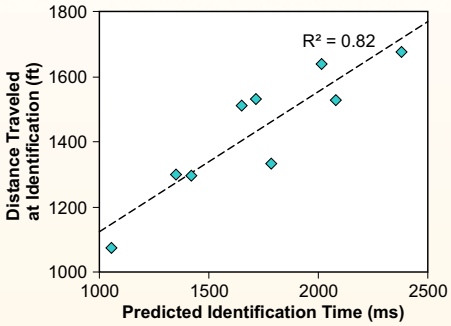
# Effectiveness of Linear Lighting for Airfields

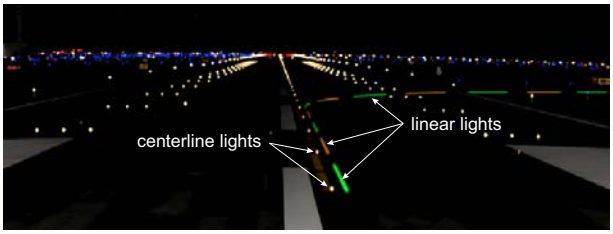
Airport runways, taxiways, and centerlines are lighted by intermittent point sources to provide delineation and guidance to pilots. However, studies of roadway lighting suggest that continuous linear lighting can provide better information about the geometric configuration of roadways. In 2014, the FAA began evaluations of linear lighting for airfields. The LRC conducted laboratory studies testing different intersection types, linear element lengths, and spacing to measure the time required to identify configuration geometry. The results suggested that linear elements provide shorter identification times than point sources, and a predictive model relating visual identification times to length and spacing of linear elements was developed. Recently, the LRC supported the FAA's further investigations.




**Average distances traveled toward intersections upon identification vs. predicted identification times**

## Simulator and Airport Field Experiments

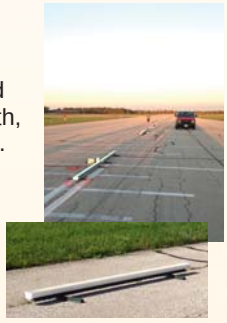
Following the LRC's research, the most promising configurations were tested with licensed pilots in more complex visual simulations. In a cockpit simulator, the FAA tested 2-ft, 8-ft, and 32-ft linear elements with spacings of 50, 100, and 200 feet, for geometric configurations of 30° and 90° left and right turns. For each condition, the distance at which pilots signaled that they could identify




**Cockpit simulator presentation of a right 30° turn with 32-ft linear elements and 50-ft spacing**

the geometric configuration was measured, along with the accuracy of the identification and the pilots' self-assessment of difficulty. The simulator results were consistent with the LRC's lab study, and the average results were correlated with model predictions, showing a relationship between linear element length and spacing. The 32-ft linear element with 50-ft spacing provided the best identification distances since this was the condition with the longest elements and the shortest spacing.

Next, a field evaluation on an airport runway at Ohio State University consisted of green LED fixtures developed by the LRC and measured similar combinations of element length, spacing, and geometric configuration. Pilots determined the configuration as they were taxiing toward it, and the reaction time and accuracy were recorded. Again, the results were consistent with the model's predictions, with the exception of the findings for spacing. Most likely this is because the shorter spacing in this study did not extend as far out from the intersection as the longer spacing, reducing its advantage.



**LRC prototype fixture**

## Conclusions

The results from the three investigations were consistent in suggesting that there can be visual benefits to using linear light sources for airfield delineation. The predictive model developed by the LRC appears to be useful for judging the relative tradeoff between light source spacing and length and could serve as a tool for identifying configurations that are equivalent to existing delineation practices.


## Sponsor

Federal Aviation Administration (agreements 10-G-013 and 13-G-009)

### *Study Partners*

Partnership to Enhance General Aviation Safety, Accessibility and Sustainability (PEGASAS) Center of Excellence

CSRA Inc.

Ohio State University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