Now that wind profilers have been added to its product selection, Vaisala now has a full range of atmospheric remote sensing instruments to assist its customers in meeting a wide range of requirements. The applications of wind profiling include meteorological and climatological research, aviation, air quality monitoring and research, defense operations and land resource management. Additionally, wind profilers are used at airports to protect against vertical wind shear, and in urban areas for urban airshed modeling.

With the acquisition of the Radian Meteorological Systems group, Vaisala’s product range now includes wind profilers, in the form of the LAP®-3000 wind profiler product line. Vaisala profiler production and engineering operations are based in Boulder, Colorado (USA). The location – in close proximity to the NOAA laboratories and National Center for Atmospheric Research, NCAR – encourages scientific cooperation and coordination.

The LAP®-3000 Wind Profiler was designed in a cooperation program between the U.S. National Oceanic and Atmospheric Administration (NOAA), Sonoma Technology Inc., and Radian International LLC (Radian). In accordance with the 1991 Cooperative Research and Development Agreement (CRADA), the LAP®-3000 boundary layer profiler was developed at NOAA’s Aeronomy Laboratory and Wave Propagation Laboratory. The profiler was refined for commercial use by Radian so that it could be brought to the market.

**Vertical profiles of wind speed and direction**

The LAP®-3000 Wind Profiler is a “lower atmosphere profiler” with a range of approximately 3000 meters. The remote sensing Doppler radar produces a profile of vertical and horizontal winds up to three kilometers or more above ground level. The profile includes wind speed and direction. Vaisala produces the Radio Acoustic Sounding System (RASS) with technology developed at the National Oceanic and Atmospheric Administration. RASS can measure vertical profiles of virtual temperature in the lower troposphere, and can be integrated with a wind profiler of any frequency to augment the profiler’s capabilities. When a Radio Acoustic Sounding System (RASS) is integrated with the LAP®-3000, the profile includes virtual temperature up to approximately 1.2 kilome-
The profiler produces these data by transmitting in three or five orthogonal pointing directions. After transmitting a signal upwards, the profiler receives the return signals that are reflected back by the turbulence in the atmosphere. Then the profiler computes the wind speed and direction for the selected number of heights above the ground. In this way, the LAP®-3000 provides continuous, real-time atmospheric wind and temperature data with high spatial resolution. Furthermore, the LAP-3000 can operate unattended and/or networked to another location.

System components

The LAP®-3000 System consists of the wind profiler antenna (housed in a shelter) and a PC and server, along with associated software for processing the data. The PC is fitted with a receiver/modulator unit, interface unit and radar computer boards. A profiler monitor option is available for maintenance and system control. Peripherals include a printer, an optional uninterruptible power supply unit (UPS) and a surge suppression outlet strip. Other options available include an extended antenna aperture option, an antenna-mounting frame, a snow cover and a trailer option.

Possibilities for versatile data presentation

The LAP-XM® software on the radar computer is modular, Windows-based and can be expanded. It receives signal data, processes it, computes meteorological data products and presents the data visually. Additionally, the LAP-XM® saves and transfers data products as well as converts them into new formats. The software enables the profiler to be controlled from remote locations, and monitors both the profiler hardware and the transfer of data products. Moreover, for enhanced use, the user-friendly profiling software is compatible with common office applications, such as Excel and Word. The wind profiling data can be printed out, but would usually be viewed on a PC screen in graphic or tabular format. Several display options are available to meet varied customer needs. For instance, the development trends are clearly presented in spectral format for the needs of engineers and researchers whereas Graph-XM shows wind and temperature data in what is a more standard format.

Numerous applications

Customers both in the public and private sector use the LAP®-3000 for a variety of applications, including:

- Atmospheric boundary layer research
- Air pollution research
- Emergency response
- Global climate change studies
- Aviation operations
- Mesoscale meteorological forecasting
- Defense operations
- Forest fire management
- Urban airshed modeling
- Weather modification
- Offshore, shipboard, and airborne platforms
- Arctic/Antarctic research
- Optical turbulence measurements

The wind profiling data can be viewed on a PC screen in graphic or tabular format. Several display options are available to meet varied customer needs. For instance, the development trends are clearly presented in spectral format for the needs of engineers and researchers whereas Graph-XM shows wind and temperature data in what is a more standard format.

Many established users

Current government users of the LAP®-3000 include NOAA, the National Center for Atmospheric Research (NCAR), the National Aeronautics and Space Administration (NASA), the U.S. Department of Defense (DoD), and the U.S. Department of Energy (DoE), the Royal Netherlands Meteorological Institute (KNMI), the Swiss Meteorological Institute, and the Deutscher Wetterdienst (German Weather Service). Current U.S. and international private users include air-quality districts, airports, universities, and utility companies.

Other products

Vaisala also produces a number of other radar-related products in Boulder. The LAP®-16000 is a tropospheric wind profiler that operates in the range of 400-500 MHz and can measure winds up to 16 km above the ground. It employs much of the same signal processing capability of the LAP®-3000 but uses a different amplifier and has different antenna architecture. Another application of CRADA technology is the 8mm Cloud radar that operates in the K-band. The Cloud radar employs specialized electronic and signal processing technology to produce a relatively low cost, highly reliable instrument to measure cloud boundaries, cloud layers, and Doppler velocities within clouds. Another variant, the S-Band Precipitating-Cloud Radar System, measures backscatter, spectral width, mean noise level, full Doppler spectra, and Doppler velocity of precipitating clouds from 250 meters above the ground to altitudes in excess of 20 km.

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