Federal Aviation Administration

Research Highlights

Remote Airfield LED Lighting System

Study Goals

To help increase visibility and conspicuity and to potentially reduce accidents, the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute along with a consortium of universities conducted laboratory and field studies to develop lighting requirements and low-cost, low-energy lighting systems that could be used in off-grid, remote airfields under harsh conditions.

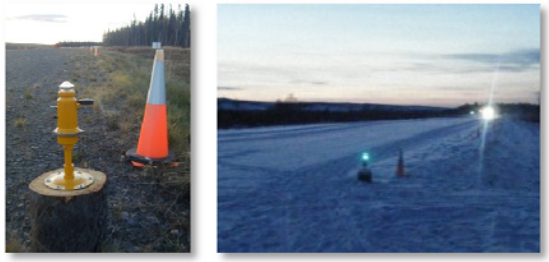
Research Activities

In 2005, a laboratory study was used to develop operating specifications for remote airfield lighting that could: 1) help pilots detect and locate the airfield; and 2) be designed into a lighting system that would be reliable, easy to install, low maintenance, and use minimal energy. LRC researchers designed a scale model airfield with different lighting scenarios and conducted a psychophysical experiment in which subjects were asked to locate the simulated airfield and determine the orientation of the runway. Their response times, accuracy rates, and confidence levels, along with existing knowledge of vision science, were used to develop a prototype lighting system for field testing.

Lab scale model airfield

The LRC built the prototype system using light-emitting diodes (LEDs) and the colors, intensity, and flash pattern determined from the lab study. In 2006, the LRC and the University of North Dakota field-tested the system. In 2010, the final specifications were used to develop a system for year-long testing by Embry-Riddle Aeronautical University and University of Alaska, Anchorage. The goals of the long-term study were to collect additional data in the field, to develop further confidence in the designed system based on the LRC's lab study and identified components, and to understand field implementation issues and operation. The system included LED corner lights, a battery, and a small photovoltaic (solar) panel to recharge the battery during the day. During the year-long test, the system operated well, even under harsh temperatures of –40°F in the remote village of Napaimute, Alaska. One critical test came when a chartered aircraft was called to Napaimute's airfield well after sunset to transport a seriously ill resident. The pilot was impressed by the lighting system and reported he could see the airfield's runway from several miles away.

Remote airfield system with solar panel used for long-term testing in Florida and Alaska



System field testing in Napaimute, Alaska.

Green LEDs, peak = 505 nm
2 Hz to 4 Hz flash frequency, on-period >80 ms
5 cd (photopic, time-averaged)
The above recommended minimum specifications required for visually effective remote airfield lighting systems were published in the Community Service Airports Visual Aids Handbook by the IES's Aviation Lighting Committee.

For More Information

- http://www.lrc.rpi.edu/resources/newsroom/pdf/2006/FAARemoteAirfieldProject2006-8511.pdf
- http://www.lrc.rpi.edu/resources/newsroom/pdf/2007/RemoteAirfieldLtg8511.pdf

This project was conducted by the Lighting Research Center at Rensselaer Polytechnic Institute (www.lrc.rpi.edu) under FAA contract FAA/05-C-AT-RPI. This summary was prepared by the Lighting Research Center on behalf of the FAA.

Further details: Don Gallagher, donald.gallagher@faa.gov; http://www.lrc.rpi.edu/programs/solidstate/aviation.asp.

Lighting Research Center