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What Goes on in the Air? :-

14 Groups Study Weather Over Prairie at O'Neill

By Edwin Sidey

World-Herald Staff Member

O'Neill, Neb.

THE LOWER layer of the blanket of air in which we live is about to "tell all" to a group of scientists here.

A quarter of a square mile of Nebraska prairie has been converted into a laboratory for study of turbulence in the lower atmosphere. It is covered with some of the most intricate instruments ever devised for measuring wind, temperature, moisture and other factors of weather.

Operating the instruments are about 150 scientists, weather experts and Air Force men from all parts of the United States.

There are scientists from 14 universities and research centers. Nearly all have been working on lower atmosphere problems for at least three of four years, building up to the project.

Never before have so many experts and so much equipment been assembled at one place to attack the problem of what goes on in the air immediately around us.

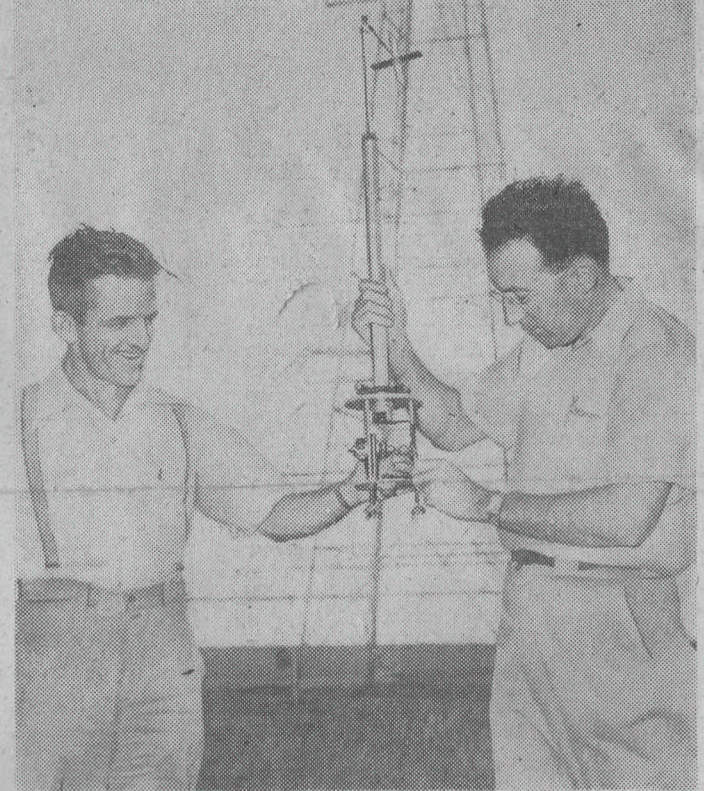
The project originated and is being directed by the Air Force Cambridge Research Center, Boston, Mass.

Because it is so massive and intricate, the efforts of the teams of experts must be co-ordinated.

That is the job of Maj. Oscar J. Tibbets, commanding officer of the military group; Ben Davidson, general coordinator, and Dr. H. Lettau, field coordinator. All are from the Cambridge center.



Dr. Harrison Cramer (on tower) and Dr. Frank Record of Massachusetts Institute of Technology inspect wind measuring instruments at the O'Neill test site. They are measuring rapid changes in wind speed at low levels.



A complex weathervane built by John E. Luby (left) on a design by Gerald Gill (right) will measure wind direction up and down, as well as side to side, and transmit readings to dials that are photographed.

turbulence in the air, your feet would be Look at the ones used by Massa- Air Force to make the studies. The

of Massachusetts Institute of Technology in
measuring instruments at the O'Neill test sit
measuring rapid changes in wind speed at

Wants Six 'Perfect' Days

WHAT does this massing of scientific ability and equipment hope to do?

Mr. Davidson explained:

"We want to get a connected picture of everything that happens in a section of atmosphere for a whole day. To do that, each group has concentrated on measuring one thing with a great deal of precision."

The tests will be run for a period of 26 hours continuously. Once an "alert" is sounded and the measuring begun, few of the scientists will get any sleep until it is completed.

The project hopes to get data from six "perfect" days this month and in September.

A perfect day is one with clear skies, a steady wind almost directly from the south, and no violent weather such as a thunderstorm.

The site seven miles northeast of O'Neill was chosen because the Weather Bureau said such conditions were likely to be found there. Also, land that was nearly level was needed, and a climate not too humid.

All the results from all of the instruments for six days will make a mountainous pile of data. It will take six months to reduce the instrument readings to statistics, Mr. Davidson said.

Evaluating it—deciding what it means and how it can be used—will take years.

What It Means

AND WHAT will it mean to you and me?

The Air Force needs the information, because turbulence in the air is of importance to everything passing through it. That includes aircraft, guided missiles and bombs. It needs the information in forecasting the weather, not as much the day-to-day but the hour-by-hour changes.

Air turbulence near the ground is of importance in chemical warfare. It would vitally affect the laying of a smoke screen or the use of gas.

But the importance goes further. The scientists want to find out how, and how fast, water evaporates from the soil. That will mean better planning of irrigation.

They want to find out what happens to crop spray when it is laid down as a fog near the ground. They hope to get an idea of the best time to spray crops.

They want to measure the amount of the sun's energy that goes into the air, into the ground and into plants.

Turbulence is the irregular motion of anything, the soft-spoken Mr. Davidson explained. If you don't stir your cup of coffee, the sugar on the bottom does not spread. When you stir, that is turbulence.

On a hot day, if there were no tur-

bulence in the air, your feet would be burned near the ground. Turbulence in the air spreads the heat.

Instruments Fantastic

THE instruments developed to measure turbulence and its causes are fantastic to anyone but a scientist.

Dr. A. R. Kassander and R. M. Stewart from Iowa State College at Ames have with them instruments that take the temperature of the air two hundred times a second.

The thermometers that do it are 13-one-thousandths of an inch in diameter, barely visible.

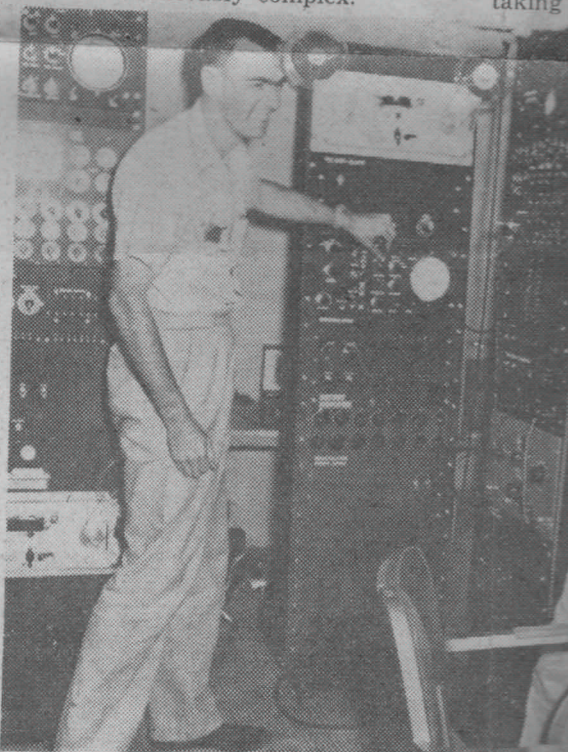
The temperature readings of not one but several of these thermometers are recorded electrically on a tape by the same process that many phone calls can be sent over a single wire.

The readings then can be fed into an electronic analyzer that converts them to statistics.

At the same time, the scientists will be recording wind speed. Their anemometer, which turns in the wind, is made of ping-pong balls.

The parts of their electric equipment alone cost perhaps 20 thousand dollars. Countless hours of work went into the construction. And on the other end—a 10-cent ping-pong ball.

Even the common weathervane becomes unbelievably complex.



Dr. A. R. Kassander (right) and R. M. Stewart, with the electronic analyzer which converts into statistics many times a

the O'Neill test site. They are
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Look at the ones used by Massa-
chusetts Institute of Technology. Ger-
ald Gill designed them and John E.
Luby built them. They record wind di-
rection up and down as well as side to
side. The findings are recorded inside
a hut, on dials that can be photo-
graphed from second to second.

Dr. A. H. Glaser of Texas A. and M.
has a machine that does the same
thing a different way. The wind is
measured through a pinpoint hole in a
tiny rod that is whirled at high speed.
The wind direction and force is traced
on a graph, electrically.

There can be no dollar-and-cents esti-
mate of all of the instruments assem-
bled at O'Neill. They are not on any
market. All have been built for one
specific job.

John Vehrencamp of the University
of California at Los Angeles has cut
out a circle of prairie sod. It floats on
sensitive instruments that can measure
the amount of drag the wind causes
on the soil surface.

His partner, David Rhoades, has an
electric typewriter that types the read-
ings of thermometers buried in the soil.
It does it automatically, 16 tempera-
tures every three minutes.

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Many Groups Team Up

SOME of the Universities
taking part are under contract to the

a design by Gerald Gill (right) will measure wind direc-
tion up and down, as well as side to side, and transmit
readings to dials that are photographed.

Air Force to make the studies. The
others are sponsored by the Office of
Naval Research.

Walking down the half-mile line of
installations at the project site, here
are the groups you would find:

The University of New Mexico, Albu-
querque, measuring ozone in the air.

Massachusetts Institute of Technol-
ogy, Cambridge, measuring very rapid
changes in wind speed up to 50 feet
from the ground.

Iowa State College, Ames, measuring
very rapid temperature changes up to
30 feet from the ground.

Texas A. and M., College Station,
measuring the transfer of heat up or
down in the atmosphere.

The Geophysics Research Directorate
of the Air Force Cambridge Research
Center, measuring winds up to five
thousand feet.

Wright Air Development Center,
Dayton, O., doing the photographic
tracking of weather balloons and
smoke.

The University of Wisconsin, Madi-
son, measuring the "heat budget" of
the ground surface (how much heat
penetrates the ground, how much goes
into evaporation and into the air).

The University of Texas, Austin,
measuring ground heat.

The University of California at Los
Angeles and Davis College of Agricul-
ture, measuring wind and temperature
up to 50 feet and soil temperature
changes.

The Sixth Weather Squadron, Tinker
Air Force Base, Oklahoma, operating
weather balloons which will radio tem-
perature and humidity readings from
up to 10 thousand feet.

Johns Hopkins University, Baltimore,
measuring wind, temperature, dew
point, radiation of heat and the thirst
of soil for water.

A detachment of the Fourth Weath-
er Group, Air Force, from Baltimore,
operating captive balloons that send
temperature and humidity readings to
the ground by wire.

The Woods Hole (Mass.) Oceanog-
raphic Institute group, measuring
wind.

Argonne Laboratory meteorology
group, Chicago, measuring wind.

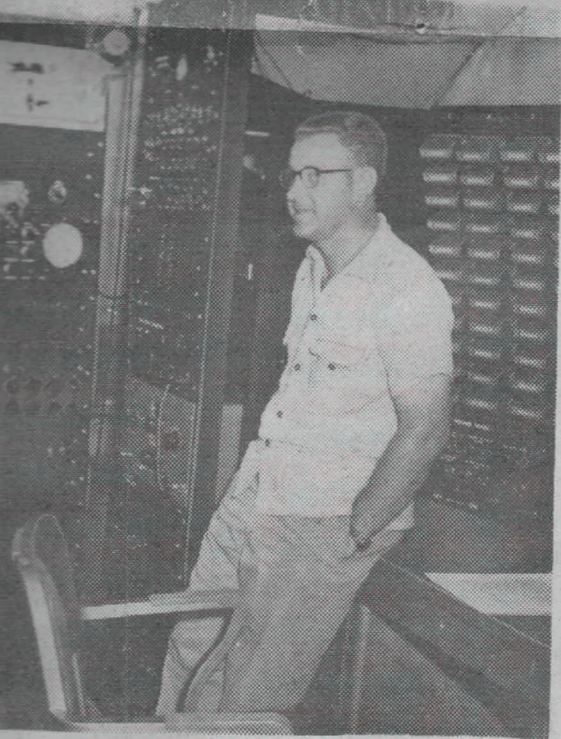
The Woods Hole group will operate
a seaplane out of Lincoln which will
measure temperature and wind
changes.

The Argonne group has a very sen-
sitive electronic wind vane.

Offutt Air Force Base is furnishing
vehicles and support personnel.

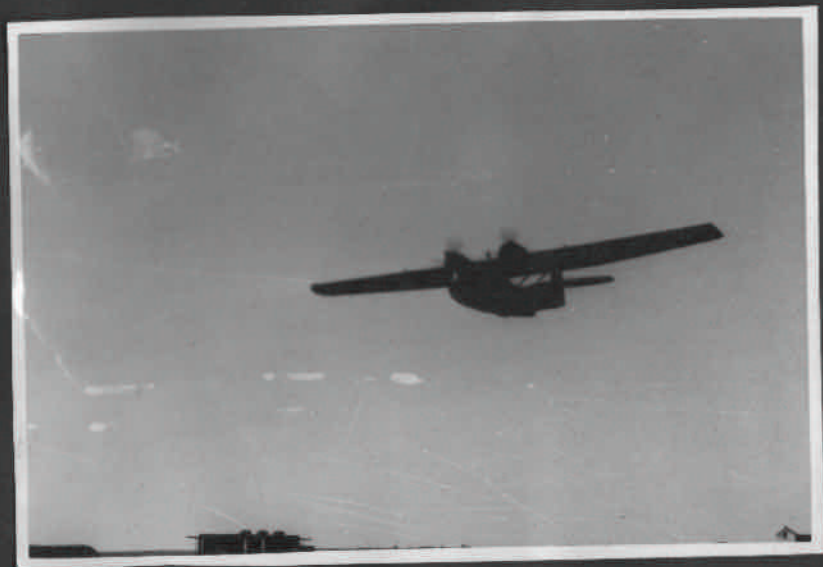
Another helicopter to replace the one
which crashed, killing six persons in-
cluding Dr. Guenter Loeser, the head
of the project, has been flown in.

From it, smoke bombs will be
dropped to measure winds during the
day. At night, lighted balloons will be
sent aloft for the same purpose.



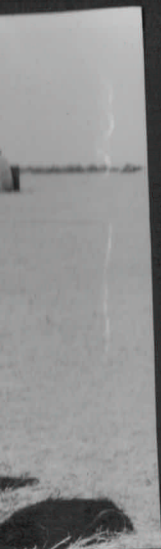
—World-Herald Photos.

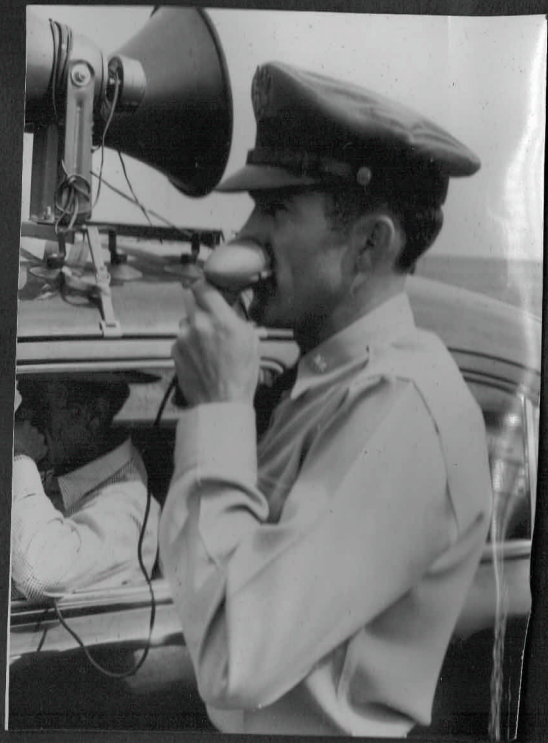
and R. M. Stewart, Iowa State College physi-
cal analyzer which converts temperature readings
ties many times a second.

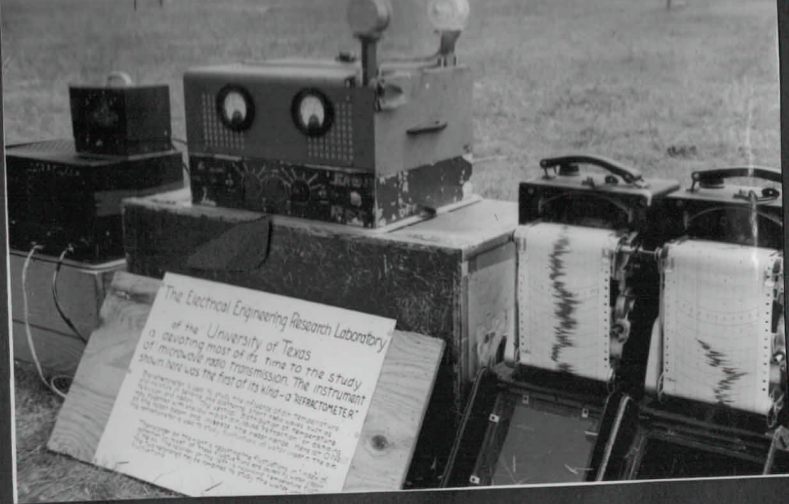




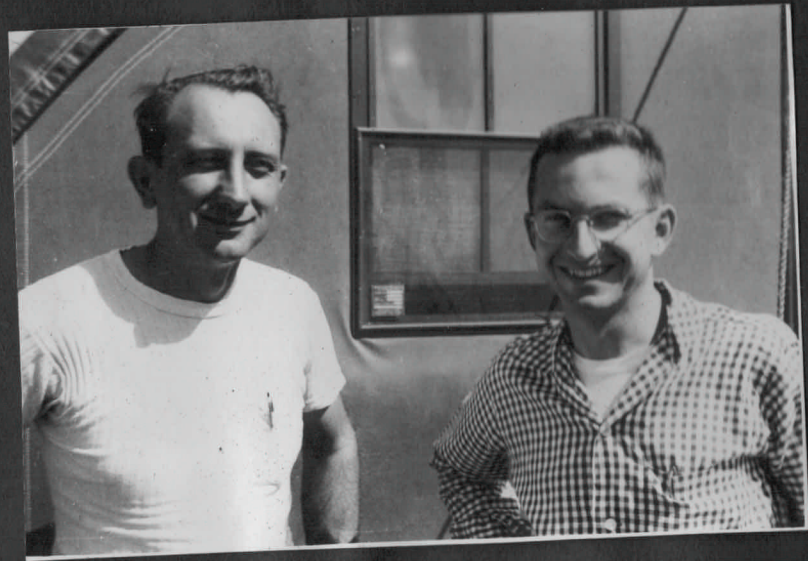








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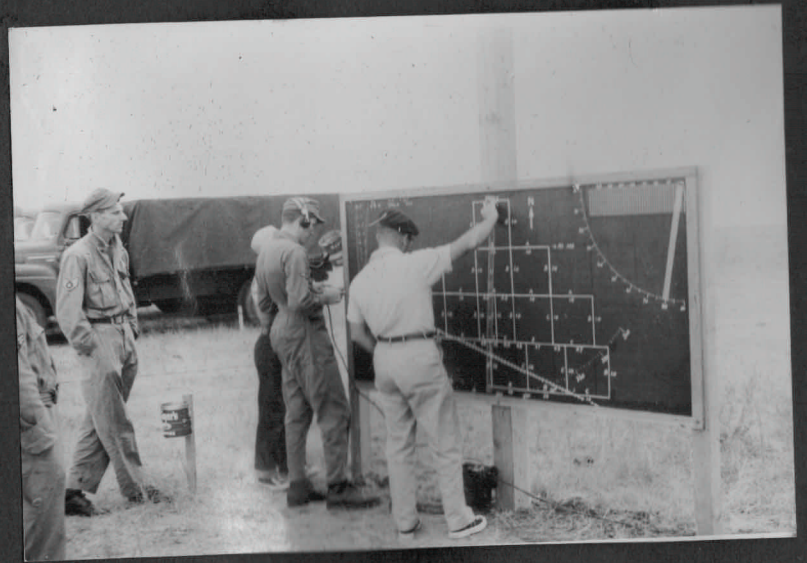


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The refractometer is used to study the influence of air temperature
and moisture in bending and scattering short radio waves such as
television and radar. The vertical distribution of temperature
together with shallow moist air, cause refraction or bending
of the radar beam and increase the radar range. Here at O'Neill
the refractometer is used to study fluctuations of water vapor in the air.

The recorder on the right is reporting the fluctuations in "index of
refraction" - most of these fluctuations are caused by water vapor
in the air. The recorder on the left is recording temperature fluctuations.
The two recordings may be combined to study the water vapor
fluctuations.







The house we lived in 1953
and how it looks in 1996





"Open House"

