Airport Visual Aids Updates

Federal Aviation Administration

Presented to: IESALC Government Contract Meeting

By: Tom Mai (Thomas.Mai@faa.gov)

Date: May 10, 2012

Purpose

To Provide Update on FAA Airfield Visual Aids Advisory Circulars (AC), Engineering Briefs (EB) and Related Topics.

AGENDA

- Advisory Circulars (AC) Updates
- Engineering Briefs (EB) Updates
- FY-2012 R&D Efforts

OUTLINE

- 5345-28G, Precision Approach Path Indicator (9/29/11)
- 5345-39D, Specification For L-853, Runway And Taxiway Retroreflective Markers (9/26/11)
- 5345-47C, Specification for Series to Series Isolation Transformers (7/22/11)
- 5345-56B, Specification for L-890, ALCMS (9/29/11)
- 5345-53C, Airport Lighting Equipment Certification Program (Addendum updated monthly)
- 5340-30F, Design and Installation Details for Airport Visual Aids (9/29/11)
- Draft 5340-30G, Design and Installation Details for Airport Visual Aids

OUTLINE (Cont.)

- EB 87, Heliport Perimeter Lights for Visual Meteorological Conditions (1/13/12)
- EB 89, Taxiway Nomenclature Convention (3/29/12)
- Draft EB 84, Remote Maintenance and Monitoring of ALCMS and L-821 Computerized Control Panels
- Draft EB for FAROS

OUTLINE (Cont.)

- Draft AC 5345-43G, Specification For Obstruction Lighting Equipment
- EB 67D, Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures
- Draft EB for NVIS
- FY-2012 R&D Efforts

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News & Highlights

- Draft AC 150/5300-13A, Airport Design Available for Comment
  Contains the FAA standards and recommendations for airport design. This draft substantially revises AC 150/5300-13 to incorporate all changes to the original document as well as new standards and technical requirements. Comments requested by **July 6, 2012.**
- Notice of Modification of Airport Improvement Program Grant Assurances; Opportunity to Comment
  The FAA Modernization and Reform Act of 2012 included a number of changes that impact the standard assurances for airport sponsors. The FAA will consider comments on the changes submitted on or before **May 14, 2012.**
- Notice about Airport Tarmac Delay Contingency Plans (PDF)
  The FAA Modernization and Reform Act of 2012 requires covered U.S. carriers and airports to submit tarmac delay contingency plans to the Secretary of Transportation for approval by **May 14, 2012**. A follow-up notice will explain how carriers and airports can submit their plans.
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Tools & Other Resources

AC 150/5345-28G
Precision Approach Path Indicator

Federal Aviation
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AC 150/5345-28G
Precision Approach Path Indicator

- Incorporated Engineering Brief #67, Light Sources Other Than Incandescent and Xenon For Airport and Obstruction Lighting Fixtures, when using alternative lighting devices.

- A test procedure that verifies the light output and aiming device accuracy for each production unit must be submitted to the third party certification body for approval

AC 150/5345-28G
Precision Approach Path Indicator

- Style A Surge and Transient Protection
  - The PAPI equipment susceptibility to power line surges must be per the defined waveforms detailed in Table 4, Location Category C2, in ANSI/IEEE C62.41-1991, *Recommended Practices on Surge Voltages in Low Voltage AC Power Circuits*. Surge protection must be provided against a minimum of 3 applications at 15 second intervals of a 5 kilo amp 8/20 microsecond (µS) short circuit current pulse and 10 kilo volt 1.2/50 µS open circuit pulse.

AC 5345-39D

SPECIFICATION FOR L-853, RUNWAY AND TAXIWAY RETROREFLECTIVE MARKERS

Federal Aviation Administration

AC 5345-39D

- Clarify the Type II retroreflective marker maximum cylinder diameter.
- Clarify the standard height requirement of a Type II retroreflective marker.
- Clarify Type II marker mounting system requirements.

AC 5345-47C

Specification for Series to Series Isolation Transformers

Federal Aviation Administration

AC 5345-47C

- Deleted references to ASTM D4247 and 2240. Paragraph is rewritten to allow the use of thermoplastic elastomers (TPE) and thermoplastic vulcanizates (TPV).
- Durometer hardness is increased from 65 10 to 75 10 for the use of TPE and TPV materials.

AC 5345-56B

Specification for L-890 Airport Lighting Control and Monitoring System (ALCMS)

Federal Aviation Administration

AC 150/5345-56B ALCMS

- Paragraph 5.4c is updated to delete reference to Appendix 2 and add reference to paragraph 10.3.2 for test system preset settings.
- Appendix 2, Airport Lighting Preset Controls, is deleted to eliminate the possibility of any confusion between System Test preset settings.
- Paragraph 10.3.2, Table 8 adds a note for airport managers to notify air traffic of variances in airfield lighting preset standards of the Airfield Lighting Control & Monitoring System.

AC 5340-30F

Design and Installation Details for Airport Visual Aids

Federal Aviation Administration

150/5340-30F, Design and Installation Details for Airport Visual Aids

- Paragraph added to prevent mixing elevated and in-pavement light fixtures for runway threshold lights.
- Added clarification to the application of retroreflective markers.
- Table 2-2, Note 2 is clarified for the use of L-861SE light fixtures.
- Reinstated longitudinal tolerance for runway centerline lights.

Federal Aviation Administration

150/5340-30F, Design and Installation Details for Airport Visual Aids

- Taxiway Centerline Lights - additional information is added to clarify the use of yellow and green fixtures.
- NFPA 780 is included to provide additional information for the installation of lightning protection systems on airfields.
- Paragraph 12.6 adds additional information found in the National Electric Code (NEC) Handbook and NFPA 780 about grounding stakes.

150/5340-30F, Design and Installation Details for Airport Visual Aids

- Paragraph 12.7 is added to add a bonding wire to connect the light fixture to the light base internal grounding lug.
- Paragraph 13.3(a) adds a note for airport managers to notify air traffic control about variances in airfield lighting preset standards for the Airfield Lighting Control and Monitoring System (ALCMS).

DRAFT AC 5340-30G

Design and Installation Details for Airport Visual Aids

Federal Aviation Administration

DRAFT AC 5340-30G
PRINCIPAL CHANGES

- a. Paragraph 2.1.2b(1)(c) is added to prevent mixing elevated and in-pavement light fixtures for runway threshold lights.
- b. Paragraph 2.1.5b adds a reference to ICAO Aerodrome Design Manual, Part 5, Electrical Systems, for the technical aspects of interleaving airport lighting circuits.
- c. Paragraph 3.2 is updated to include a reference to FAA Order 8900.1 for RVR takeoff minima.
- d. Paragraph 4.3c, NOTE is corrected to 2.5 ft. (0.8 m) for displacement of taxiway centerline lights.
- e. Paragraph 7.4b is updated to provide correct REIL installation requirements relevant to the runway threshold.
- f. Paragraph 7.e, NOTE is added for PAPI installations on the right side of the runway.

DRAFT AC 5340-30G
PRINCIPAL CHANGES

- g. Paragraph 12.5 is updated with a reference to recently revised NFPA 780, Standard for the Installation of Lightning Protection Systems.
- h. Paragraph 12.12 is corrected for stainless steel bolts with black oxide coating. A reference to Engineering Brief #83 is added when using coated bolts.
- i. Paragraph 13.3, NOTE is added relevant to modifications of airfield lighting standards in JO 7110.65T.
- j. All drawings are updated to eliminate undesirable colors and colored text.
- k. Figure 50 is updated to include a combination stop bar/runway guard light fixture.
- l. Figure 75 is updated to eliminate dimensions for a standard illuminated wind cone assembly.
- m. Figure 107 is updated to add elevated edge reflectors and non-applicability to runway threshold/end lights.

EB 87

Heliport Perimeter Lights for Visual Meteorological Conditions

Federal Aviation Administration

Federal Aviation Administration

Memorandum

JAN 13 2012

To: Helicopter Association International and all Industry

From: John R. Dermody, Manager, Airport Engineering Division, AAS-1

Prepared By: Khalil Kodsi, P.E. Civil Engineer, Airport Engineering Division, AAS-100, x77553

Subject: Engineering Brief No. 87: Heliport Perimeter Light for Visual Meteorological Conditions

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This Engineering Brief (EB) specifies the design requirements for raised and semi-flush heliport perimeter lights. The new light fixture photometric standard is based on testing and pilot surveys performed by the Federal Aviation Administration Airport Safety Technology Research and Development at the William J. Hughes Technical Center, Atlantic City, New Jersey.

Key Elements of this EB, including the applicability of referenced fixtures for Flight Path Alignment Lights and Landing Direction Lights, will be incorporated into the newly revised Heliport Design Advisory Circular 150/5390-2C.

EB 89

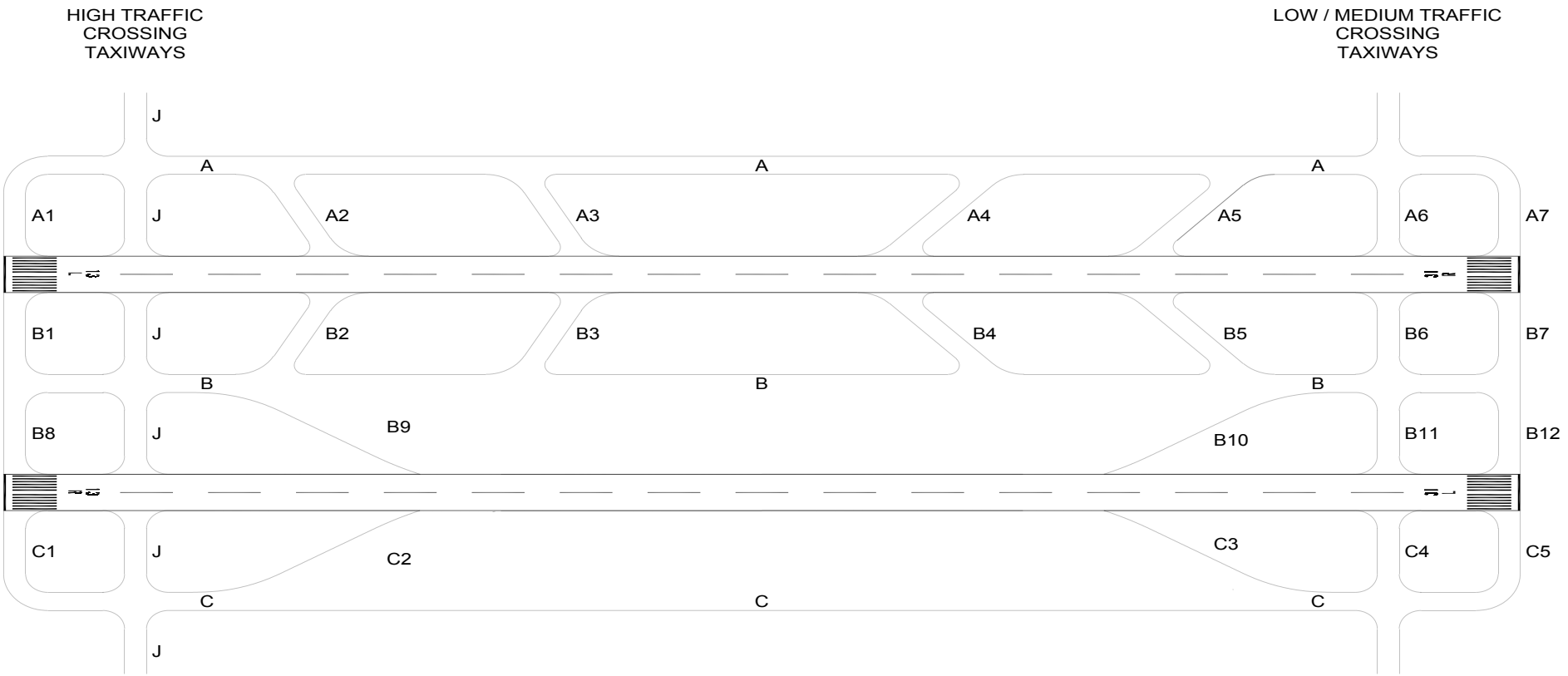
Taxiway Nomenclature Convention

Federal Aviation Administration

EB 89

- This EB provides clarification for taxiway designation convention standards contained in FAA Advisory Circular (AC) 150/5340-18F, Standards for Airport Sign Systems
- The FAA recommends using the guidelines and standards in this EB when developing, or revising an airport signage plan, an airport layout plan and for all new development projects.
- Until such development or revision, existing taxiways not conforming to the guidance below do not need be changed as a result of this EB.

EB 89



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EB 89 TAXIWAY NOMENCLATURE CONVENTION

Federal Aviation Administration

Memorandum

Date: MAR 29 2012

To: All Regional Airports Divisions Managers

From: John R. Dermody, Manager, Airport Engineering, AAS-100

Prepared by: Thomas Mai, Electronics Engineer, Airport Engineering, Division, AAS-100, x78754

Subject: INFORMATION: Engineering Brief No. 89, Taxiway Nomenclature Convention

This Engineering Brief (EB) provides clarification for taxiway designation convention standards contained in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5340-18F, Standards for Airport Sign Systems.

Attachment

Draft Engineering Briefs

Federal Aviation Administration

Draft EB 84

- EB No. 84, Remote Maintenance and Monitoring of ALCMS and L-821 Computerized Control Panels.

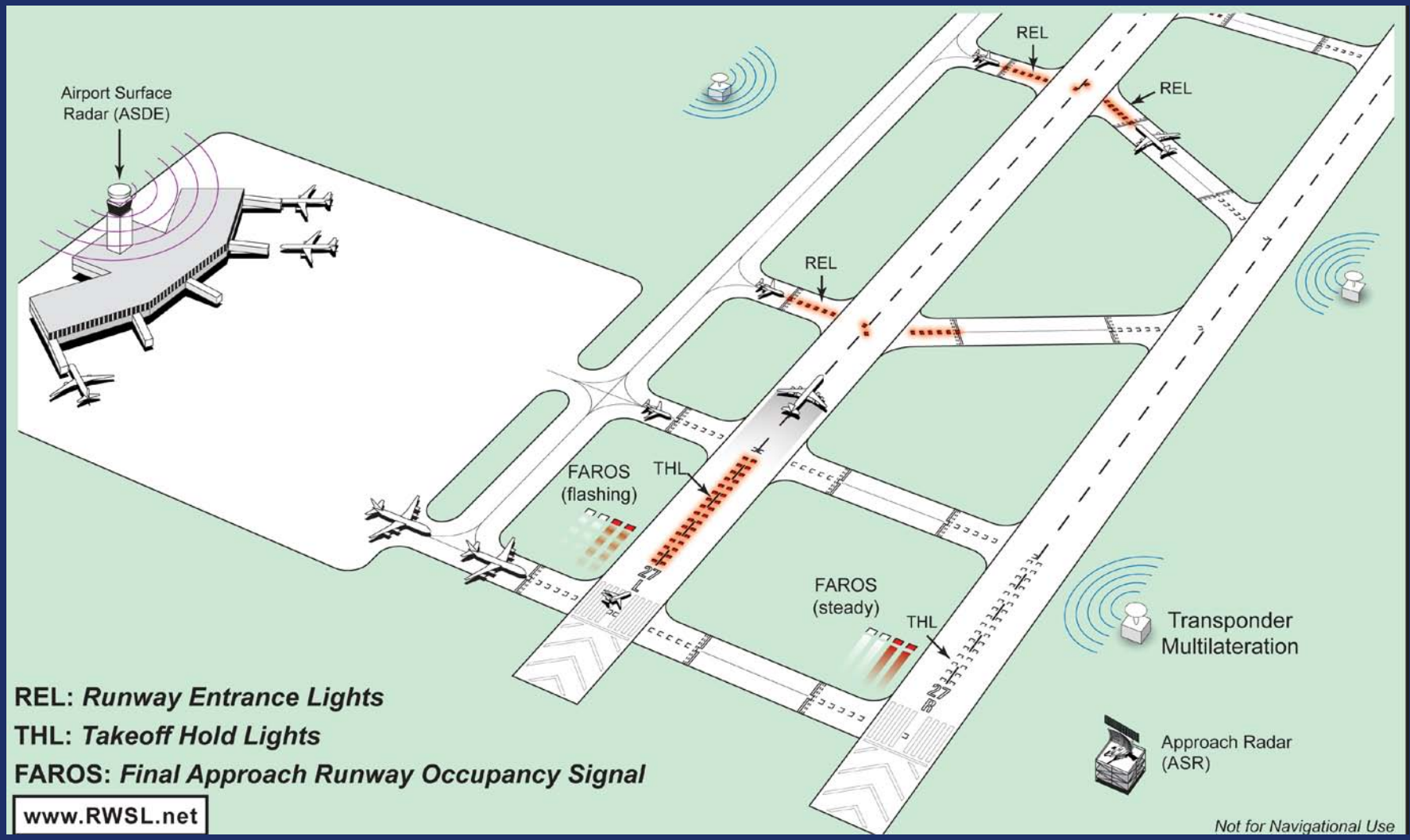
- Provides guidance for the design and use of virtual private network (VPN) systems to enable secure off-site remote maintenance and monitoring of airport lighting control monitoring systems (ALCMS).

Federal Aviation Administration

Draft EB for FAROS

- FAROS-Final Approach Runway Occupancy System's Description:
  - At present, there is no automated capability in the National Airspace System (NAS) to directly warn airborne flight crews of runway occupancy status at either small or medium controlled and uncontrolled airports
  - The stand-alone FAROS system is one possible implementation of the FAROS concept. The stand-alone FAROS system is intended for small to medium sized airports that are unlikely to receive a comprehensive surveillance system such as the Airport Surface Detection Equipment – Model X (ASDE-X) or other NAS-deployed surface surveillance systems.
  - The FAROS system provides a direct visual indication of an occupied runway to pilots on final approach by flashing PAPI.
  - Based on LOOPs sensor
- This draft EB is still in progress and in revision.
- Will be circulated to FAA Regions for comment to make a determination of feasibility, practicality of usage.

FAROS Operational Concept



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DRAFT AC 5345-43G

SPECIFICATION FOR OBSTRUCTION LIGHTING EQUIPMENT

DRAFT AC 5345-43G, PRINCIPAL CHANGES

- Para 3.3.3, Light Colors, is corrected to not state aviation red. The color for red obstruction light must be per *ICAO Annex 14, Vol.1, App 1, Colours for Aeronautical Ground Lights*. Reference to EB #67's chromaticity is removed.
- Paragraph 3.3.14.4, Alternative Lighting Devices (ALD) Equipment, reference to Engineering Brief #67 is removed to avoid any confusion about warranty requirements.
  - Min. rated life of 2 yrs without maintenance or loss of light output below the min specified intensity.
- Para 3.4.1.1, the Blondel-Rey-Douglas formula is updated to correct form per Yoshi Ohno at the National Institute of Standards and Technology (NIST).
- Paragraph 3.4.1.1d, add statement that multiple pulse flashes cannot be used in day or twilight applications.

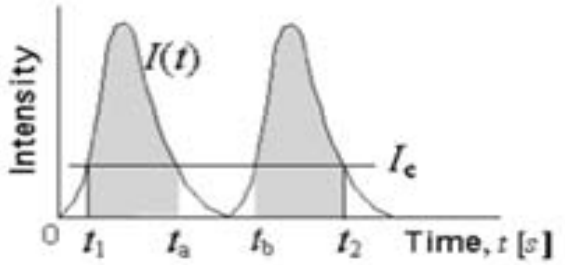
DRAFT AC 5345-43G, PRINCIPAL CHANGES

The effective intensity for multiple pulse flashes as used in lights during **nighttime** operation must be calculated by (Blondel-Rey-Douglas equation). Multiple pulse flashes cannot be used in day or twilight applications.

$$I_e = \frac{\int_{t_1}^{t_a} I(t)\,dt + \int_{t_b}^{t_2} I(t)\,dt}{a + (t_2 - t_1)}$$

$$I_e = I(t_1) = I(t_2)$$

Where: I_e = effective intensity
$I(t)$ = instantaneous luminous flash intensity
a = Blondel-Rey constant (0.2 seconds)
t = time (seconds)



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DRAFT AC 5345-43G, PRINCIPAL CHANGES

- Table 1, 2, and 3 – change Peak Intensity (candela) to Effective Intensity (candela)
- Paragraph 3.4.1.5, L-864 Light Unit, add a requirement for multiple light units.
- Paragraph 4.2.10, System Operational Test – add a note about excluding Type L-810 lights from the requirements paragraphs 4.2.10c through f.
- EB 67D does not apply to this AC; only arctic kit*
- Flashing L-810*…is coming!

Obstruction Lighting/Wildlife R&D Project

In 2009 at the request of the Obstruction Evaluation Services Team (AT), Airport Engineering Division (AAS-100) asked the Airport Safety Technology Sub Team to conduct a research project that includes the following requirements:

- Evaluating the concept of either omitting or flashing the normally steady burning red lights;
- Evaluate differences in the conspicuity of flashing vs. steady burning obstruction lights; and
- Evaluating the benefits of using new light emitting diode (LED) obstruction lights over conventional incandescent obstruction lights.

Contributing Factors: Flashing vs. Steady

There are several factors involved in this issue:

- Migratory birds love obstruction lighting
- Wildlife research studies pointing at steady burning lights (L-810s) as problem.
- Wildlife organizations, the telecommunication industry, and the FCC collectively approached the FAA and requested that the FAA consider re-defining the standards for obstruction lighting to either omit or flash the normally steady burning red lights to reduce their impact on the mortality rates of migratory birds
- Increased construction of communication towers and wind turbines.

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Flashing vs. Steady

Harrietta Test Tower

- 1130ft. guyed tower.
- Located between Manistee and Cadillac, MI
- Owned/operated by WPBN in Traverse City
- Configured to have L810 and L864s flash in unison.
- Located in heart of Michigan bird migration zone.

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Flashing vs. Steady

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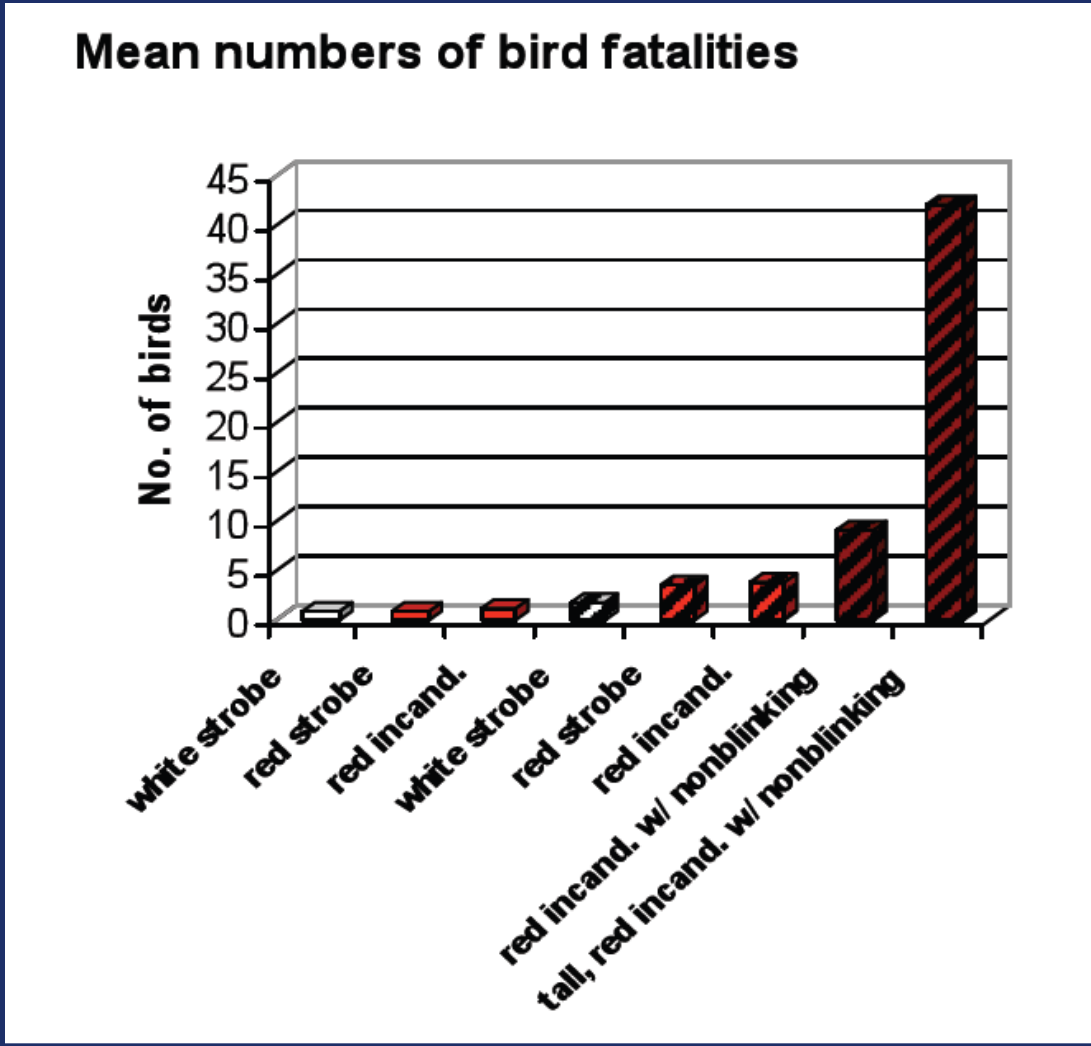
Flashing vs. Steady



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Flashing vs. Steady

Airport Tech R&D Sub Team members visited the Harrietta tower several times to conduct both ground and airborne evaluations.

-Still pictures and video from ground and air.

- Coordinated ‘tweaking’ of tower lighting.
- Varied Flash Rate.
- Night vision goggle evaluation.
- Input from local pilots.
- Direct comparison to other towers in vicinity of Harrietta.

Flashing vs. Steady

Researchers determined:

- 30 FPM was optimal for flashing tower lights in unison.
- No impact on Night Vision Goggle.
- Tower was still visible from great distances.

Problem:

- No current specification for flashing L-810s.
- What if we turned off the L-810s?

Proposed Change to AC 150/5345-43G

- *Flashing red obstruction light L-810*, 28 to 32 FPM*
- *L-810 Night 30 FPM 1/2 to 2/3 of flash period if incandescent lighting, and between 100 and 2000 ms inclusive if other lighting sources.*
- *For certain lighting configurations, the L-810 may be flashed at the same time as other lights located on the same obstruction (Reference AC 7460-1K). Research has shown that flashing the L-810 fixture can mitigate the negative impacts steady burning lights have on migratory bird populations.*

Engineering Brief 67D

Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures

Federal Aviation
Administration

Engineering Brief 67D Updates

- Signed March 6, 2012

- This EB is effective 9 months from the date of signature (3/6/12) except for the requirements specified in paragraph 1.0 “Intensity Ratios”, Table I (white light) and Appendix I, Table 3 (continuous curve for white light) that are effective immediately

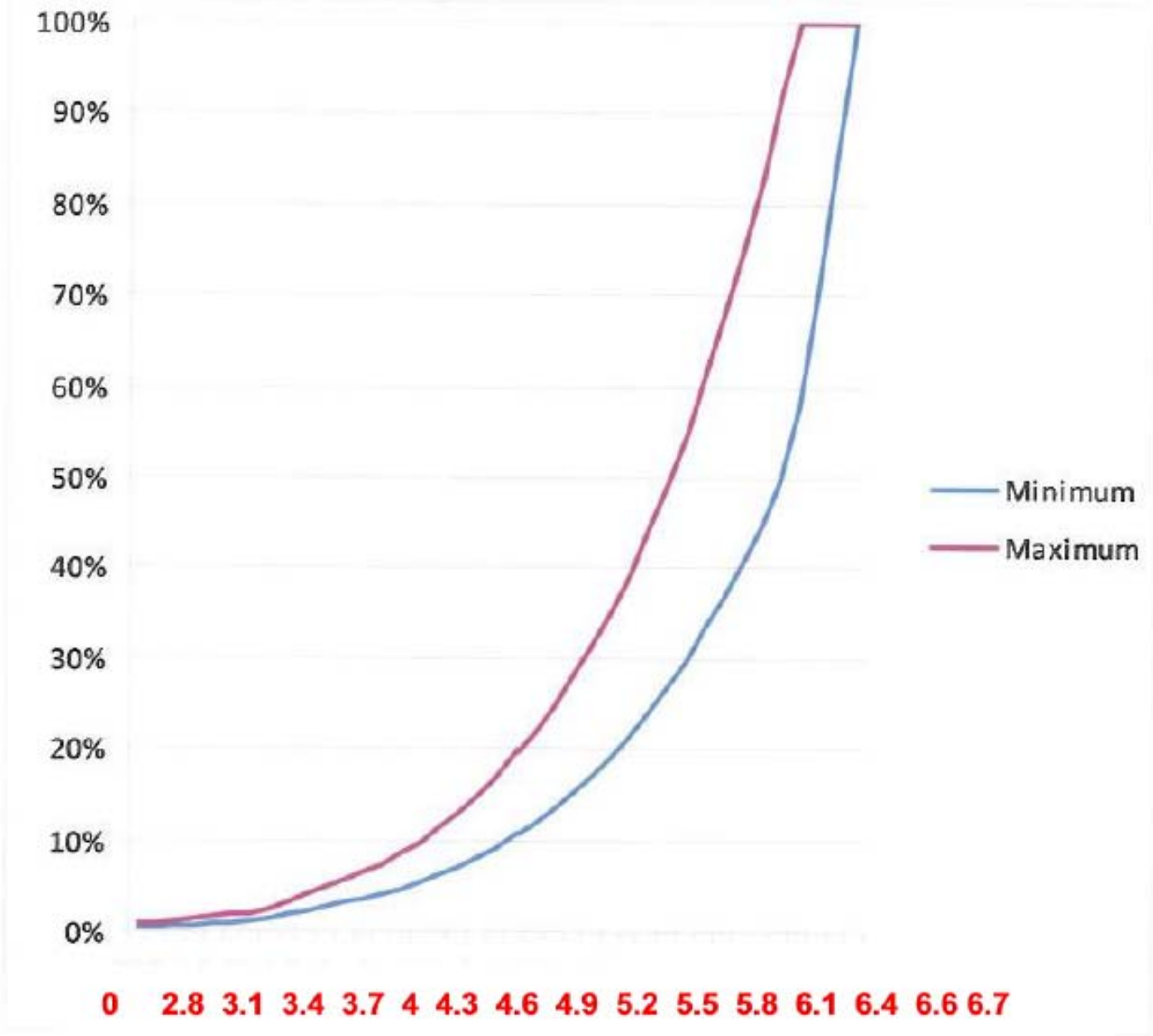

Figure 1: Dimming Curve (Applies To White Light Only)

Appendix I – Additional Information

Table 3. Detailed Version of Table 1 (White Light Only)

Current	Minimum	Maximum
2.7	0.15%	0.70%
2.8	0.15%	0.70%
2.9	0.28%	0.92%
3	0.41%	1.14%
3.1	0.54%	1.35%
3.2	0.67%	1.57%
3.3	0.80%	1.78%
3.4	1.00%	2.10%
3.5	1.36%	2.75%
3.6	1.79%	3.50%
3.7	2.22%	4.25%
3.8	2.65%	5.00%
3.9	3.08%	5.75%
4	3.51%	6.50%
4.1	3.94%	7.35%
4.2	4.57%	8.45%
4.3	5.28%	9.76%
4.4	6.08%	11.23%
4.5	6.98%	12.89%
4.6	7.99%	14.75%
4.7	9.11%	16.83%
4.8	10.37%	19.15%
4.9	11.76%	21.73%
5	13.31%	24.59%

Engineering Brief 67D Updates

- “Where a light fixture type is available as both Incandescent (L-XXX) or LED (L-XXX(L)), the owner must select the fixture type to be used, or must specify that either incandescent or LED are acceptable.”
- All LED type fixtures shall be designated as “L-XXX(L)”
  - Example:
    - Incandescent txy edge light L-861T
    - The LED version of the taxiway edge light type will be specified as "L-861T(L)".

Engineering Brief 67D Updates

- Refined a standard white chromaticity range. Boundary intersection points for aviation white LED chromaticity boundaries were added.

- Dominant wavelengths are removed. Reduced range CIE1931 chromaticity coordinates are used to prevent undesirable color changes within the chromaticity range.

- The objective of defining ranges of chromaticity that are smaller than the AS 25050 spec is to promote better color uniformity when using LEDs. This way, for example, when one looks at green centerline lights, they will all appear to be the same color. Under the old AS 25050 spec. there was sufficient range that different color shades would be readily apparent.

Engineering Brief 67D Updates

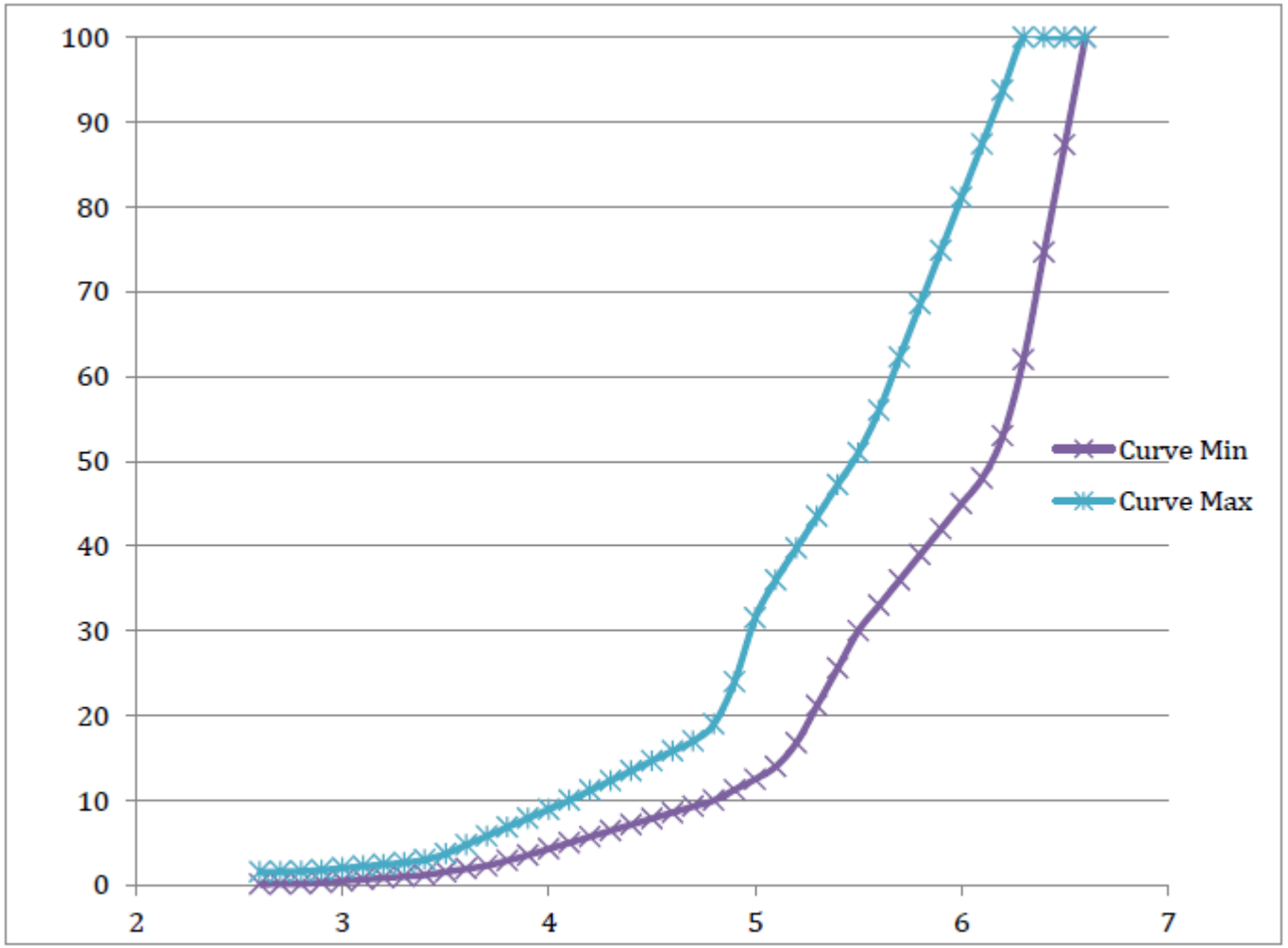

Figure 2. Detailed Current/intensity Graph of Figure 2 for LED Light Colors Blue, Red, Green, and Yellow

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Engineering Brief 67D Updates

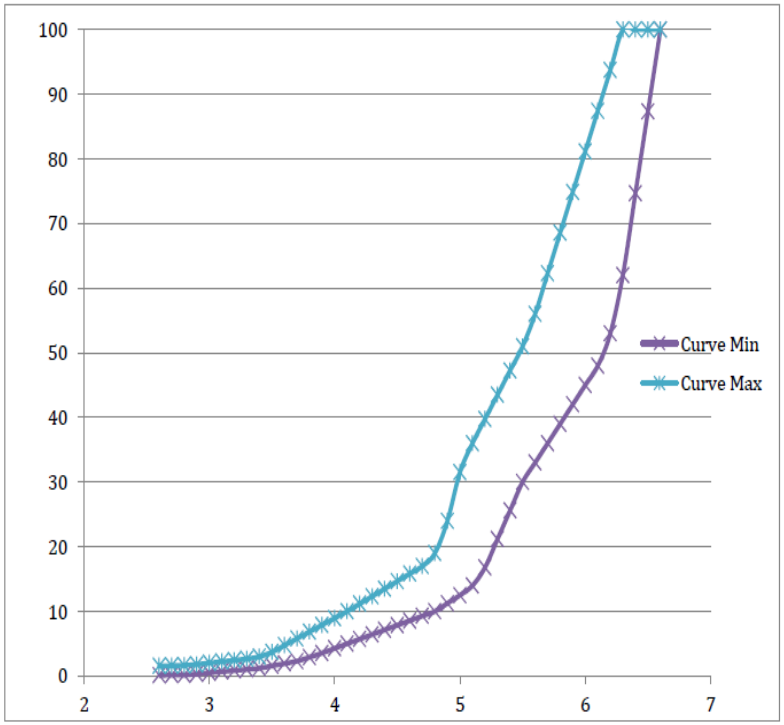

Figure 2. Detailed Current/intensity Graph of Figure 2 for LED Light Colors Blue, Red, Green, and Yellow

LAMP CURRENT	% MINIMUM INTENSITY	% MAXIMUM INTENSITY
6.6	100	n/a
5.5	30.0	51.0
5.2	16.8	39.75
4.8	10.0	19.0
4.1	5.0	10.0
3.4	1.2	3.0
2.8	0.15	1.65

Table 2. Applies To Colored Light Only (see Appendix 1 for detailed table)

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Engineering Brief 67D Updates

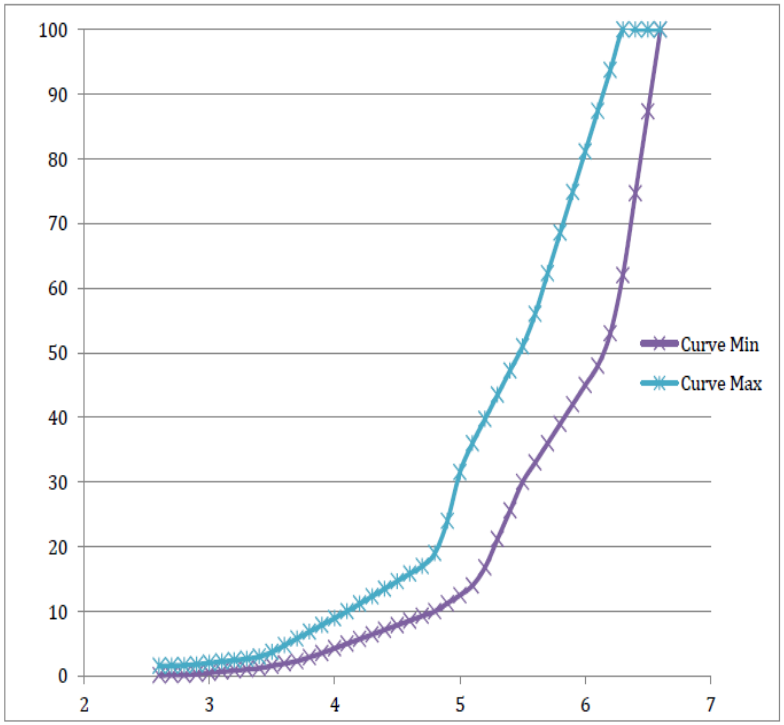

Figure 2. Detailed Current/intensity Graph of Figure 2 for LED Light Colors Blue, Red, Green, and Yellow

Table 4. Detailed current/intensity for color LEDs

		Curves	
Step	I(A)	Dmin(%)	Dmax(%)
	2.7	0.13	1.6
B1	2.8	**0.15**	**1.65**
	2.9	0.33	1.8
	3	0.5	2.01
	3.1	0.68	2.23
	3.2	0.85	2.44
	3.3	1.03	2.65
B2	3.4	**1.2**	**3**
	3.5	1.57	3.7
	3.6	1.93	4.75
	3.7	2.3	5.8
	3.8	2.9	6.85
	3.9	3.55	7.9
	4	4.28	8.95
B3	4.1	**5**	**10**
	4.2	5.71	11.17
	4.3	6.43	12.33
	4.4	7.14	13.5
	4.5	7.86	14.67
	4.6	8.57	15.83
	4.7	9.29	17
B10	4.8	**10**	**19**
	4.9	11.25	24

Engineering Brief 67D Updates

- The true power factor for all fixtures powered by a Constant Current Regulator must not be less than 0.7 when measured at the isolation transformer primary input power leads of the fixture on all constant current regulator current steps.

- Light fixture true power factor is computed over a frequency bandwidth range of at least 100 kHz. The power factor measurement must not be displacement power factor (cos φ). Testing will be conducted using a pure sine wave source.

Engineering Brief 67D Updates

- Light Fixture Flicker - All light fixtures that use pulse width modulation (PWM) to facilitate LED brightness changes must not cause perceptible flicker to a moving human observer (example: pilot in an aircraft) throughout the range of brightness steps.
- Optional Arctic Kits requirement is also applied to Obstruction Lights (AC 5345-43F)

Engineering Brief 67D Updates

- All LED light fixtures with the exception of obstruction lighting (AC 150/5345-43) must be warranted by the manufacturer for a minimum of 4 years after date of installation inclusive of all electronics. The replacement criterion for light fixtures is per AC 150/5340-26.

- This warranty includes….

Program Guidance Letter for LEDs

- PGL 12-02 (March 5, 2012)
- Program Guidance Letter (PGL) had been prepared to discuss the impact of Engineering Brief (EB) 67D on AIP funded projects.
- Sponsor must specify either LED or incandescent.
- A life cycle cost analysis will no longer be required to permit the selection and use of LED fixtures for an AIP funded project.

Program Guidance Letter for LEDs

- Exceptions: The FAA is reviewing the use of :
  - *LED Obstruction Lights*
  - *LED Approach Lights*
  - *LED High Intensity Runway Edge lights*
- For these reasons, LED obstruction lights, LED approach lights and LED high intensity runway edge lights are not AIP eligible at this time.

NVG
EFVS

Federal Aviation
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Draft EB No. xx for Aviation Obstruction and Ground Lighting Visibility with NVIS

Federal Aviation Administration

Draft EB No. xx for Aviation Obstruction and Ground Lighting Visibility with NVIS

- Purpose
- Background
- NVIS Operation
- NVIS and Civil Aviation
- NVIS Filter Classes
- Proposed LED Obstruction Light with IR signal
- Proposed Intermediate Steps

Federal Aviation Administration

Draft EB No. xx for Aviation Obstruction and Ground Lighting Visibility with NVIS

- **PURPOSE**

This engineering brief provides information about the interaction of light emitting diodes (LEDs) used for both obstruction and aviation ground lighting with night vision systems on board both rotary and fixed wing aircraft. In addition, a prototype LED L-810 obstruction light fixture with built-in NVIS compatibility is proposed.

Federal Aviation Administration

SAFO

Safety Alert for Operators

U.S. Department
of Transportation

**Federal Aviation
Administration**

SAFO 09007
DATE 3/6/09

Flight Standards Service
Washington, DC

http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo

A SAFO contains important safety information and may include recommended action. SAFO content should be especially valuable to air carriers in meeting their statutory duty to provide service with the highest possible degree of safety in the public interest. Besides the specific action recommended in a SAFO, an alternative action may be as effective in addressing the safety issue named in the SAFO.

Subject: Night Vision Goggle (NVG) Advisory Pertaining to Certain Red Color Light Emitting Diodes (LED)

Purpose: This SAFO advises operators utilizing NVGs that certain LED lighting systems fall outside the combined visible and near-infrared spectrum of NVGs.

Discussion: A Flight Safety Flash was issued in 2008 by the Canadian Air Force's Directorate of Flight Safety, which identified some red obstruction lighting systems that were clearly visible to the naked eye but not visible to NVGs. These lighting systems employ LEDs instead of traditional incandescent sources. The use of LEDs is becoming more common for almost all lighting applications because of their energy efficiency and extremely long life.

Aviation Red light ranges from about 610 to 700 nanometers (nm), and NVGs approved for civil aviation (having a Class B Minus Blue Filter) are only sensitive to energy ranging from 665 to about 930 nm. Because LEDs have a relatively narrow emission band and do not emit infrared energy like incandescent lights, it is possible for them to meet FAA requirements for Aviation Red but be below the range in which NVGs are sensitive.

In general terms, NVG users should be aware that LED lighting systems falling outside the combined visible and near-infrared spectrum of an NVG (approximately 665 to 930 nm) will not be visible to their goggles. Crews that fly using NVGs are warned to use extra caution when flying near obstacle areas and to report any hazardous sites to the nearest Flight Standards District Office (FSDO) or the appropriate military Safety Officer.

Recommended Action: Pilots, directors of operations, chief pilots, training program managers, and training centers either using, or providing training for NVGs should advise pilots of the limitations outlined in this SAFO and ensure such information is incorporated into the pilot NVG training program.

FLIGHT SAFETY SÉCURITÉ DES VOLS

FLASH

Issue 2 2008 Numéro 2 2008

Risk posed by obstruction lighting systems not compatible with Night Vision Goggles (NVG)

It was recently identified by a CH146 Griffon crew from 400 THS Borden that some obstruction lighting systems are not visible under NVG. The crew was flying near the Shelburne (ON) Windmills when they noticed that the lighting system used at this site was very visible to the naked eye but could not be seen under NVG. These obstructions are identified using Light Emitting Diodes (LED).

Many obstacles across the country are illuminated using LED due to their energy efficiency. While the LED obstruction lighting systems meet FAA and Transport Canada requirements for Aviation Red, the wavelength chosen for the LED obstruction light is below the range to which NVG are sensitive. The sensitivity of NVG starts at about 645 nanometers (nm), peaks between 660nm and 850nm and finishes at 905nm. Some LED lighting systems fall outside of the 645-905nm spectrum for NVG, thus rendering them invisible under NVG.

Crews that fly using NVG are warned to use extra caution when flying near obstacle areas and to report hazardous sites to a Flight Safety Officer (FSO).

The Transport Canada regulations regarding obstruction lighting can be accessed at the following link:

<http://www.tc.gc.ca/CivilAviation/Regserv/Affairs/cars/PART6/Standards/Standard621.htm>

Risque associé aux feux d'obstacle non compatibles avec les lunettes de vision nocturne (LVN)

Récemment, un équipage de CH146 Griffon du 400 ETAH de Borden a constaté que certains feux d'obstacle ne sont pas compatibles avec les lunettes de vision nocturne. L'équipage volait près d'une ferme d'éoliennes à Shelburne (Ontario) quand il a remarqué que les feux utilisés à cet endroit étaient très visibles à l'oeil nu, mais qu'ils ne pouvaient pas être vus au moyen des LVN. Ces obstacles sont balisés au moyen de diodes électroluminescentes (DEL).

De nombreux obstacles partout au pays sont balisés par des DEL en raison de l'efficacité énergétique de celles-ci. Les feux d'obstacles à DEL sont conformes aux exigences de la FAA et de Transports Canada pour la couleur rouge aviation, mais la longueur d'onde choisie pour le feu à obstacle à DEL se situe sous la plage à laquelle les LVN sont sensibles. La sensibilité des LVN commence aux alentours de 645 nanomètres (nm), elle est optimale entre 660 nm et 850 nm, et elle se termine aux alentours de 905 nm. La longueur d'onde de certains feux à obstacle à DEL se situe à l'extérieur de la plage de sensibilité des LVN, laquelle est comprise entre 645 et 905 nm, ce qui rend ces feux invisibles si l'on porte des LVN.

Les équipages qui portent des LVN en vol sont donc priés d'être particulièrement vigilants lorsqu'ils voient près d'obstacles et de signaler à un officier de sécurité des vols (OSV) tout endroit susceptible de présenter des risques à cet égard.

La réglementation de Transport Canada au sujet des feux d'obstacles est accessible au moyen du lien suivant :

<http://www.tc.gc.ca/aviationcivile/ServReg/Affaires/RAC/Partie6/Normes/Norme621.htm>

Transport Canada Advisory Circular AC 603-001, Use of Night Vision Imaging System.(2012-02-03)

- **2.3 Definitions and Abbreviations**
- (1) The following **definitions** are used in this document:
- (a) **Class B**: A class of Night Vision Goggles that contains an objective filter that prevents light waves measuring below 665 nanometres from entering the image intensifier;
- (b) **Night Vision Goggles**: Goggles that picks up any light in the immediate area and amplify it several thousand times using an image intensifier. This works by the photoelectric effect. As a photon collides with a detector plate, the metal ejects several electrons that are then amplified into a cascade of electrons that light up a phosphor screen;
- (c) **Night Vision Imaging System**: A system which uses image intensifier tubes to produce an enhanced image of a scene in light conditions too low for normal navigation and pilotage;
- (d) **Night Vision Imaging Systems Radiance**: The amount of energy emitted by a light source that is visible through Night Vision Imaging Systems;
- (e) **Transparencies**: Window, windscreen, chin bubbles and overhead windows installed on the aircraft that the crew uses to look outside the aircraft; and
- (f) **Event**: An event is considered a take-off to hover, transition to forward flight, cruise, approach, hover and landing while not in an airport circuit. Training circuits at the same airfield should be avoided and may not constitute an _event‘. A fixed wing event must consist of taxi, takeoff, climb, cruise, descent, approach and landing and return to ramp to at least one other aerodrome than the departure aerodrome

Federal Aviation Administration

ALERT BULLETIN

AB 2012:8/11-1
3/23/12
992436

TO: FAA (AFS-800)

INFO: FAA (AFS-230, AFS-200, FTW-AEG, ASA-100), AASC, HAI, ICASS, NESPA, NTSB

FROM: Linda J. Connell, Director
NASA Aviation Safety Reporting System

SUBJ: Beacons Not Visible to NVG User

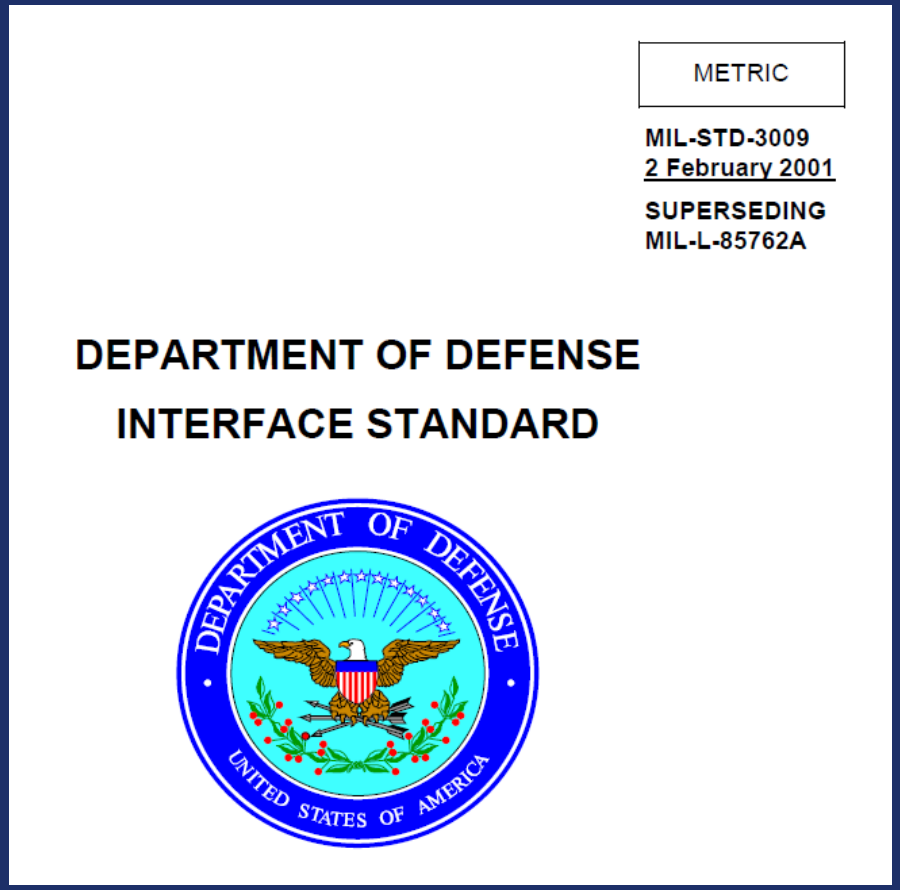
We recently received an ASRS report describing a safety concern which may involve your area of operational responsibility. We do not have sufficient details to assess either the factual accuracy or possible gravity of the report. It is our policy to relay the reported information to the appropriate authority for evaluation and any necessary follow-up. We feel you should be aware of the following:

ASRS received a report from a helicopter pilot who stated that the hazard beacons associated with new wind farms in the vicinity of Rumford and Berlin NH were not visible with his Night Vision Goggles (NVG). Reporter further stated that red obstacle beacons are normally brightly visible in his NVGs, and does not know why these new beacons are not picked up in a similar manner. Reporter expressed concern that Military or Scene Call operational safety could be negatively affected.

(Keywords: NVG Night Vision Goggles Beacon)

To properly assess the usefulness of our alert message service, we would appreciate it if

MIL-STD-3009



- LIGHTING, AIRCRAFT, NIGHT VISION IMAGING SYSTEM (NVIS) COMPATIBLE
- NVGs derived from military requirements.
- Provides interface requirements and testing methodology to ensure compatible and standardized aircraft interior lighting for NVIS compatibility.

Federal Aviation Administration

Night Vision Goggles

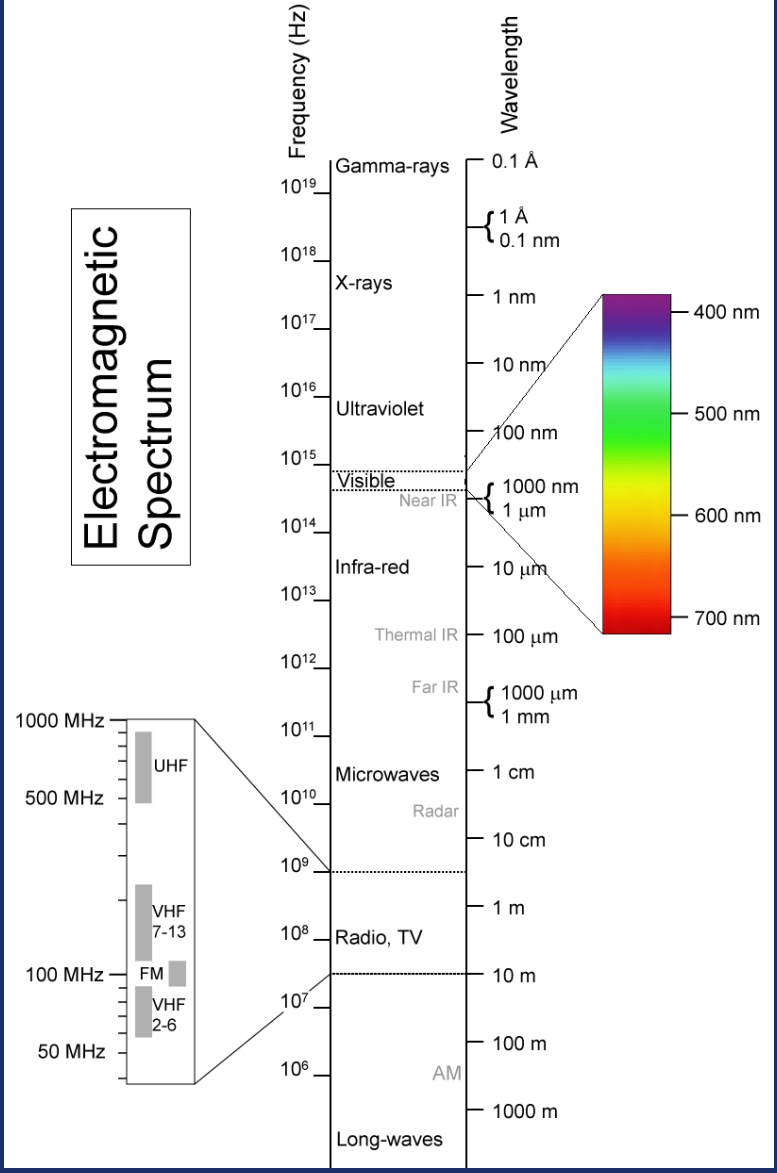
- Claim: LEDs cannot be seen with Night Vision Goggles!
- Visible light detected is independent of the lighting technology.
  - It is based on the spectrum the NVG technology uses.
- NVGs have either Type A or B filters which changes the spectrum sensed.

Federal Aviation Administration

Night Vision Goggles

- Commonly used Gen 3 NVGs sensitivity range is from approx. 450nm to 920nm.
- Commonly produced LEDs are from 460nm for Blue to 645nm for Red.
- NVG Gen3 without filters will respond to Green, Yellow, and Red LEDs.

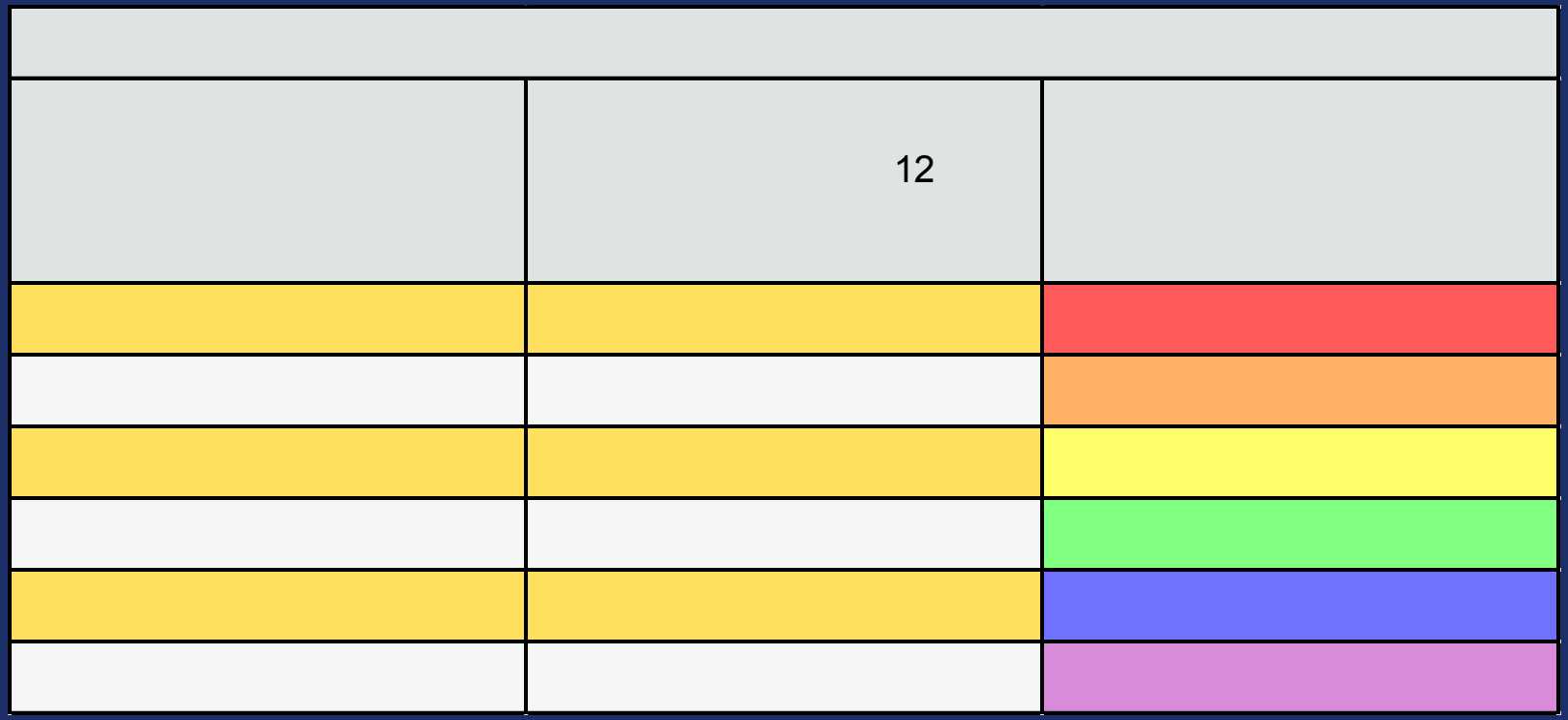
Night Vision Goggles



- **NVGs' spectral response in the range of approximately 600 to 900 nanometers in wavelength.**

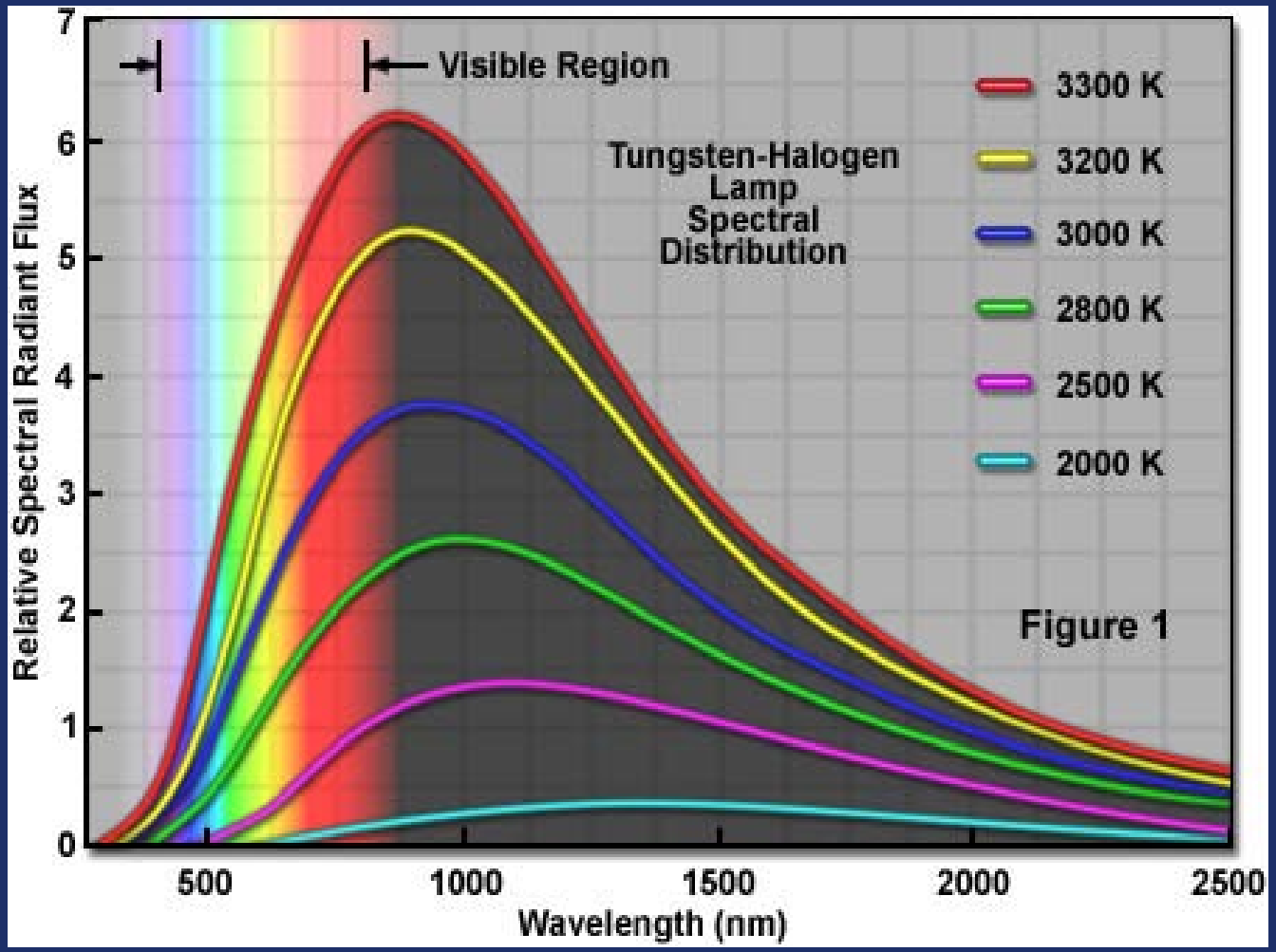
Federal Aviation Administration

Visible Spectrum



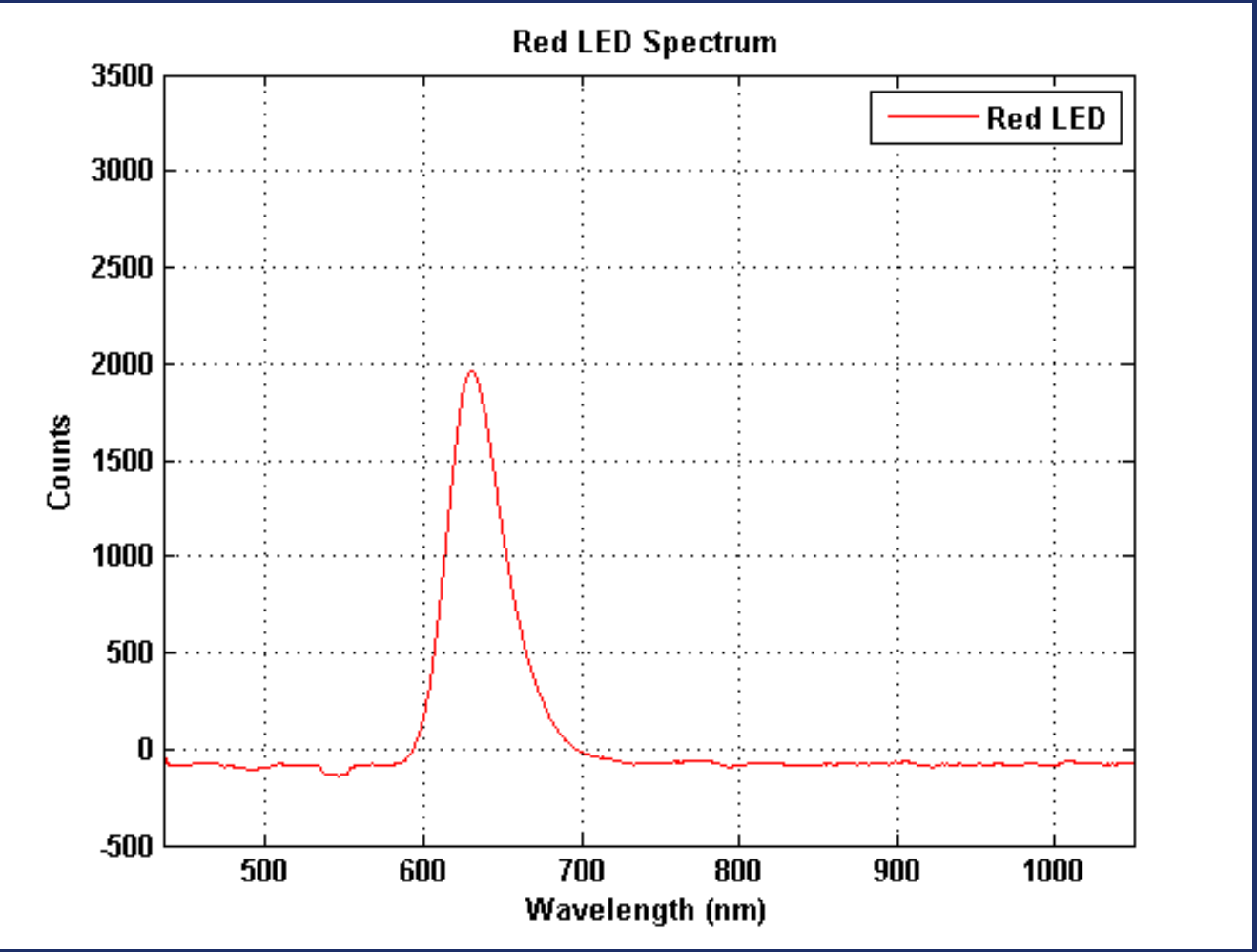
Federal Aviation Administration

Incandescent Light Output Spectrum



Federal Aviation Administration

Typical Red LED Spectrum

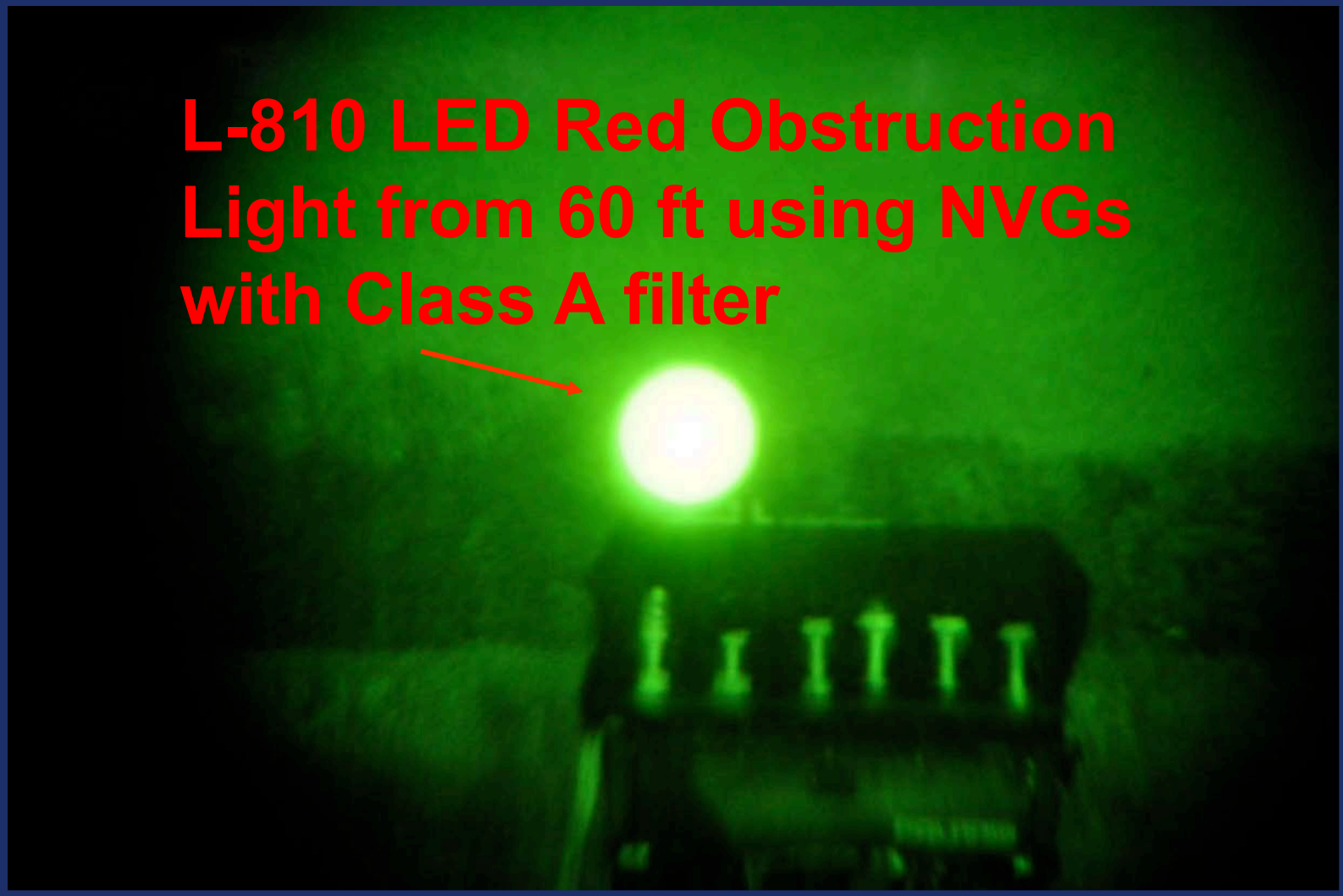


Federal Aviation Administration

Night Vision Goggles

- Class A filters respond at wavelengths longer than 625nm; Class B at 665nm.
- NVGs can detect red LEDs using Class A filters.
- NVGs cannot detect any LEDs using Class B filters. Some incandescent lights may be seen.

Night Vision Goggles



Federal Aviation Administration

Draft EB No. xx for Aviation Obstruction and Ground Lighting Visibility with NVIS

- A Proposed LED Obstruction Light
  - For NVIS compatibility, an LED based L-810 or L-864 obstruction light must have an added infrared emission spectrum. The emission from the light fixture should be within the peak response of most NVIS systems in use. For a Gen III type of system, a wavelength of 830 - 850 nm is proposed. A proposed initial value of radiant intensity for an L-810 light is from 20 to 30 mw/Sr.

NVG
EFVS

Federal Aviation
Administration

Enhanced Flight Vision Systems (EFVS)

- 14 CFR 1.1 defines EFVS as –

“

Federal Aviation Administration

Performance-Based Cockpit Technology in Low Visibility Operations

Benefits

- Enhances low visibility flight and ground operations.
- Increases access, efficiency and throughput at many airports when low visibility is a factor.
- Reduces infrastructure necessary to support low visibility operations.

Low Visibility Landing

Federal Aviation Administration

Performance-Based Cockpit Technology in Low Visibility Operations

- Provides flight guidance on a HUD

- **Provides a real time display of the outside world in low visibility conditions through the use of imaging sensors (forward looking infrared, millimeter wave, low-light level intensifying, etc.)**

Federal Aviation Administration

• NVIS-Class-B-modified cockpit lighting as viewed through Class-A objective lens ANVIS-9 NVGs

• NVIS-Class-B-modified cockpit lighting as viewed through Class-B objective lens ANVIS-9 NVGs. Class-B objective lens filters all light below 665 nanometers.

• Allows the additional use of some red lighting, primarily to allow for three-color multi-function displays

Federal Aviation Administration

Operational Concept for EFVS

- Permitted on straight-in landing instrument approach procedures other than Category II or Category III
- Provides another means of operating in the visual segment – EFVS in lieu of natural vision.
- EFVS enables descent below DA or MDA to 100 feet above TDZE provided certain requirements are met --
  - Enhanced flight visibility equal to/greater than that specified in the IAP.
  - Required visual references must be distinctly visible/identifiable.
  - All other requirements of 91.175 (l) must be met.
- Requires natural vision to be used to identify required visual references for descent below 100 feet above TDZE.

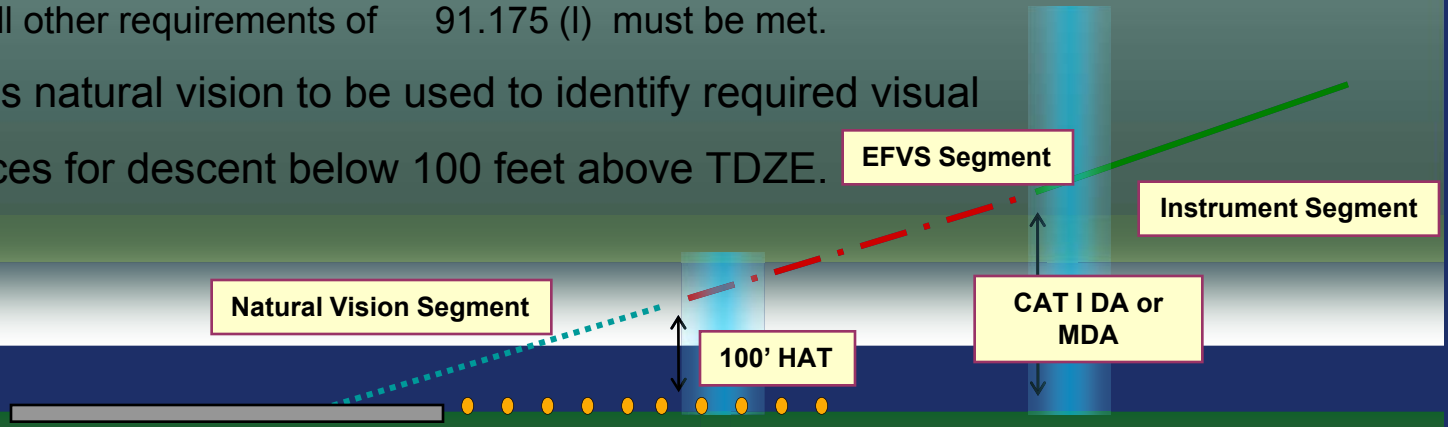


Illustration Courtesy of Mitre CAASD

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Ongoing Actions for EFVS

- Attend and participate in SAE G-20 committee meetings for EFVS.
- Participate in EFVS MALSR/IR program reviews within the the Navigation Services Group.
- Participate EFVS NPRM meetings

FY-2012 R&D Efforts

- Evaluate Heated Glass Solutions
  - Transparent conductive oxide (TCO) coating on the interior surface of the lens
- Evaluation of changing Runway Centerline Lights from Alternating White/Red to White/Yellow
  - ICAO Initiative – An accepted practice in aviation is to never cross red lights.
  - Current RCL lighting cues does not support this practice.
  - Field test both incandescent and LED RCL technologies.
- Evaluate Enhanced Strip LED Lighting

FY-2012 R&D Efforts

- Research RCL in Displaced Threshold
  > 700 ft
- Reduced Takeoff Minimums for RCL from RVR 1600 to 1000 ft.
- Approach Hold Signs/Marking Evaluation
- Improved Signage, Marking and Lighting of Engineered Material Arresting System (EMAS) Beds

FY-2012 R&D Efforts

- RWSL/THL and ALSF-II Evaluation
  - Determine if confusion exists when take-off hold lights and RELs are collocated.
- EFVS/LED Incompatibility Issue
  - G-20 Committee with SAE

Thank You!

Federal Aviation
Administration