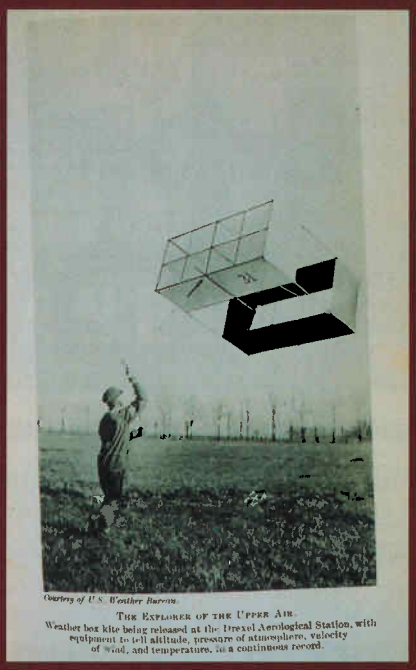
# WEATHER BALLOONS AND UPPER-AIR SOUNDINGS

In the late 19th century, meteorologists used kites to gather data about the air above them. Kites could fly up to 3 kilometers into the air. Temperature, pressure, and humidity data were gathered. Kites worked well when the wind cooperated.

The **radiosonde** was developed in 1943. A radiosonde is a weather-instrument package that can be carried into the stratosphere by a balloon. It has sensors for measuring temperature, relative humidity, and air pressure. Measurements are taken continuously as the balloon rises. A radio transmitter sends the data to a ground receiver. A tracking device monitors the location of the radiosonde during its flight. Wind speed and direction are calculated from the tracking data.

A weather balloon is made of a thin membrane of natural or synthetic rubber. It is inflated with either hydrogen or helium. A biodegradable plastic parachute is attached to the radiosonde. The balloon expands as it rises. When the balloon bursts, the radiosonde is carried to Earth by the parachute.

A radiosonde can be used as many as seven times. About one-third of the radiosondes launched by the National Weather Service (NWS) are recovered. Instructions are printed on each radiosonde, explaining how to return the device to the NWS. It goes to the NWS Instrument Reconditioning Branch in Kansas City, Missouri, where it is made ready for another flight.



Courtesy of U.S. Weather Bureau.

THE EXPLORER OF THE UPPER AIR.

Weather box kite being released at the Drexel Aerological Station, with equipment to tell altitude, pressure of atmosphere, velocity of wind, and temperature, in a continuous record.

Weather kites were used to take recording instruments to high levels. Temperature, pressure, humidity, and winds were observed from kites.

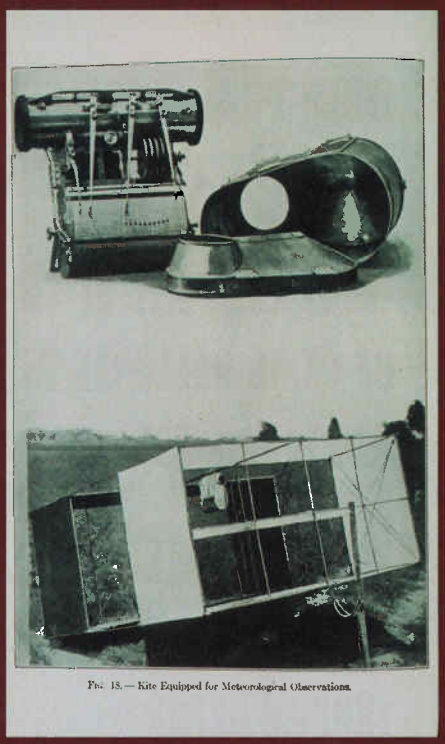


FIG. 18.—Kite Equipped for Meteorological Observations.

Recording instruments traveled with the kites. They were brought back to the ground, where the observations could be read.

There are more than 900 upper-air observation stations around the world, 108 of them in the United States. Most stations are located in the Northern Hemisphere. Observations are called soundings. Soundings are taken at the same times each day, 00:00 and 12:00 UTC (Universal Time Coordinated), 365 days per year. The data are used for global and regional weather prediction, severe-storm forecasts, general aviation and maritime navigation, ground truth for satellite data, weather research, and climate-change studies.

# THINK QUESTIONS

1. WHAT IS A RADIOSONDE?
2. WHEN DO METEOROLOGISTS LAUNCH WEATHER BALLOONS?
3. WHAT ARE SOME OF THE ADVANTAGES OF USING BALLOONS TO GATHER WEATHER INFORMATION?
4. WHY DO WEATHER BALLOONS EXPAND AS THEY RISE THROUGH THE TROPOSPHERE?

The weather-balloon assembly includes the balloon, radiosonde, and parachute.

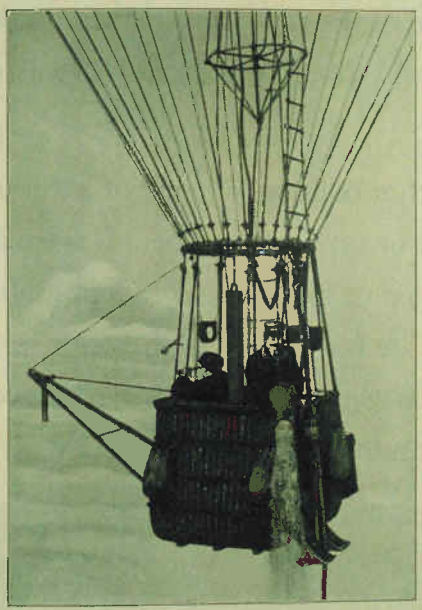


FIG. 17. — Balloon Equipped for Meteorological Observations.
(From ASSMANN'S *Wissenschaftliche Luftfahrten.*)

Hot-air balloons have been used to carry human observers and weather instruments into the atmosphere.