Aircraft PM emissions have been limited since 1981 and measured by means of the metric filter smoke number (FSN) using an undiluted heated sampling system. The regulation has been effective in eliminating visible smoke around airports. Now, a new metric is sought to better characterize the invisible particle matter (PM) emissions. This metric is needed to understand and better quantify the effects of PM emissions on health and climate change. So the mass and number of particle emissions originating from turbines are to be quantified with a more sophisticated sampling and measurement system. The Aerospace Information Report (AIR 6421) [1] defines the measurement protocol. Its hallmarks are an early dilution and cooling of the sample, well-defined set sample flows as well as tubing lengths and diameters.

Prototypes of this AIR compliant system have been developed, tested, and results have been published. Now the first commercial version is available from AVL.

**AVL Sampling System for Aviation**

The size information in Fig. 5 is the diameter of a water droplet that has the same average mass. This metric will be useful for estimates of particle losses in the sampling system, so that a more realistic engine-out mass and number can be estimated. The corrections are significant. Detail work for applying such corrections and its validation is on-going in the SAE E-31 committee. An approximate theoretical evaluation of the effects of these losses for log normal distributions is shown in Fig. 6. For the sizes expected in aircraft measurements, the adjustments are on the order of 50% for mass and a factor of 3 for number.

**Conclusion**

The SAE E-31 committee’s AIR6241 sampling protocol has been demonstrated and is now available in a commercialized version from AVL. PM emission measurements correlate well with the proof of concept prototypes and are providing consistent measurements with the improved metric.

**References**
