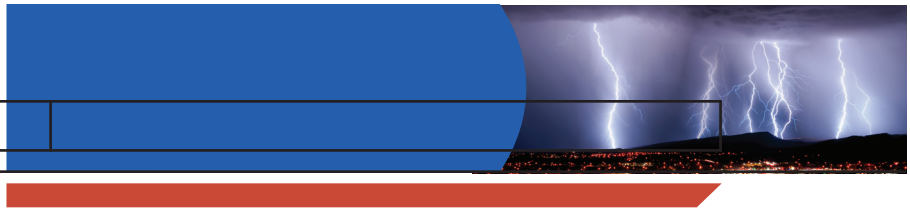


BoltAlert®: PREDICTING LIGHTNING THREATS

Lightning alerts can be provided with a lead time of up to 30 minutes, with alerts updated every 2 to 5 minutes.

Lightning can severely injure or even kill people. However, it is often an underestimated or overlooked hazard that is very difficult to predict. Operational guidance to mitigate potential lightning threats can be obtained from real-time lightning detection systems and/or lightning prediction systems.

The National Center for Atmospheric Research (NCAR) has developed BoltAlert to better predict and display lightning threats.

BoltAlert draws on radar observations, temperature information, lightning observations, and advanced algorithms to derive lightning strike probability for specific locations. Lightning alerts can be provided with a lead time of up to 30 minutes, with alerts updated every 2 to 5 minutes. The alerts can be adapted to specific user needs.

BoltAlert indicates when and where lightning flashes are likely to strike.

The predictions aim to get potentially vulnerable people out of harm's way while minimizing impacts on airport operations, open-air stadium events, and other places exposed to lightning.

BoltAlert has been developed under sponsorship of the U.S. Army Test and Evaluation Command and the Federal Aviation Administration.

The system has been adapted for use at several army test ranges, including the White Sands Missile Range in New Mexico and the Redstone Test Center in Alabama. The Army is using it to provide critical warnings in support of range testing of various materials (e.g., equipment, missiles, or explosives), as well as personnel safety during routine range activities.

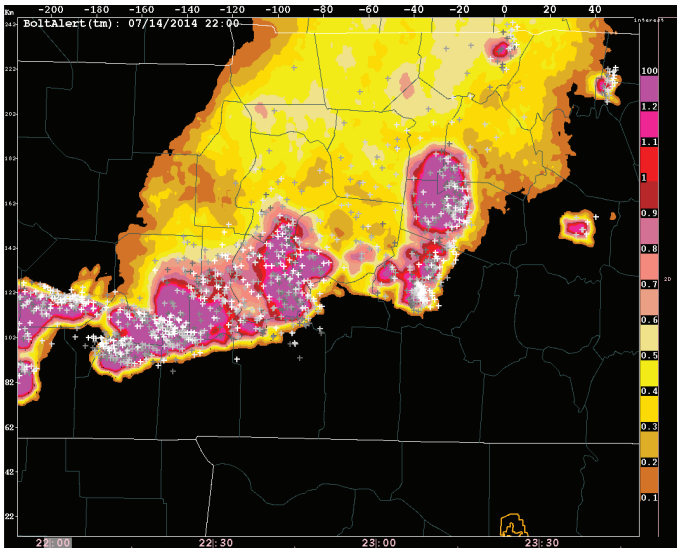
At airports, BoltAlert's lightning threat predictions may be a useful tool enabling the safety of outdoor airport personnel while minimizing disruption to operations.

Why It's Important

The U.S. experiences about 25 million cloud-to-ground lightning strikes each year. These strikes killed an average of 33 people yearly and injured an additional 234 between 2004–2013, according to the National Oceanic and Atmospheric Administration.

Lightning strikes also can be costly to businesses.

For example, lightning-safety procedures at airports trigger ramp closures because baggage handlers, mechanics, and



BoltAlert shows areas of high lightning potential (magenta), as well as lightning potential outside storm areas.

continued on reverse side

other logistics and maintenance personnel need to go inside for protection. Those closures cause significant departure and arrival delays that can also impact the wider national aviation system.

Operators must balance safety needs and efficiency, but the current decision-making process for closing and reopening a ramp is burdened with significant uncertainties. BoltAlert may help reduce uncertainty, leading to more consistent lightning safety decisions.

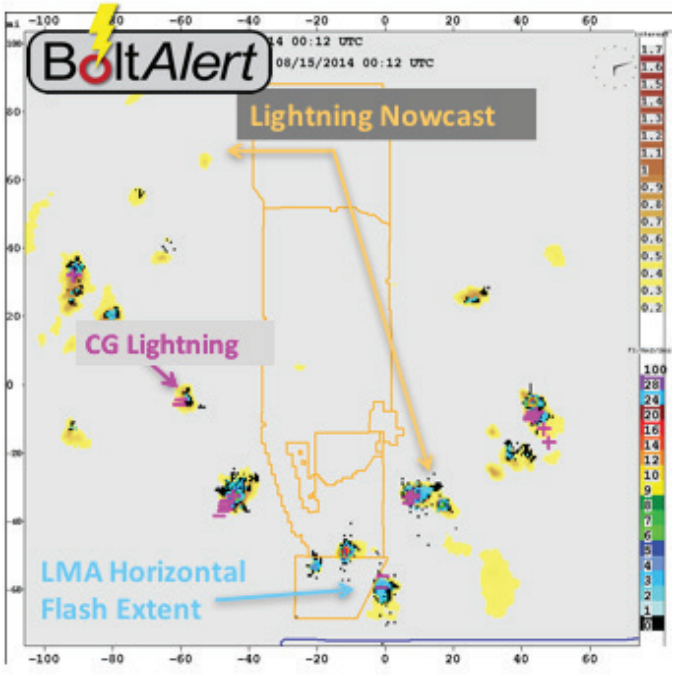
How the NCAR System Works

BoltAlert draws on detailed, real-time radar and lightning observations and computer model simulations. It then runs the information through advanced algorithms, developed by NCAR scientists, that indicate when and where lightning flashes are likely to strike.

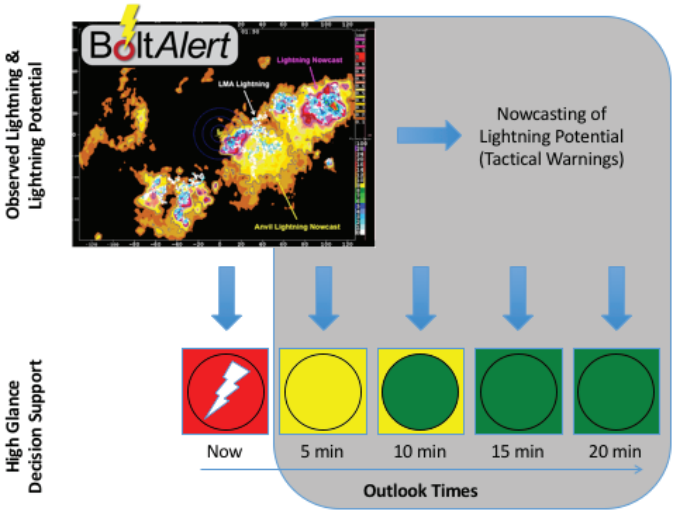
The system identifies areas of strong electric fields inside thunderstorm cores as well as stratified areas outside of thunderstorm cores and other cloud systems that have potential to produce lightning in the near future. BoltAlert can also extrapolate these threat areas in space and time.

A notable benefit of BoltAlert is that users can change alert thresholds, depending on their needs

A notable benefit of BoltAlert is that users can change alert thresholds, depending on their needs. For example, some users might be interested in just high lightning probability, while others might want to include areas of low probability as well to maximize safety when people are present or to protect sensitive equipment.



Lightning potential nowcast for an Army test range. Decision makers can use the information to safely evacuate personnel and protect sensitive equipment.



BoltAlert output showing observed lighting and lightning potential for an area. Color-coded circles show how lightning alert warnings can be displayed and communicated.

BoltAlert has a patent-pending technology to display, in simple color-coded circles, the anticipated lightning potential in a location of interest.

Steady Improvement

BoltAlert accuracy is steadily improved through the evolution of NCAR algorithms and incorporation of more detailed observations from improved remote-sensing techniques.

Applications

BoltAlert provides potential advantages to:

- Airports, airlines, and other forms of transportation
- Sites that handle or test volatile or explosive equipment, fuel, or other sensitive materials
- Construction and open-air mining sites
- Utilities
- Outdoor venues such as football stadiums and baseball parks, open-air concerts, golf courses, and swimming pools
- Outdoor enthusiasts including boaters, campers, and hikers

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