

SERDP PROJECT OF THE YEAR WEAPONS SYSTEMS AND PLATFORMS

A COMPREHENSIVE PROGRAM FOR MEASUREMENT OF EMISSIONS FROM MILITARY AIRCRAFT

DR. MENG-DAWN CHENG
Oak Ridge National Laboratory
Oak Ridge, Tennessee
(865) 241-5918
chengmd@ornl.gov

CO-PERFORMERS: Mr. Edwin Corporan (AFRL); Dr. Matthew DeWitt and Mr. Christopher Klingshirn (UDRI); Dr. Shannon Mahurin (ORNL); Dr. Robert Kagann and Dr. Ram Hashmonay (Arcadis); Dr. Richard Shores and Dr. Bruce Harris (EPA)

The growing demand for jet air service for war fighting and transport of cargo and soldiers is likely to generate increased emissions, which can cause deterioration of local and regional air quality and visibility. Aircraft fuel and emissions contain mixtures of gas and particle pollutants that are known to be harmful to human health and the environment. The lack of a standard methodology for measuring military aircraft emissions has hindered efforts to accurately measure contributions from military sources.

Dr. Meng-Dawn Cheng and his team have developed a comprehensive emission-characterization program for military aircraft on the ground in ambient conditions. Emissions were measured in relation to several factors such as engine power setting, sampling configuration, and measurement technique. For a given pollutant, the emission index was calculated with respect to the engine power level. Sampling and measurement technologies utilized in this program are classified in two platforms. One class of measurements perform on the plume samples physically extracted from jet engine exhaust, transfer the exhaust material to time-integrated samplers and continuous measurement instruments, and analyze the collected particulate matter and gases in-line on site or off-line in a laboratory after the campaign. The other class of measurements do not extract or transfer sample material from the exhaust plume; instead, they rely on optical remote sensing techniques for continuous plume measurement on-site.

Through this effort, state-of-the-art measurement techniques and instruments are now available for military aircraft emissions. The resulting high-quality aircraft emissions factor data sets reduce the uncertainties associated with existing emission estimates, support regulatory decision making, and assist in the design of cost-effective air pollution control strategies.