Objectives:
To characterize particle and trace gas precursor species from several CFM56 class engines at the engine exit plane as well as at selected down stream locations to advance the understanding of particle emissions and their evolution in the atmosphere from current in-service turboshaft engines.

Parameters measured (total and non-volatile aerosol)
Dgeom – number based geometric mean diameter
Sigma – geometric standard deviation
Dgeom M – mass (volumetric) based geometric mean diameter
Elm – number based emission index
Elm – mass based emission index

Test Location
Oakland Airport, Ground Runup Enclosure
Aug. 23-25, 2005

Sponsors:
NASA, EPA, FAA, CARB

Participants:
AEDC, ARS, Carb, EPA,
NASA (GRC, LaRC),
UCF, UCR, UMR

Observers:
Boeing, GE

Instrumentation
Combustion DMS500 (2)
DMA
TSI CNC
CO₂ detector
Weather station

Result highlights for CFM56 engines
(averages for all powers and engines studied)

> Particle diameters fall into the range from 12 to 30 nm. Number and mass based geometric mean diameters increase with engine power.
> Number based emission indices exhibit a minimum at low to mid power, range from 0.5 to 28x10⁻⁸ kg fuel, and increase in the plume.
> Mass based emission indices tend to increase with power and range from 0.002 to 0.25 x 10⁻⁸ kg fuel.

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