

Final Report for FY2005- HARC Contract H-44-C-2005 TVA

Submitted to Houston Advanced Research Center

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Executive Summary

With funding from the Houston Advanced Research Center (HARC), the Tennessee Valley Authority (TVA) outfitted and managed the operation of a Twin Otter research aircraft for the 2005 Southeast Texas Transport Study to provide research measurements of air quality downwind of sources in the Houston, TX area. The aircraft system included TVA's integrated measurement system for airborne gases (ozone, speciated nitrogen oxides, SO₂, CO, and hydrocarbons), particles, meteorology (winds aloft, temperature, humidity, pressure), and GPS location and altitude. The aircraft was also equipped with a satellite tracking system that enabled the scientists on board the aircraft to track CMET balloons that were released as tracers of the Houston area sources. TVA coordinated the inclusion of all instrument systems including the first airborne deployment of a PTRMS hydrocarbon system from Texas A&M University and the satellite balloon system developed by co-investigators from the University of Massachusetts and Battelle Memorial Institute/Pacific Northwest National Laboratory. PNNL also provided and operated a particle spectrometer for the study.

The aircraft system was installed and tested in early July at Grand Junction, Colorado and then the aircraft was deployed at Conroe, TX, on schedule, during the last two weeks of July 2005. Three successful balloon tracking and air quality sampling missions were conducted during the two week field study window, as planned. During the flights the scientific crew included scientists from TVA, PNNL, and Texas A&M. The aircraft measurement systems performed well and the system was on call for potential flight operations on every day of the planned study program. No mechanical problems with the aircraft occurred during the field program. Overall data recovery was very high, exceeding 95 percent for most of the measured parameters, and real time on-board data displays functioned very well throughout the measurement period. TCEQ also provided a thorough performance audit of the analytical systems during the field study.

The program proved conclusively that it is possible to track urban and industrial plumes over long travel distances and over night time transport using state-of-the-art balloon tracking and real time air quality technology. The balloons were released into the urban plume in the late afternoon and were successfully followed throughout the night. The raw data from the on board instrument systems verified that the balloons were useful tracers of the urban plume.

All the raw data have been archived and provided to the customer. At the writing of this summary, work on the project is continuing at TVA. As planned, the raw data are being processed by TVA scientists and the QA review is ongoing. It is planned that all data will be finalized during fall of 2005 and provided to the customer. All the TVA project work from data collection through the validation and reporting process will be completed within the original budget estimate. TVA scientists are currently actively involved in the scientific reporting and analysis of the results. One technical conference paper coauthored with other study participants has already been submitted for inclusion in the December 2005 meeting of the American Geophysical Union.