Statement of Work
Airborne Spectral Photometric Environmental Collection Technology (ASPECT)
Gamma Emergency Mapper (GEM) Project

**Title: ASPECT GEM Airborne Radiation Screening Tool**

**Background**

The purpose of this activity is to improve the US EPA airborne gamma-screening and mapping capability of ground-based gamma contamination following a wide-area radiological dispersal device (RDD) or improvised nuclear detonation (IND) attack. The goal is to develop the most advanced gamma-radiation detection capability mountable within an Aero Command 680 airframe. This technology will use on-board integrated geospatial, high-definition photography, mapping and satellite technology to send scientifically-valid images of the contaminated areas to EPA unified command and decision makers within minutes of completing a sortie.

This project directly supports the EPA Office of Homeland Security focal area that directs the agency to *"Develop appropriate/effective technologies to lessen the time frame for characterization and decontamination… for widespread contamination of populated areas following a radiological dispersal device (RDD)."*[1]

**Project Team**

The ASPECT GEM project is led by members from the National Decontamination Team (NDT) and includes subject matter experts from EPA Special Teams (Radiological Emergency Response Team [RERT], Environmental Response Team [ERT], the EPA National Homeland Security Research Center (NHSRC), Office of Radiation and Indoor Air (ORIA), the University of Cincinnati, Los Alamos National Laboratory, ASPECT pilots and technicians, and most recently the Department of Energy.

**Homeland Security Benefits**

EPA's strong collaboration with DOE will result in the agency achieving a state-of-art radiological detection capability via the quickest timeline by incorporating DOE's lessons learned into this project. This relationship also benefits Homeland Security by:

(1) adding one more aircraft with the latest radiation detection capabilities to the limited federal inventory,
(2) quickening response times to the central part of the United States (EPA aircraft is stationed near Dallas, Texas; DOE aircrafts are stationed in Las Vegas and Washington DC), and
(3) ensuring consistent products from multiple federal agencies to decision makers in the field.

[1] EPA Homeland Security Workplan dated July 2008. EPA, Office of Homeland Security

**ASPECT GEM Website**

A website (www.epaosc.net/aspectgem) has been created to coordinate and communicate activities among the team members and organizations. It contains summary and reference documents that provided additional information if needed.

# Design Conditions

1. Up to three lanthium-bromide [$LaBr_3$(Ce)] crystals (largest available size but no larger than 3x9 cylinder or 2x4x8 inches)
2. Up to six sodium-iodide [NaI(Tl)] 2x4x16 inches crystals.
3. Must fit inside Aero Commander 680 aircraft
4. Maximum Weight (220 lbs), not including back-up system.
5. Power (28 V DC; 12 V DC)
6. Detect Isotope of Interests (Cs-137, Co-60, Ir-192, Uranium and Thorium, K-40, Fission Products)
7. Minimal mouse controls – switch on/off for data collection
8. No cryogenics
9. Software application and data management
    a. Capable to map gross count / calibrated exposure rates while in-flight.
    b. Start-up defaults (ready to collect data without optimized instrument settings)
    c. At minimum, a 1,024 channel gamma spectrometer for isotope identification capability
    d. Data format must be compatible with EPA data management protocols (http://www.emsus.com/frtr/decisionsupport/DST_Tools/SCRIBE.htm)
    e. Use passive system setup and performance for validation (e.g., no radioactive sources)
10. Engineering requirements
    a. Mounting system built to meet FAA requirements (e.g., able to withstand 9 G forces).
    b. Automatic gain stabilization
    c. Communication input/output ports should include Ethernet, RS-232, and USB
    d. Operating Temperatures between -20$^{o}$F to 110$^{o}$F
    e. Photomultiplier tubes (PMT) must be shielded by Mu-metal to provide sufficient shielding to limit the gain shift to no more than 1% geomagnetic application (compass effect from PMT/crystal orientation).
    f. No crystal voids
    g. All crystals to be oriented in a “downward-looking” configuration.
    h. 7.5% resolution maximum at Cs-137 off the large face of the NaI(Tl) and $LaBr_3$ crystals.
    i. Integrated circuitry to minimize or prevent failures due to turbulence.