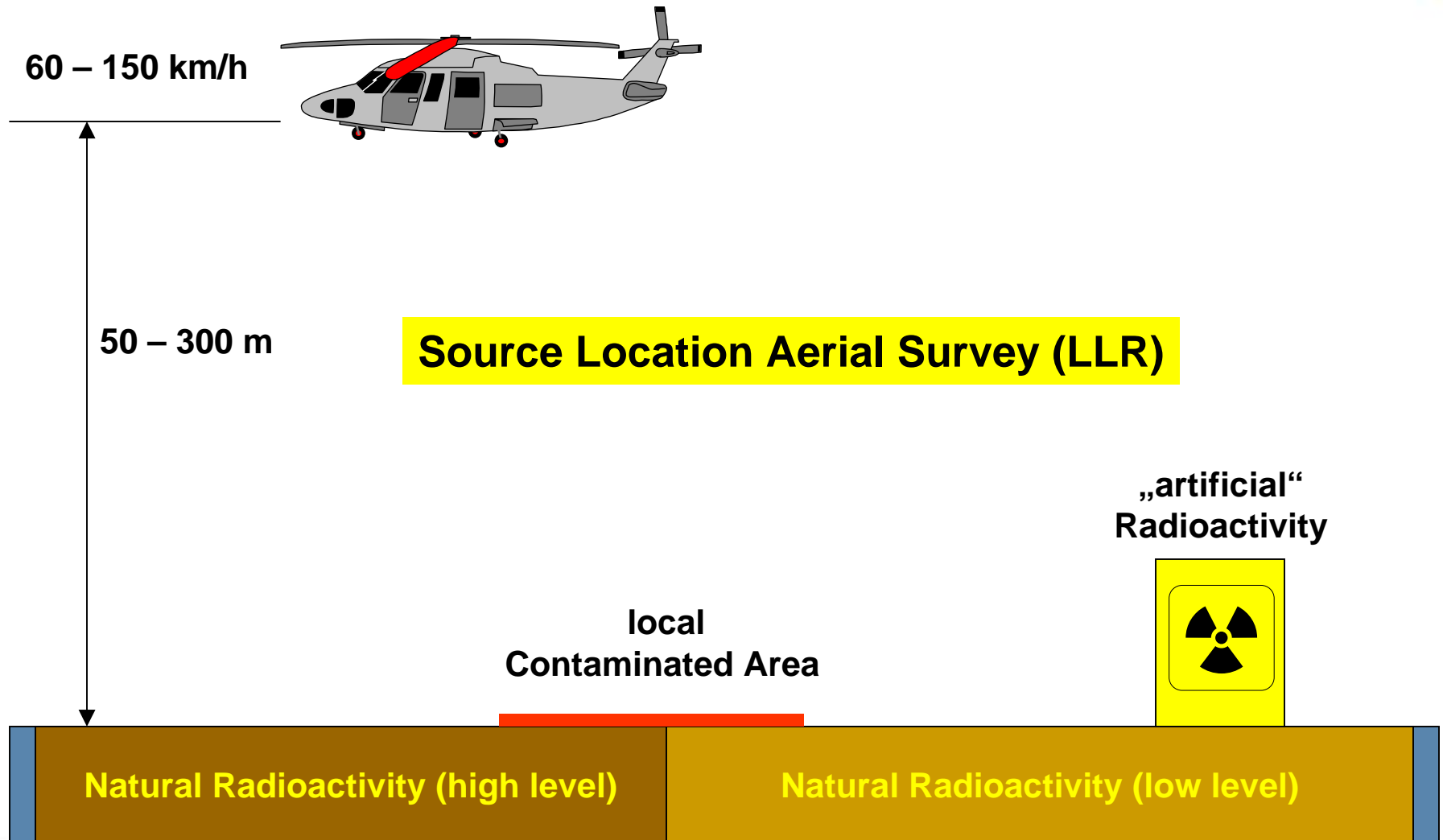
- Rapid detection of large areas by helicopter or car
- Online-Display of detection results
- GPS-based movable map GUI or ArcGIS interface
- Output in .dbf and .mdx files or standard ESRI formats (.shp, .tlg or .trx)
- Files are easily exported to .csv format for easy use with Excel
- Coloured inserted track with local radioactivity
- Discrimination of artificial and natural radioactivity
- Direct data transfer during mission
- Remote control of mission by ground station
- NATO Stock number
- Additional neutron, contamination and NaI probes can be added for complete mission response (discovery, identification, measurement)



# Mobile Detection System (MDS) for the Use in Helicopters and Vehicles



# Mobile Detection System (MDS) for the Use in Helicopters and Vehicles



# Mobile Detection System (MDS) for the Use in Helicopters and Vehicles

Airborne Source Monitoring  
with a  
EC 135 Helicopter  
in May 2003



# Mobile Detection System (MDS) for the Use in Helicopters and Vehicles



## Flight Parameters:

≈ 100 km/h  
velocity

≈ 100 m  
height above  
ground

## Source Parameters:

Cs-137  
≈ 3 GBq  
Sealed Source  
unshielded on the  
ground

# Military Model MDS in Germany



# NBR Measurement – 40 m. from source



Eu-152 source, 5 GBq

in vessel of lead (diameter. 20 cm, height 15 cm)

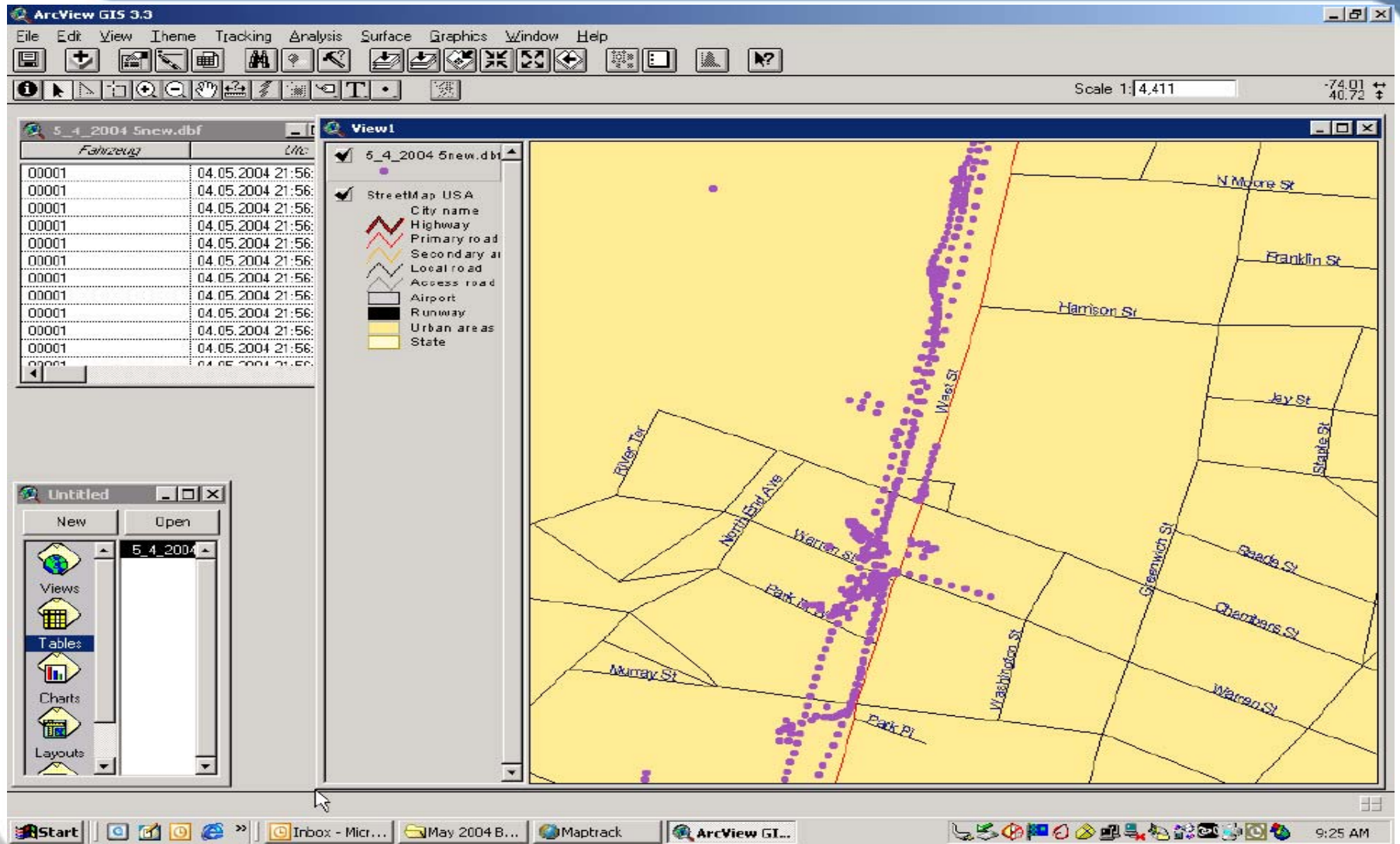
30 m

10 mSv/h

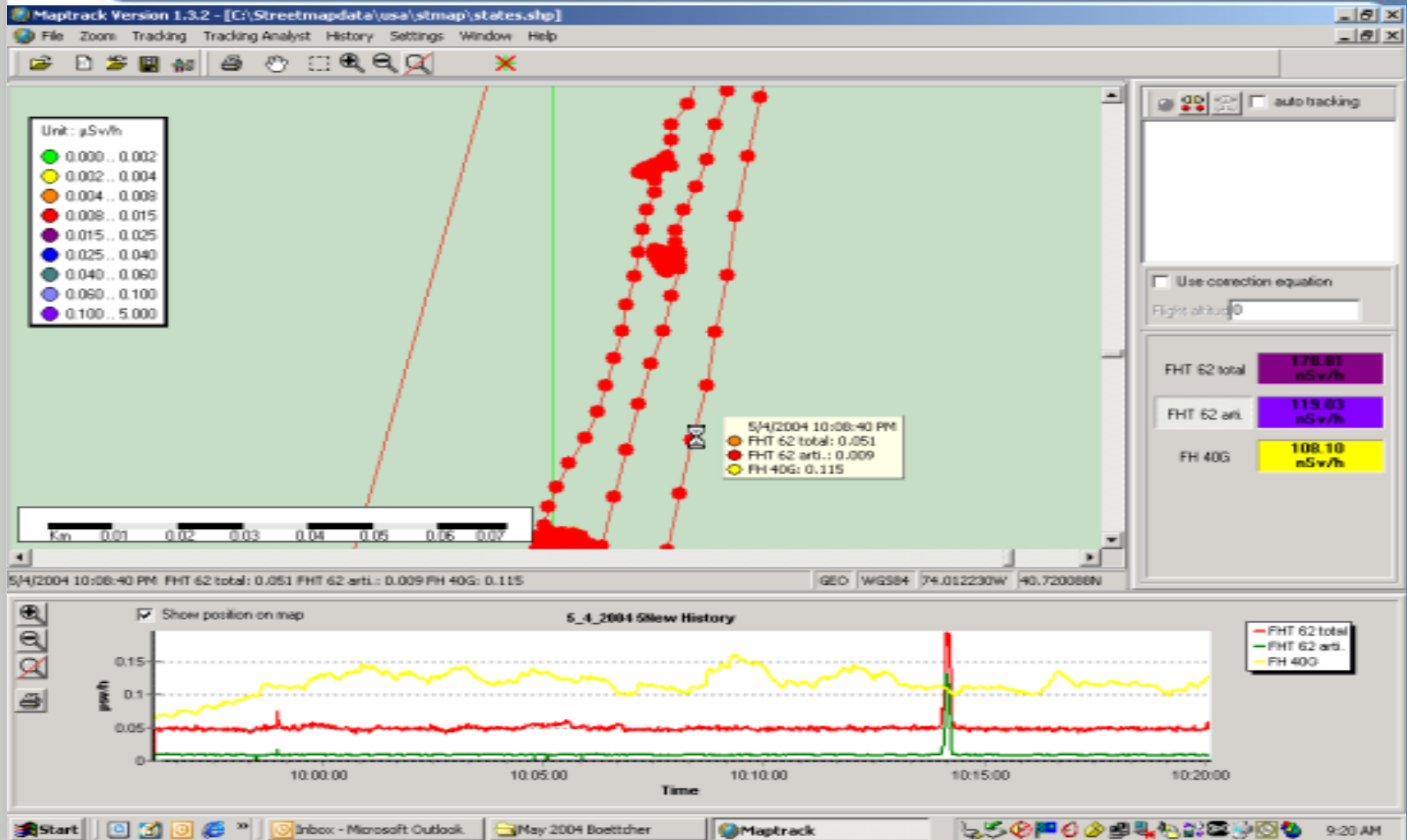
30 cm

lead

# Trials in NYC, May 2004



# Trials in NYC, May 2004, MO Application





# 2<sup>nd</sup> Weapons of Mass Destruction Civil Support Team

## □ **What is the 2<sup>nd</sup> Civil Support Team?**

The *2<sup>nd</sup> Weapons of Mass Destruction Civil Support Team*, also known as *2<sup>nd</sup> CST*, is a federally funded New York Army National Guard unit established under Presidential Decision Directive 39. The full-time unit is stationed at Stratton Air National Guard Base in Scotia, New York. The *2<sup>nd</sup> CST* is one of 32 such units in the United States. The first 10 teams, New York being one of them, entered service in 2001, 17 additional CST's entered service in 2002 and 5 more will be operational in 2003. Originally designated "*RAID*" for *Rapid Assessment and Initial Detection*, the teams were renamed to *Civil Support Team* to emphasize their supporting role to civil authorities.

## □ **What is the mission of 2<sup>nd</sup> CST?**

... CST DEPLOYS TO AN AREA OF OPERATION TO: "... Support the civil authorities at a domestic CBRNE (Chemical, Biological, Radiological, Nuclear or High Explosive) incident site by identifying CBRNE agents / substances; assess current and projected consequences and advise on appropriate response measures; assist with appropriate requests for state response."

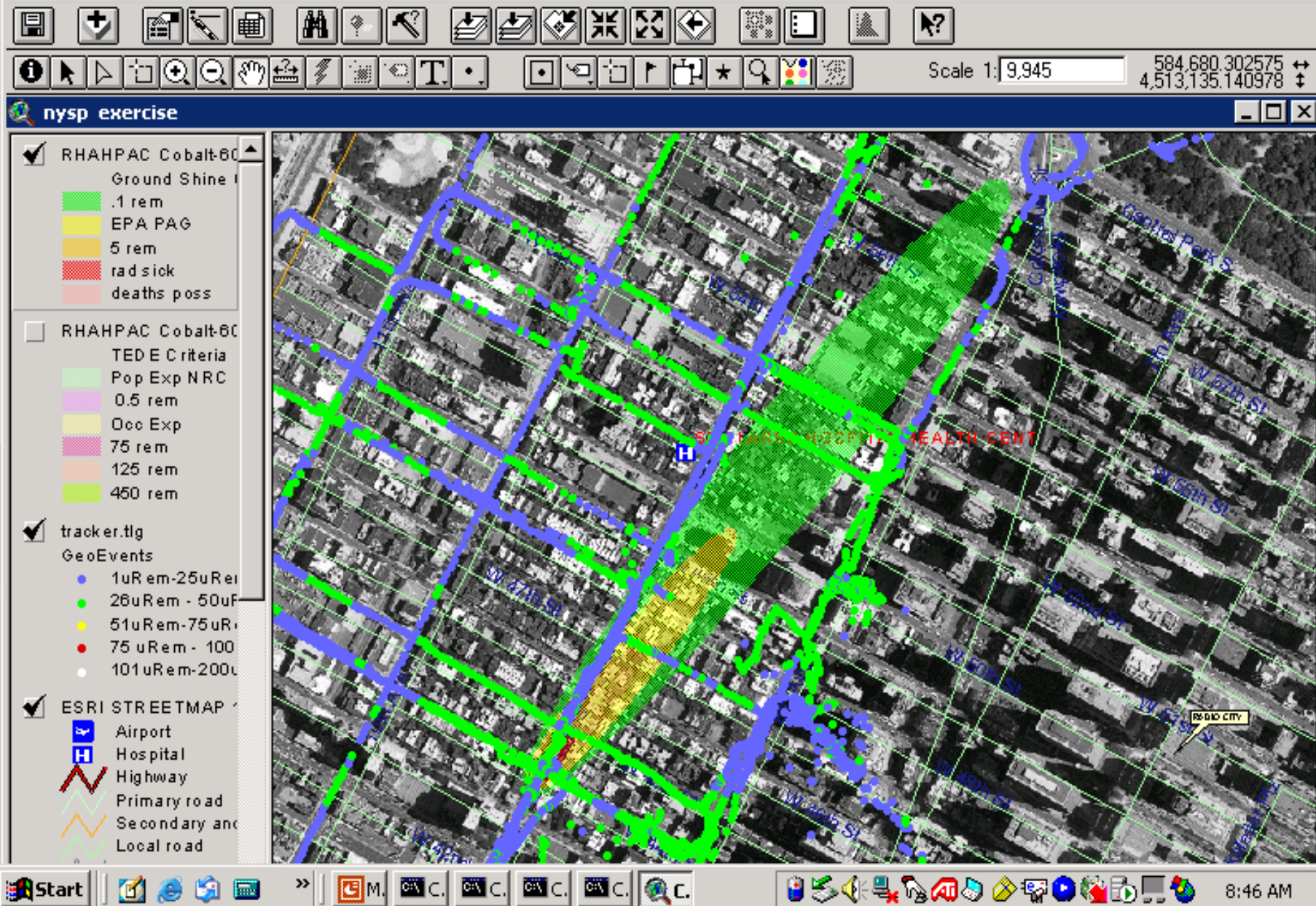
*To execute this mission the CST has three core competencies: to provide analytical function to obtain, process, and presumptively identify unknown agents; to establish and maintain a robust interagency communications capability; and to provide the incident commander with an array of civil military response options and advise.*

# Early Results with MDS with 2<sup>nd</sup> CST, NYC

12/31/03



# NYC image with 2<sup>nd</sup> CST's RDD Model overlaid on MDS Data



# Summary

- Lightweight portable mil. spec. system for reconnaissance and discovery of artificial gamma radiation sources by air, ground or sea
- Can be used for surveys of large areas by air or ground
- Additional probes can be added for discovery and accurate dose rate measurement of low energy gamma and neutron radiation
- Alpha/beta probes can be added to aid field personnel with measuring localized contamination and releasing personnel
- Can be configured with any version of ArcView
- Simple MO applications are available
- Completely customized ArcGIS Engine applications are now available
- System can be easily configured with CATS-JACE, using ArcView 3.3
- Simultaneous mission viewing from ground station is also available
- Special housing for use in UAV's is available
- Underwater probes can also be added to the system
- Can be a simple reconnaissance tool or complete response system

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- 2<sup>nd</sup> WMD CST
- New York Police Department
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- Thermo Electron Radiation, Measurement and Protection and Environmental Instruments Division

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