T-REX takes to the sky

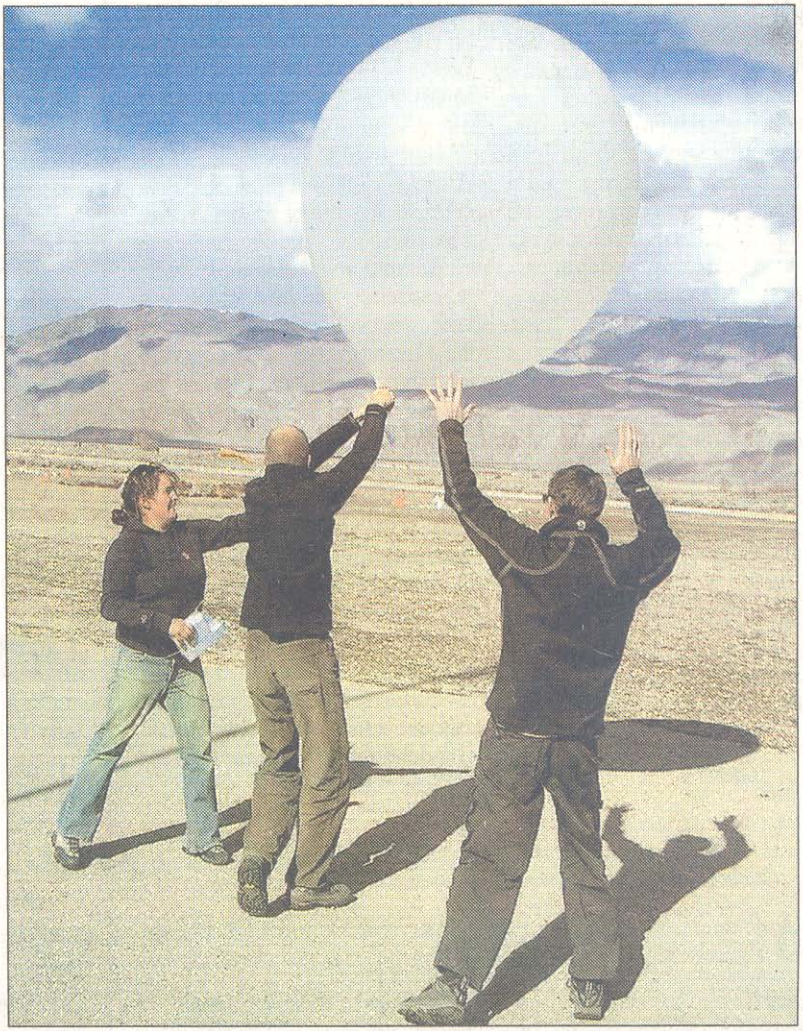
Study of local wind phenomena well under way as part of international team's research project

By Mike Bodine
Special to The Inyo Register

Stormy winds blowing in from the Pacific Ocean slam into and race up the gentle west side slopes of the Sierra. When conditions are right, these winds hit the crest, spin and rotate off the edge, creating a whirlwind, a horizontal vortex that can ripple and mix the atmospheres up to 30,000 feet above the mountains.

What this can look like in the Owens Valley is the layered, linear cloud formation, the Sierra Wave. But, for aircraft, it is unpredictable and dangerous turbulence. This weather phenomenon is common to the lee, or sheltered side of mountain ranges throughout the world. These are not thermals, the columns of updrafts created by rising heat off the valley floor.

While this "rotor effect" may not be particular to the Owens Valley, it is an ideal location to study the effect. Scientists of the Terrain Induced Rotor Experiment, or T-REX, are taking advantage of the Owens Valley and its windy conditions for a multi-million dollar data collection mission that could lead to safer air travel worldwide. T-REX project director, Vanda Grubisic of the Desert Research Institute (DRI) in Reno, said the valley was chosen for its "simplicity."



Researchers from the University of Leeds in London launch a weather balloon from the Independence Airport as part of the T-REX project to study Eastern Sierra weather phenemona. Photo by Mike Bodine

The Sierra are the tallest, steepest, linear mountain range in the contiguous United States with gentle upward and steep lee slopes, Grubisic explained from the operation headquarters at the White Mountain Research Station in Bishop.

The converted classroom at the Research Station, now the "T-REX Internet Cafe," is a busy epicenter of real-time data collection, video con-

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ferencing and weather models circling on computer monitors. An international team of about 100 scientists, graduate students and technicians working from the DRI, the University of Houston, the University of Leeds from London and the Boulder, Colo.-based National Center for Atmospheric Research are collaborating with weather services from Las Vegas and the National Research ' Laboratory in Monterey in conducting the research.

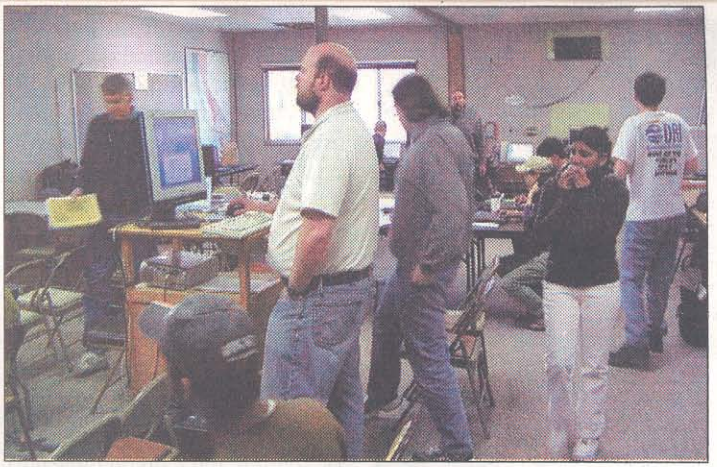
T-REX is the first field experiment to use new computer software like AccessGrid and Chat, Grubisic said, which allows video conferencing while watching and discussing the data as it is being collected. This technology allows the scientists to talk to the researchers in the field or in the air about current conditions and updates allowing for precise information gathering.

Just some of the equipment utilized by T-REX researchers includes 30- and 10-foot towers that measure wind speed and direction. Photo by Mike Bodine

T-REX is actually phase two of the experiment following the initial, exploratory phase, the Sierra Rotors Project, that was conducted two years ago and used ground-based observation systems. (To access the real-time weather data of these stations, with a two-hour delay, go to http://www.wrcc.DRI.edu/TREX). The T-REX phase consists of collecting data during coordinated efforts between aerial monitoring and fixed and mobile ground sensoring during predicted conditions.

The concentration of ground-based instruments is around Independence, north and south of what the scientists are calling the Kearsarge Gap, or Kearsarge Pass, a break in the crest of the Sierra west of Independence. Thirty- and 10-foot towers equipped with wind anemometers (measuring wind speed and direction), temperature sensors, barometers, humidity sensors and transmitters are strategically placed within the valley and into the Sierra and Inyo Mountains. Weather balloons are launched from the Independence Airport by a team from London and a large SODAR, a device measuring vertical turbulence and wind structure, chirps constantly. There is also ground-based LIDAR, light detection and ranging, or laser radar.

The LIDAR works like conventional radar but it can detect not only the visible light spectrum, but also the infrared and ultraviolet spectrums. LIDAR can measure the distance, speed, rotation, chemical composition and concentration of clouds.



Anyone stepping into what's affectionately known as the "T-Rex Internet Cafe" at White Mountain Research Station will find a whirlwind of activity – including real-time data collection, video conferencing and weather models circling on computer monitors. Photo by Mike Bodine

There will be three research aircraft involved, including a brand-new $81.5 million National Scienee Foundation Gulfstream V high-altitude jet (HIAPER). "This is the first aircraft made specifically for scientific research ... not a modification," Grubisic said. This is also the aircraft's maiden voyage for field research. The HIAPER will be flying as high as the lower stratosphere, enabling the researchers to gather data about what happens to the mixing of the atmospheres and their chemicals after being rearranged by the waves. There are also wind profilers, measuring turbulence, and the Wyoming Cloud Radar that can measure movements within cloud boundaries.

The other aircraft, stationed in Bishop and Fresno, will be flying lower and dropping instruments from the sky as ground instruments measure from the ground up. The atmospheric measuring devices, or sondes, look like paper towel rolls containing general wind and weather instruments along with a transmitter, sending real-time information to the researchers as they parachute to the ground. The drop sondes are useless once they ground. Grubisic noted that there is an effort to find and clean up the fully biodegradable drop sondes and up sondes. She explained that they are labeled as to their non-hazardous nature and where they can be returned if found for recycling.

Grubisic said the first two mountain wave events last week went well, but one flight last weekend was cancelled because of poor visibility.

The T-REX project is similar to the Sierra Wave Project performed in the Owens Valley in the 1950s, the "predecessor to the modern field research project," Grubisic said. A project planner of the Sierra Wave Project, Bob Symons, is also a part of the T-REX project, to the admiration of all of the scientists in the current project.