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High-Tech Atmospheric Research Balloon Carrying Unique Ozone Instrument Trots Globe

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DURHAM, N.H. -- A 10-foot, spherical, unmanned NOAA "smart balloon" launched August 3 from Long Island, N.Y., and carrying a one-of-a-kind, miniaturized ozone detector built by the University of New Hampshire, has ended its atmospheric research mission after a 12-day journey across the Atlantic Ocean

Randy Johnson (NOAA, right) and Steven Businger (University of Hawaii, left) look on as a smart balloon rises above Long Island.

The transatlantic flight marks the first time a low-level balloon has drifted in air masses from one continent to another, while continuously measuring ozone and meteorological conditions. The balloon's ability to adjust its buoyancy to maintain its vertical position, come rain or shine, is what makes the balloon "smart."

The smart balloon technology is the culmination of five generations of smart balloon development since 1991 at the National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory in Idaho Falls, Idaho.

Randy Johnson, of NOAA, the smart balloon developer, says "There have been many changes and improvements to the balloon design and instrument package over the past 13 years that have given us our present success. For example, the recent addition of a low-power, light-weight satellite phone allows us to communicate with the smart balloon anywhere in the world and has proven to be invaluable for this research."

" NOAA's achievement, which may set a new record for a balloon flight in the lower troposphere, opens a new horizon for data collection for the atmospheric sciences community," says Steven Businger, a meteorology professor at the University of Hawaii, who helped secure funding for smart balloons' continued development.

The six-ounce, $1,000 ozone instrument was designed and built at UNH's Institute for the Study of Earth, Oceans, and Space. The ozone detector provides research-grade measurement capabilities, and in combination with the smart balloon provides an inexpensive, semi-autonomous means of measuring the evolution of pollution plumes as they move from place to

place.

"These balloon flights indicate that the ozone concentrations over the North Atlantic can be much higher than previously observed – levels approaching 200 parts per billion that greatly exceed U.S. air quality standards," says Robert Talbot of EOS, principal investigator for the UNH-NOAA Targeted Wind Sensing program under which four balloon launches were carried out. "What we don't know is how persistent these high levels of ozone are, and it will take more flights over the Atlantic in the next few years to determine this."

Smart balloon fights lasted from one to two days to nearly two weeks and, added Talbot, "were more successful than we ever imagined several months ago during the initial planning stages." The balloons traveled over many different paths after leaving North America, and confirmed the anticipated complexity of atmospheric circulation. The first balloons launched were carried north to Maine and Prince Edward Island. The third and most long-lasting balloon traveled just south of Nova Scotia, past the Azores Islands, the Canary Islands, and finally headed toward the Mediterranean region.

" It's not only a question of understanding the intricacy of the chemistry, but the transport as well," Talbot says. "These balloon measurements will not only improve our understanding of ozone distribution over the ocean, but will improve our ability to model and forecast it."

The balloon missions were part of a six-week-long air quality-climate study involving six countries and hundreds of scientists from numerous agencies and institutions. The intensive field campaign, entitled the International Consortium for Atmospheric Research on Transport and Transformation or ICARTT, ended late last week. A host of scientific platforms were mustered for the study, including a 274-foot research vessel, 12 scientific aircraft, three satellites, and the little, high-tech balloon.

Taken together, the platforms provided a detailed, three-dimensional picture of the complex chemical and physical processes that create air pollution and transport it great distances, and will ultimately be used to help forecast air quality and provide decision-makers with the solid science needed to craft public policy.

ICARTT was led by NOAA's Aeronomy Laboratory in conjunction with the UNH Atmospheric Investigation, Regional Modeling, Analysis, and Prediction program - a cooperative NOAA/UNH institute based at UNH's Institute for the Study of Earth, Oceans, and Space. A host of other agencies and institutions from around the country, including NASA, the Department of Energy, and numerous universities, were involved in this summer's project, as were scientists from Britain, France, Germany and Canada.

The following digital photos are available for download:
http://www.unh.edu/news/img/eos/randy.jpg
Randy Johnson, smart balloon developer, checks the balloon pressure.

http://www.unh.edu/news/img/eos/randysteve.jpg
Randy Johnson (NOAA, right) and Steven Businger (University of Hawaii, left) look on as a smart balloon rises above Long Island.

http://www.unh.edu/news/img/eos/track.jpg
Track of the high-tech smart balloon.

http://www.unh.edu/news/img/eos/troop.jpg
Don Troop, Research Engineer, holding the miniature ozone sensor he developed with the UNH team.