AAFEX Status Report #3 – 22 January 2009

Primary Activities: Rake and inlet plumbing; instrument setup/test/calibration

Weather: Calm, 58 F at 7 am with overcast. Periods of rain, sometimes heavy, between 9 am and noon. Afternoon overcast with occasional drops of rain as well as period of sunshine; temperatures near 70 F.

Summary: Work started around 7 am, with all groups present in full force. Major accomplishments and notable activities are described below.

About half the participants received photo IDs and can gain access to the hanger and experiment area without NASA escort. About 10 AAFEXers also took a flight-line driver training course and obtained drivers licenses that allow them to drive qualified vehicles to/from the hanger. This should greatly reduce the transportation problem that we experienced during the first two days of the campaign.

Ron Sun, Dryden Facility Engineer, inspected the rake and probe installations to satisfy the safety review board's need for documentation on the durability of sampling system equipment mounted in the exhaust of the aircraft. He was particularly impressed with the EPA, 30-m inlet probe installation (Figure 1). He and Frank are also reviewing the 30-m instrument enclosure (Figure 2) and have asked a Dryden structural engineer to evaluate the AEDC load/stress calculations for concurrence. Although thought to be "dead in the water" due to its lack of inclusion in the experiment documentation, it appears that the 30-m in situ measurement box may still have life.

NASA Dryden's photographer came down to document our setup and obtain photos for possible inclusion within a press-release that will be issued early next week. A group photo was made and will be available on a web site shortly (more details later). The photographer and a videographer will return to the site on Tuesday (Jan 27) to document activities during and after an engine run.

The day's mechanical work focused on plumbing and securing the sampling rakes and inlets. Despite losing much of the morning to rain, AEDC and the MST Bruise Brothers made great progress on meeting the 1-m plumbing challenge (see Figure 3) as they: positioned and wired the sample line heaters and valve boxes for both engines; emplaced the heated sample lines and began to install them; and made connections between the valve boxes and the MST sample distribution manifold. AFRL also made strides in installing their 1-m sampling equipment as they were able to hook up and test their heated, multiport valve box and independent sampling lines. UTRC and NASA spent much of the afternoon installing the common 30-m sample inlets and securing the flexible sampling lines to the tarmac. Using Rick's (ARI) suggested approach, they were also able to mount a pitot tube to the 30-m rake stand to facilitate plume velocity measurements at that location (Figure 4). The EPA team completed tying down the 2" diameter

sample lines; installed the sampling tunnel; and leak checked the complete 30-m sampling system. The ARI/Harvard downstream team began building up a sampling system that would hopefully allow them to preserve HONO and other "sticky" gases in air transported through 15-m of tubing (Figure 5).

Investigators also focused on testing and calibrating their instruments. Changlie reported having his conventional gas-phase analyzers (CGA) and the FTIR multi-gas analyzer (MGA) up and running. Chris also cranked up the AFRL instrument suite and was able to make reasonable measurements of background CO2 mixing ratios. Andreas and Eddie tested the NASA LaRC instrument suite and found that, with the exception of the cloud condensation nuclei (CCN) detector, all equipment had survived the 3500 mile trip from Virginia. The CCN problem was quickly diagnosed and replacement parts are being overnight expressed from Langley. ARI reported making aerosol and gas-phase measurements on ambient air samples. MST busied themselves preparing instruments for installation aboard the downstream trailer (Figure 6) and use in the line-loss tests and in testing their primary aerosol counting and sizing instruments.

UCSD made progress on adapting their ambient air, filter collectors to draw samples from the 1- and 30-m inlet probes. At 1 m, the filter box will hopefully be strapped to the AEDC temp-trace line controller and be fed samples from a ¾" tube attached to the button-hook probe on the #3 engine rake. They plan to avoid overheating the monitor's blower motor by either reducing the sample flow rate or intentionally making the sample-tube connection loose to allow ambient air to bleed into the filter inlet. At the 30-m position, they will direct exhaust from the EPA high-volume sampling system into the inlet of their filter collector.

Figure 1. Dryden facility engineer, Ron Sun, inspecs 30-m inlet on #2 engine.

Figure 2. Dave (UTRC) assembles the instrument enclosure that will hopefully be mounted just behind the #3 engine, 30-m inlet stand.

Figure 3. AEDC and MST attack the 1-m inlet rake plumbing/wiring problem.

Figure 4. Top of the #3 engine, 30-m rake stand showing the common sample inlet (left) with dilution air feed tube attached; the EPA 2” inlet with leak-check plug installed (center); and the pitot-static pressure tube (right) that will be used for air velocity measurements.

The ARI/Harvard team applies its considerable brainpower toward solving the downstream inlet installation problem.

Figure 6. Max Trueblood, veteran of numerous field campaigns, readies an MST instrument for deployment in the downstream instrument trailer.