

A Personal Storm Warning Service

Among technology transfers that contribute to enhanced public safety is a family of affordable, general use lightning detectors

Each year in the United States more people are killed or injured by lightning than by tornadoes, floods and hurricanes combined. Lightning detection systems operated by government agencies, utilities and other businesses provide storm warnings, but their information is not readily available to the general public; it typically covers a broad region rather than a specific locale and reaches the public through radio and TV reports an hour or so after the observations are made.

However, there is now available a low-cost personal lightning detector that offers a significant safety advantage in immediate, localized warning of dangerous conditions. It is a valuable aid to business owners, private flyers, boaters, golfers, homeowners and millions of others who would like to know when it is prudent to stop outdoor activities and find shelter, or when to shut down sensitive equipment that could be damaged by lightning, or how to avoid costly liability suits by providing adequate warnings to employees and clients.

Through a family of portable detectors developed by Airborne Research Associates (ARA), Weston, Massachusetts, a user can get information on lightning presence and storm intensity allowing him to determine instantaneously whether ominous-looking clouds are dangerous, with as much as 30 minutes warning.

Now commercially available, these detectors had their origins in an early 1980s NASA project involving Space Shuttle tests of an optical lightning detection technique proposed by Professor Bernard Vonnegut of the State University of New York at Albany. Two decades of research had convinced Vonnegut that optical detection offered significant advantages over then-existing radio wave detectors. For one thing, optical signals are static-free and insensitive to man-made noise, thus can work close to machinery or within metal structures, such as the Shuttle Orbiter. For another, optical detection can provide directional information on which clouds contain lightning.

On three Space Shuttle missions in 1981-83, astronauts were able to observe and record lightning strikes within clouds far below them in broad daylight as well as at night (normally intracloud lightning flashes are not visible in daytime). The project, conducted by Marshall Space Flight Center, utilized a simple solar cell sensor and amplifier, a tape recorder and a movie camera. The sensor reacted to changes in light intensity. Whenever lightning flashed within the field of view, it produced a signal that was recorded as a click on the tape recorder. Night movies verified that the clicks were actual lightning flashes.

Dr. Ralph Markson, founder and president of ARA, became a participant in the NASA experiment when he was awarded a contract to test the camera system — called NOSL, for Nighttime/Daytime Optical Survey of Lightning — in an aircraft before it was flown on the Shuttle. In tests at Socorro, New Mexico, Markson was impressed by the system's ability to distinguish among developing clouds and determine which were the lightning-laden thunderstorm clouds. "I realized then," he says, "that this technology made it possible to develop a small, portable, inexpensive yet highly reliable lightning detector for public use."



In the late 1980s, Markson used the NASA technology to develop a simple, hand-held optical lightning detector. After testing a prototype on the major golf tours of the Professional Golf Association, ARA refined the design and began marketing the M-10 detector in 1990. The device is simply pointed toward a cloud and it detects invisible intracloud lightning by sensing subtle changes in light intensity; it advises of lightning presence by a "beep." The M-10 features an electric field change detector so that occasional light reflections — which might trigger an optical-only detector — do not produce false alarms; the beep sounds only when the optical and field change signals occur simultaneously.

In 1993, ARA introduced a companion system, the P-10, which offers omnidirectional warning; it is simply an M-10 encased in a housing with a conical mirror so that the system can guard all directions at once. An adjustable sensitivity control allows selection of the distance where lightning is observed.

By the end of 1993, ARA had sold about 1,000 M-10s, mostly to golf courses. But the \$600 cost was too expensive for most individuals, and industrial users wanted a full-time AC-powered system rather than the battery power of the M-10. So, in 1994, ARA introduced some new members of the family.

The newest consumer product is the M-2, an advanced version equipped with a ratemeter that, by measuring the lightning strikes per minute, provides a reading of storm intensity, allowing the user to decide whether clouds are indeed

dangerous. For the industrial user, ARA has introduced the F-10, which essentially turns the P-10 into an AC-powered base station; the sensor section is housed within a transparent, waterproof casing for permanent installation on the roof of a building, connected to a control/display unit within the building that provides audible and light signals when lightning is detected.

Coming up in the near future is ARA's most advanced model, the F-20, which will provide the distance to each lightning flash, storm intensity and relays that can trigger alarms or automatically disconnect equipment that is sensitive to lightning.



Above, a golfer practices putting, secure in the knowledge that his M-10 personal lightning detector (foreground) will signal a "beeping" warning of imminent storm danger. At left, a larger F-10 detector guards a multi-field municipal park whose tall trees often mask approaching storms until they are directly overhead; the F-10 sends audible and light warnings to baseball, softball and tennis players when lightning presence is detected.

