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 phenomena. 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 col-
laborating with weather services
from Las Vegas and the National
Research Laboratory in
Monterey in conducting the
research.

T-REX is the first field exper-
iment to use new computer soft-
ware like AccessGrid and Chat,
Grubisic said, which allows
video conferencing while watch-
ing 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.

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
The T-REX phase consists of
collecting data during coordinat-
ed efforts between aerial moni-
toring and fixed and mobile
ground sensoring during predict-
ed 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 anemome-
ters (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 measur-
ing vertical turbulence and wind
structure, chirps constantly.
There is also ground-based
LIDAR, light detection and rang-
ing, or laser radar.

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

There will be three research
aircraft involved, including a
brand-new $81.5 million
National Science Foundation
Gulfstream V high-altitude jet
(HIAPER). “This is the first air-
craft made specifically for sci-
tific research ... not a modifica-
tion,” 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 re-
searchers to gather data about
what happens to the mixing of
the atmospheres and their chem-
icals 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 atmos-
pheric measuring devices, or
sondes, look like paper towel
rags 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 per-
formed in the Owens Valley in
the 1950s, the “predecessor to
the modern field research proj-
ject,” 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.