

Atmospheric Research FAAM Flies at Last

Application Note AR-001

On October 1, 2003 the United Kingdom Facility for Airborne Atmospheric Measurement (FAAM) research aircraft, registration G-LUXE, took off from Woodford Aerodrome in Cheshire, England for the first of about 18 tests. The first flight lasted 4 hours and went to 35,000 feet. It marked a major milestone in the development of a replacement for the old C-130 Hercules that provided such sterling service for many years. The new platform is the BAe 146-30 aircraft and is based at the BAe airfield at Woodford during testing.



*Rendering of FAAM's new BAe 146-30 aircraft.
Image courtesy of BAe Systems.*

The replacement aircraft has been largely funded through the Joint Infrastructure Funding Project and the Natural Environment Research Council. Eventually, over £21,000,000 (approximately \$35,000,000) will be spent on this one project. It is anticipated to be a major provider of atmospheric, environmental, and meteorological research data over the next decade.



TSI Model 3776 Ultrafine Condensation Particle Counter (UCPC). Successor to the 3025A UCPC.

Scientists and engineers from all the major British universities and research groups have been involved, with a major lead coming from the Physics Group at the University of Manchester Institute of Science and Technology (UMIST) and the University of Cambridge. Dr. Martin Gallagher of UMIST said that this new aircraft and its associated instruments will represent a fundamental step forward in the way the UK university community conducts research into physical and chemical properties of the atmosphere. It will help answer important questions about how global climate works and how it may alter in the future.

The UK Universities Atmospheric Science community has been campaigning for such a national facility for many years. Professor Peter Jonas and his colleagues at UMIST and Dr. Rod Jones at the University of Cambridge have been central to the selection of a new, state-of-the-art instrumentation suite. Instruments include systems for measuring a wide array of physical, optical, and chemical atmospheric parameters.

We are pleased that two TSI Model 3025A Ultrafine Condensation Particle Counters (UCPCs) have been specified for inclusion in the instrumentation suite. One CPC is included as a core instrument that will be a permanent, key feature of the on-board instrumentation package. The Model 3025A is widely respected as the de facto standard by which all Condensation Particle Counters are judged.

A TSI Model 3563

Integrating Nephelometer is also a permanent instrument in the FAAM aircraft. Installed by the UK Meteorological Office, this instrument measures the total scattering (7° to 170°

angular integration) coefficient and the hemispheric backscattering (90° to 170°) coefficient at three visible wavelengths (450, 550, and 700 nm), each with a bandwidth of 50 nm. That's a total of six parameters! This data is used in studies such as atmospheric visibility, radiative forcing, and the extinction budget pertaining to aerosol particles. Temperature, pressure, and relative humidity are also measured within the nephelometer so that the state of the input aerosol (deliquescence, for example) can be estimated and, therefore, compared to the ambient state outside the aircraft. The instrument is sensitive to $\sim 10^{-7} \text{m}^{-1}$ using 30-second averaging. Data from the nephelometer is recorded at 1 Hz.

An Aerosol Droplet Analyzer (ADA), a modified [Phase Doppler Particle Analyzer \(PDPA\)](#) System, is also installed on the aircraft. The system measures:

- Cloud droplet size range from 0.7 to 128 μm diameter
- Cloud-droplet number concentration
- Instantaneous volume flux
- Cloud liquid-water content
- Cloud-droplet geometric mean and volume mean diameter
- Droplet interarrival time
- Size-velocity correlation as a function of size



TSI Model 3563 Integrating Nephelometer



A similar BAe 146-100 aircraft. Photo courtesy of BAe Systems

Other instruments have been included in the core package and will very soon be generating huge amounts of data as a critical part of many national and international atmospheric experiments. Learn more about the program on the FAAM web site at <http://faam.nerc.ac.uk/>.

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