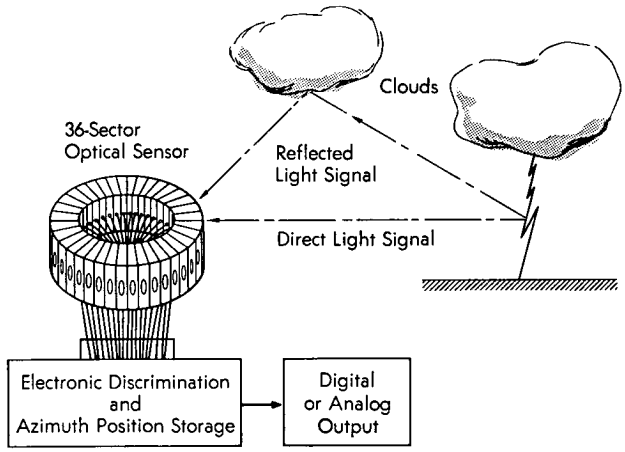
NASA TECH BRIEF

Ames Research Center

Lightning Flash Detection System

The problem:

To measure the distance and direction of lightning flashes.



The solution:

An array of photodetectors and associated circuitry which continuously monitors the entire horizon to detect a lightning flash.

How it's done:

The key element in the lightning-flash detection system is an array of 36 photodetectors mounted in a circle so that each detector views 1/36 of the horizon. As shown in the diagram, the photodetectors are mounted on the inner periphery of a cylindrical section which is divided into 36 compartments; each compartment includes one photodetector and one of the 36 windows. The windows limit the photodetectors to a view of the sky 10° horizontally by 20° vertically.

When a lightning flash occurs within the range of the detection system, the electronics converts the optical signal to electronic pulses whose *widths* are proportional to a nonlinear function of the input optical intensities. More than one channel will respond to the lightning flash because the light from the flash typically is reflected and scattered from clouds, rain, and nearby objects. Since each detector channel must be sensitive enough to register a flash at a range in excess of 30 km, it is clear that whenever a nearby flash occurs, many of the channels will receive enough reflected light to trigger them. To eliminate the spurious signals due to the reflected and scattered light (which may come from any direction) the output of all channels is simultaneously compared to obtain the pulse of longest duration. This pulse is then used in the generation of an analog output voltage that corresponds to the azimuth of the highest optical input.

Two or more of these inexpensive devices, located some distance apart, may be used to determine both the range and direction to the lightning flash.

Note:

Additional information may be obtained from:

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Reference: TSP 72-10272

Patent status:

No patent action is contemplated by NASA.

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Category 02