AIR RESOURCES LABORATORY
Laboratory Accomplishments

List 3-5 major accomplishments for your laboratory. If accomplishment occurred more than 2 years ago, cite recent progress. Please specify importance of accomplishment, who have been the major users and what has been the benefit to the taxpayer.

1. Dispersion Model Development

The original "Gaussian Plume" dispersion model was an early ARL development, now used universally. In recent years, it has evolved into the Hybrid Single-Particle Lagrangian Integrated Trajectory model (HYSPLIT), now used operationally by the National Weather Service and a large number of external organizations (such as in other countries – China, Australia, South Africa, etc., – and by various mainstream organizations internationally as well as locally). HYSPLIT is made available on the ARL Realtime Dispersion Assessment and Display System (READY) to more than 1600 registered users. In the last year, HYSPLIT has been made available to all Weather Forecast Offices as the mainstream NOAA capability to address issues related to Homeland Security.

2. Air Quality Modeling

The third generation air quality assessment model (MODELS-3/CMAQ) has now been adopted as the mainstream air quality assessment tool for use in regulatory and control applications in the USA. In the last year, it has been adapted for coupling with the NWS ETA model system, so as to provide the entry-level air quality forecasting model soon to be used operationally by the National Weather Service in partnership with the Environmental Protection Agency. This development is facilitated by the recently signed Memorandum of Understanding on Research between EPA and NOAA, and the associated Memorandum of Agreement on Air Quality Forecasting.

3. Urban Dispersion

The recent recognition of the vulnerability of American population centers to terrorist attack caused the rapid development and deployment of dedicated turbulence measuring systems across the Washington, DC, downtown area, in support of specialized forecasting of dispersion in this particular urban area. The activity has now been extended to address New York City. This DCNet work is widely seen as a centerpiece of the emergency management capability now in place in the Nation's capital. The research that accompanies the deployment of the instrumentation is rapidly leading to the development of new high-technology systems for forecasting dispersion in other urban areas, not only in Washington. Trial systems are about to be deployed at two Weather Service Forecast Offices. In parallel activities, ARL has vastly improved its capabilities related to the use of atmospheric tracers, and has provided the related skills and field expertise at the first two of the modern sequence of urban experiments – Salt Lake City and Oklahoma City. This activity will provide a vastly improved capability to protect the public in the event of a terrorist attack.

4. Mercury in the Environment

Mercury emitted from coal burning and other sources remains in the air for an extended period, until transformed into chemical forms that are soluble and are therefore easily deposited to the surface. ARL science over the last two years has helped identify the chemical processes that lead to this transformation, especially at high latitudes where the deposition of mercury is especially important (because it accumulates in mammals that are part of the food chain of humans). ARL models have addressed the transport and transformation of mercury in air, and have been used at a policy level to help identify regional origins of mercury that could be curtailed. The issue of growing importance, since increasing reliance on fossil fuels in developing countries is rapidly elevating levels of mercury in air, with potentially severe consequences to US fish stocks.

5. Flux Measurement Systems and Aircraft Programs

Following a decade of development using small research aircraft, the ARL Mobile Flux Platform has been adapted for use in hurricane research using the P-3 aircraft. The system, with its infrared gas analyzer system for measuring carbon dioxide exchange rates with the surface, is now standard equipment on Sky Arrow aircraft used for atmospheric research. Expansion of the ARL aircraft rogram is now anticipated, with the proposed addition of a Velocity aircraft to the NOAA fleet. Similar flux measuring systems have recently been deployed at ground stations, to provide surface benchmarks for future assessments of regional water cycles and carbon dioxide sequestration.

6. Climate Programs – "Integrated" Monitoring

ARL has steadfastly advocated the adoption of the principles of integrated monitoring in its research activities, strongly promoting the collocation of various measurement programs and the integral coupling of measurements with ongoing research and interpretation. The focus of ARL ongoing "quasi-operational" measurement programs is on the interaction between the atmosphere and the surface, and the extraction of meaningful climate data from other than specialist sources of data. These climate activities extend beyond the atmosphere alone. They also address aspects of ecosystem behavior such as water quality. ARL components of this monitoring activity address the exchange of radiation components, and of water, heat, momentum, carbon dioxide and various trace chemicals (the last in the Atmospheric Integrated Research Monitoring Network). A parallel part of this program couples ARL sensor technology research by (a) supporting the development of the Climate Reference Network and (b) the extraction of climate trends and variability data from routine radiosonde and ozone observations.