Comparing the Effective Intensity of Flashing Lights

Flashing lights are often used in aviation signaling because they have better attention-capturing properties than steady-burning lights. Different formulae exist for calculating the effective intensity of flashing signal lights that can use multiple pulses of light within each flash, such as runway end identifier lights.

LRC researchers conducted two laboratory experiments to evaluate the effective intensity formulation used by the Federal Aviation Administration (FAA).

Runway end identifier lights can produce flashes of light each with multiple pulses.

Experiment 1: Comparing Steady-Burning and Flashing Lights

In Experiment 1, subjects viewed two LED light sources of varying intensities. One was a steady-burning light, and the other flashed once every second, with each flash containing three distinct light pulses. The duration of each pulse was constant, with different times between pulses. Subjects were asked to determine which light was more attention-getting, which had higher brightness, and which was more visible overall: the steady or the flashing light. The FAA effective intensity formula predicted all of the flashing light patterns to be equally effective.

Experiment 1 Results

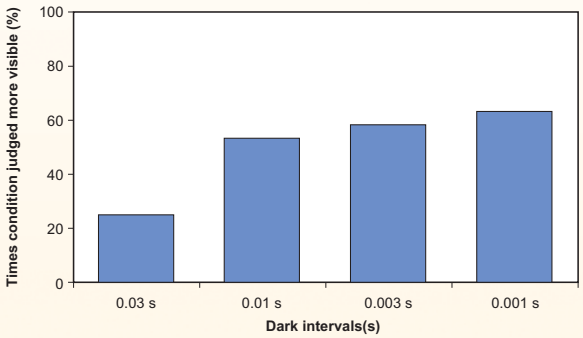
The flashing lights were, in fact, judged as more "attention getting" than the steady-burning lights, but the steady lights were judged as brighter. Importantly, the effective intensity formulation used by FAA was found not to be predictive of visibility. The flashing lights with pulses spaced closest together were judged as relatively more effective than those with the pulses spaced further apart.

Experiment 2: Comparing the Dark Interval between Pulses

In Experiment 2, subjects made similar judgments as in Experiment 1, but compared flashing lights to other flashing lights.

Experiment 2 Results

The results confirmed the data from Experiment 1. Shorter durations between pulses in the flashes of light resulted in higher effectiveness.



In both experiments, the condition with the shortest duration between pulses were judged to be the most effective (Experiment 2 results shown).

Conclusion

Both experiments indicated that the visual effectiveness for the flashing light conditions was highest when the dark interval between pulses of light in the flash was shortest. Since the FAA method of calculating the effective intensity predicts each of these conditions to be equal, the results led to a recommendation for a different formulation, proposed in the 1960s by the Illuminating Engineering Society, for estimating the effectiveness of flashing light signals.

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