

## THREAT AGENT DEFEAT MODELING AND TESTING USING WMD SIMULANTS

# Ambient Air Test Facility For Testing Of Chemical Aerosol Identification Point Detection Sensors

**Vasanthi Sivaprakasam** Naval Research Laboratory **Cathy Scotto** Naval Research Laboratory **Matthew Hart** Naval Research Laboratory **Oyedoyin Aduroja** NRC Postdoctoral Associate, U.S. Naval Research Laboratory **Jay Eversole** Nova Research Inc. **Ken Grabowski** Nova Research Inc.

For a current program of interest, the Ambient Air Test Facility (AATF) at the Naval Research Laboratory is being operated as a test facility for developmental chemical aerosol point detection sensors. The facility draws ambient air from outside the building, with or without HEPA filtration, then introduces generated aerosols of interest within a 30-cm-diameter, 14-m-long air tunnel at flow speeds of 2 m/s to 15 m/s. At these speeds, the turbulent flow provides a homogeneous distribution of the aerosols to a few percent over most of the tube cross section by the time the flow reaches sampling ports in a 3-m-long test section at the end of the tube. The test section allows sampling and analysis by developmental sensors and various referee sensors to determine aerosol size, concentration, and chemical composition in the presence of realistic backgrounds.

We generate simulant and interferent aerosols representing various classes of chemicals of interest. A range of aerosol generators are used to generate liquid or dry aerosols of interest that becomes well mixed with the carrier air (ambient aerosols or filtered air) in the air tunnel. Generators such as the Collison nebulizer, Tekcelo vibrating mesh nozzles and Sono-Tek ultra-sonic nebulizers generate aerosol particles over a wide range of particle sizes and concentrations. Multiple referee instruments are used to characterize the resulting aerosols. Commercially available particle sizers such as the TSI APS 3321 and Palas Promo 2000 provide particle size and count. A high-resolution, time-of-flight aerosol mass spectrometer (HR-ToF-AMS) from Aerodyne, Inc., determines inline particle composition. The AMS is configured with an aerosol focusing lens to transmit 100 nm to 3.5  $\mu\text{m}$  diameter particles, and provides both aerodynamic size, mass loading and chemical composition information. In addition, Tenax adsorption tubes with Thermo-Desorption Gas Chromatography Mass Spectrometry (TD-GCMS) collects for offline quantitative calibration purposes. A filter paper collection method followed by gravimetry studies is implemented to validate the total mass loadings. A calibration system consisting of a scanning mobility particle sizer and a water-based condensation particle counter is used to validate the calibration and operation of the AMS instrument.

Measurements will be conducted on a number of chemicals representing various classes of interest. Some of these measurements and analysis will be presented from the suite of referee instruments discussed above. The capabilities of the aerosol generators in terms of particle size and concentration will be described and comparison between particle sizers and mass measurements will be presented. Aerosol compositions from the HR-ToF-AMS will results from offline TD-GCMS.