

AAFEX-II Status Report #2 – 22 March 2011

Primary Activities: Continue instrument setup, connect power, install rakes and probes.

Weather: 41 F at 7 am, mostly clear with strong southwesterly winds. Had to scrape frost off the Southern California rental car windshield with a credit card. Temperatures climbed to near 60 F in the afternoon and working conditions were superb, allowing the group to make significant progress on work objectives.

Summary: Participants departed the Embassy Suites around 0700, proceeded to the AAFEX-II site without too much delay in passing through security, resumed work on activities initiated the previous day, and launched new efforts on several fronts. Here are a few highlights:

- On the facilities side, DAOF came through in delivering the all-important Port-o-lets. Dual units were placed near the primary vehicle encampment and singles were positioned near the downstream site and E-31 trailer. In addition, the large, nitrogen-gas tank trailer arrived and was parked on the west ramp, near the MST trailer where its contents will be used to dilute exhaust samples and provide “zero” gas to several instruments. Two, “six-packs” of A-size nitrogen cylinders were also delivered and secured by the main group of trailers.
- After some adventures in travel, the Aerodyne contingent arrived late Monday and was on-site first thing Tuesday morning. The crew quickly jumped to task, with Eben taking lead in installing instruments in the downstream trailer and Mike and Zhenhong unloading and setting up their High-Resolution Aerosol Mass Spectrometer (Figure 1) in the NASA van. Rick and John focused on getting the ARI mobile laboratory over to the site and getting its instruments up and operational.
- Once again, the AESO team was a blur of activity, completing the DB2.0 installation (Figure 2), relocating and powering their container/lab, and setting up/calibrating instruments. The team is installing a small box near the 1-m rake stand. It and the DB2.0 will contain duplicate, remotely operated aerosol sizing instruments, which will facilitate comparisons of aerosol microphysical characteristics in fresh and aged exhaust.
- At 0900, about 15 participants gathered in hanger room 241 to take a flight-line driving course administered by the dynamic, Mr. Roger Williams, who managed to expand a 15-minute slideshow into a 1.5 hour presentation. All attending passed the 30-question final examination with distinction and are now qualified to ride bicycles between the hanger and experiment site.
- LaRC with help from ARI resumed installing the 30-m sampling lines. About 160 and 120 feet of ¾” OD stainless tubing were respectively required to connect the left and right inlets to the common manifold in the MST trailer. The lines were leak tested by placing a filter on one end and using a CPC to count the number of particles in ambient air samples drawn through the tubes with a vacuum pump. Later, the fractional loss of particles from samples drawn through the long lines were examined by placing identical CPCs on the up- and downstream ends and comparing count rates (Figure 3). Losses were typically on the order

of 20%; more detailed line penetration measurements using monodisperse test aerosols will be conducted prior to engine runs.

- Around 1230, after multiple phone calls and lots of paper pushing and arm twisting, the facility electrician came to the site and connected the power distribution panel to 440-VAC 3-phase outlets in the power substation adjacent to the experiment site. Folks from MST, AEDC, and LaRC immediately began ringing out the secondary panel plugs (Figure 4) and hooking up umbilicals to the various trailers. Power was established to all near-field equipment shelters by about 1500. Additional parts were needed to connect the downstream trailers; those will be obtained and brought out to complete the work on Wednesday morning.
- Chris, Joe and the AFRL team spent the day hooking up instruments and connecting power to the Tertel trailer (Figure 5). Their kit has grown since AAFEX-I to now include black carbon measurements from a MAAP sensor and collection of impinger samples for subsequent determination of hazardous pollutant emissions.
- Dave and John made great progress in setting up the E31 trailer (Figure 6). Tables were obtained from the hanger and set up along the sides of the experiment space to support the multitude of sampling system components and instruments that are being tested as part of the ARP validation activity. Central sampling system elements were connected and suspended from the trailer wall nearest the aircraft engine to allow easy access for attaching instruments and incoming sample lines. Shipments of borrowed instruments from EPA and TSI arrived and were loaded into the trailer.
- AEDC continued work on setting up the very complicated, 1-m rake stands and associated sampling probes (Figure 7). During early morning and to prevent stand movement during high power engine runs, both traversing tables were firmly attached to the concrete pad using large anchor bolts. Afterward, Brad made great progress in inserting new inlet probes and attaching dilution and sample transport lines. Probes for the E-31 and AESO tests arrived in a mid morning shipment and are next on the list of items to be installed.

ITEMS ON THE AGENDA FOR DAY 3:

- Hook up dilution gas trailer
- Continue plumbing 1-m rake
- Establish single phase 220VAC power to the two downstream trailers
- Leak check and characterize sampling lines.
- Continue instrument calibrations and tests.



Figure 1. Zhenhong takes the AMS out for a bit of exercise to keep it in tip-top shape for the upcoming emissions tests.



Figure 2. After hours of drilling holes, turning nuts and screws, and lifting heavy panels, DB2.0 assembly is finally complete.



Figure 3. Eddie sets up instruments to check the integrity of the 30-m sampling lines.



Figure 4. Steve and Dave check power connections on the EPA distribution panel.



Figure 5. The proudly displayed TERTEL banner announces the AFRL instrument trailer is ready and open for business.



Figure 6. John and Dave begin an Extreme Home Makeover of the E-31 trailer.



Figure 7. Right 1-m sampling rake mounted on a 5-foot traversing table. The AFRL dilution tunnel is located to the left and the heated, 6-port valve box is on the lower right. Another rake will be attached to the right of the main rake to supply exhaust samples to the AESO experiment.