



Chromaticity Boundaries for LED Signal Lights

Study Goals

Pilots must correctly identify the colors of airfield lights to safely land and navigate planes on an airport runway. Chromaticity requirements for airfield lighting were based on incandescent technology, often used with colored filters. When dimmed to lower intensity steps, such as during clear nighttime conditions, incandescent shifts to a yellowish appearance that can make color identification difficult for pilots with color-vision deficiencies and with normal color vision. LEDs overcome some of the shortcomings of incandescent: they can produce all aviation colors without needing filters, and they don't shift in color appearance when dimmed. The goal of this study was to identify chromaticity regions that maximize correct color identification for light sources not limited by these shortcomings.



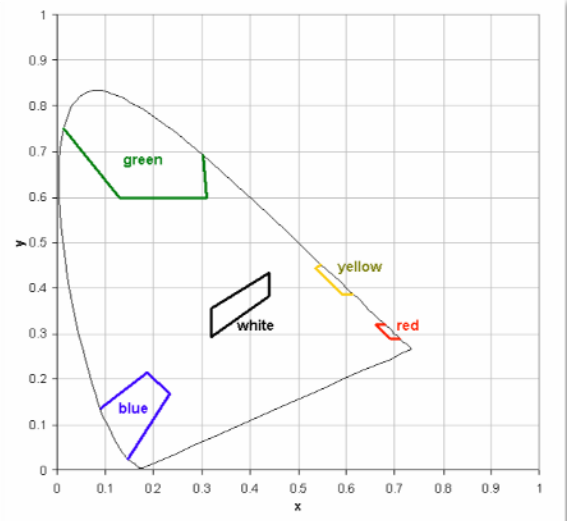
Research Activities

The first study focused on requirements for white lights; incandescent white aviation lights have often been called yellow. Study participants viewed light sources with a wide range of chromaticities in order to determine the chromaticity region resulting in high percentage (>80%) of identification as white. A revised chromaticity boundary for white LEDs permits lights that are "bluer" than incandescent lamp color, but avoids confusion with blue lights.



One of the configurations observed in the white identification study

The second study included observers with color-normal and color-deficient vision and tested all aviation signal light colors (white, yellow, red, green and blue). LEDs improved correct identification of white and green signal lights for both color-normal and color-deficient groups; white because of the "bluer" appearance compared to incandescent, and green because of a more saturated color (green incandescent lights, desaturated in appearance, were often called "white" regardless of color-vision status).



Newly recommended chromaticity boundaries resulting from the LRC studies

The study findings led to new chromaticity recommendations for LED aviation lighting colors, which were adopted into Engineering Brief 67, Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting.

For More Information

- <http://www.airporttech.tc.faa.gov/DesktopModules/FlexNews/DownloadHandler.ashx?id=b8145d4d-1b09-4574-9f11-3c0e18aefee1&f=TC-TN12-61.pdf>
- https://www.faa.gov/airports/engineering/engineering_briefs/media/EB-67d.pdf