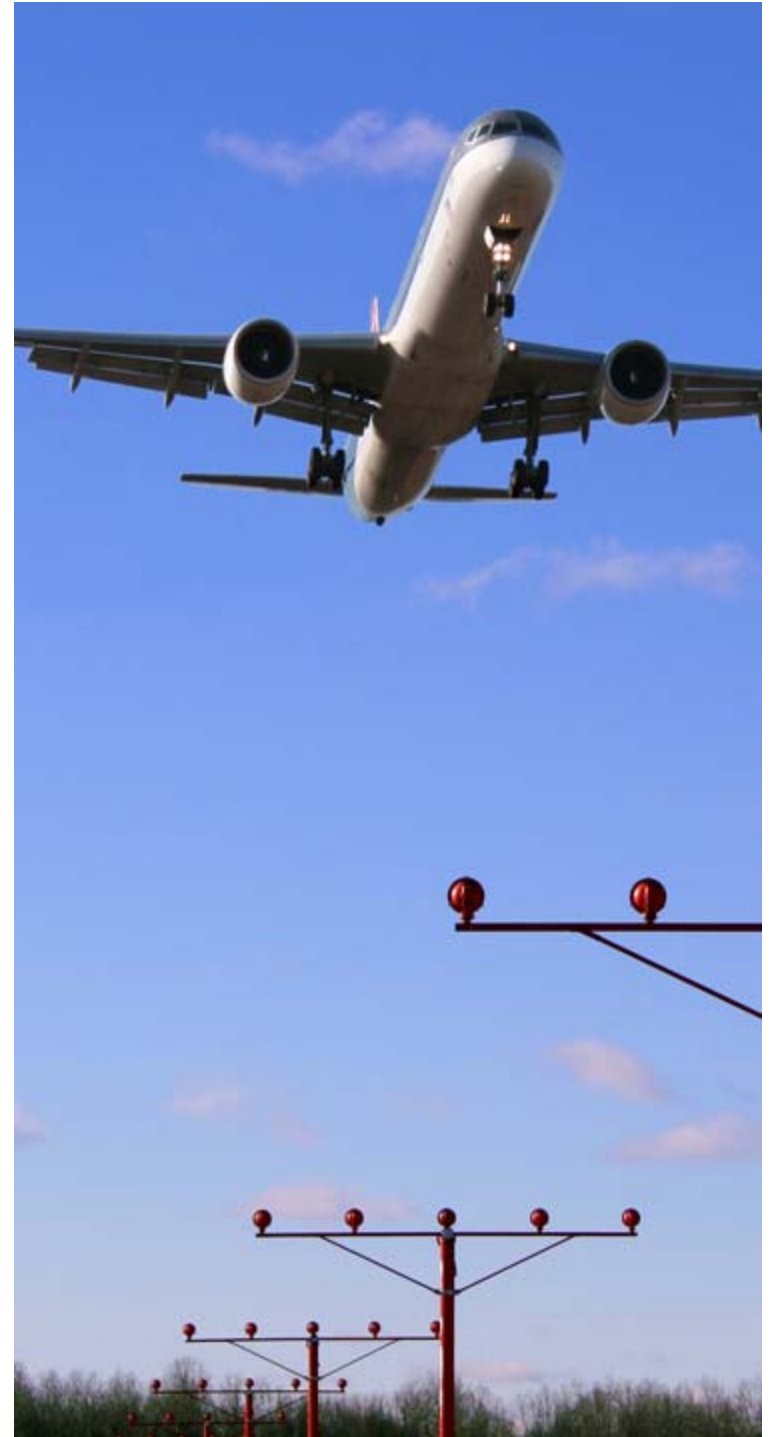


# **Illuminating Engineering Society (IES) Government Contacts Sub-Committee Meeting**

**Donald Lampkins**

Navigation Programs, Lighting Systems Team  
AJM-3222

**April 18, 2019**



# Overview

- **Lighting Systems Team**
- **Lighting Systems**
- **Capital Investment Programs**
- **Active Procurements**
- **Next Generation Lighting Systems**
- **Future Lighting Systems Initiatives**
- **Specification Updates**
- **Procurement Opportunities**



# Lighting Systems Team Contact Information

Name	Projects	Phone
John Varas	Manager	202.267.4539
Renee Williams	RVR, LEDs, LIR	202.267.9923
Ndubuisi Nnorom	RRCS, RLMS, REIL	202.267.9883
Donald Lampkins	MALSR, PAPI, LEDs	202.267.7332

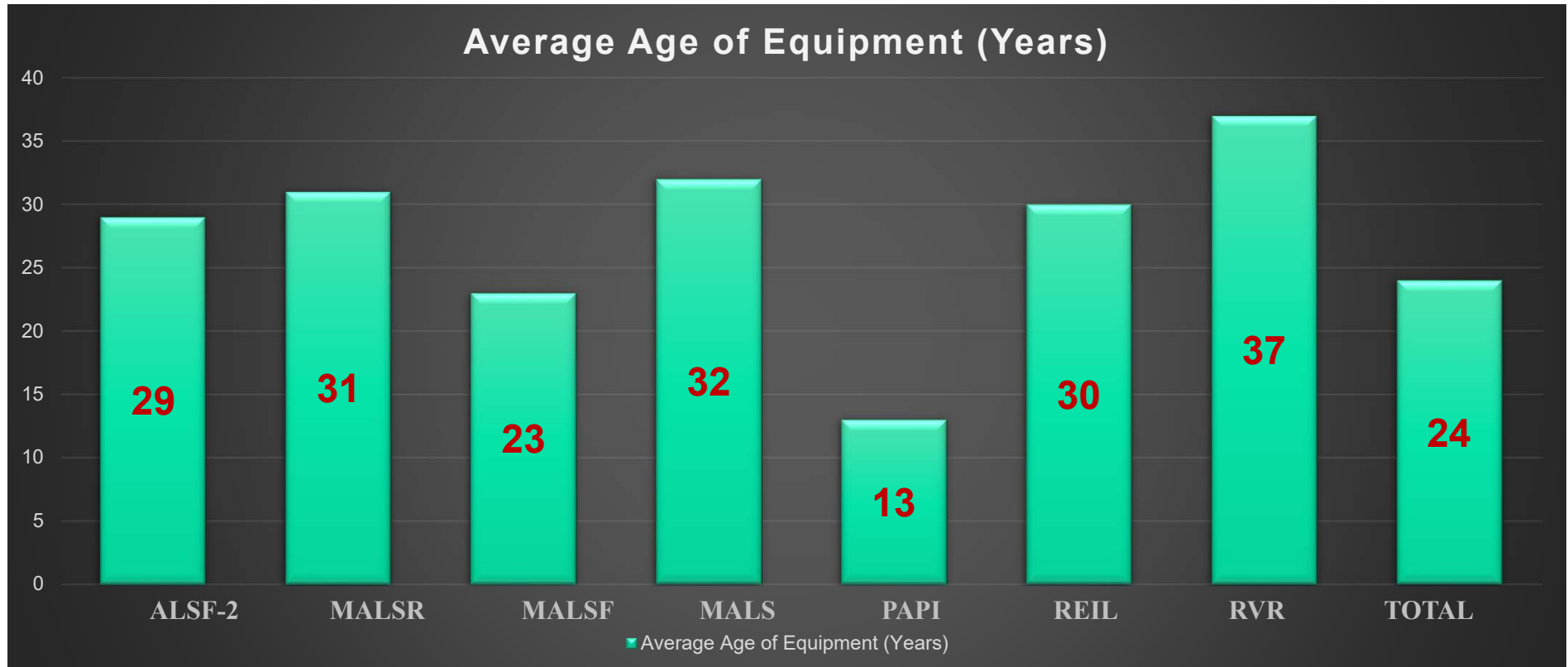


# Lighting Systems and Ancillary Equipment

- **High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2)**
- **Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR)**
- **Precision Approach Path Indicator (PAPI)**
- **Runway Visual Range (RVR)**
- **Runway End Identifier Lights (REILs)**
- **Radio Remote Control System (RRCS)**
- **Radio Remote Control Interface Unit (RRCIU)**
- **Replacement Lamp Monitoring System (RLMS)**
- **Lead-in Lights**
- **Semiflush Flashers and Steady Burners**
- **Low Impact Resistant (LIR) Structures**
- **Transformers**
- **Frangible Bolts**
- **Aiming Devices**



# Aging Infrastructure



## Aging Infrastructure cont.

- Aging Infrastructure
  - 11,000 Navigation Systems and Equipment in the NAS
  - Over 3,000 Lighting Systems and Equipment in the NAS
  - Average age >24 years
- Lighting Systems will remain in NAS past 2034
- ALS support IAP
  - Loss of ALS lowers capacity (delays)
  - Loss of ALS causes loss of IAP
- Continuous cycle of acquiring new equipment

# Capital Investment Programs

- **RVR** (Runway Visual Range)

Replaces older RVR equipment with PC-Based RVR equipment. RVR provides air traffic controllers with a measurement of the visibility at key points along a runway; touchdown, midpoint and rollout.

- **ALSIP** (Approach Lighting System Improvement Program)

Upgrades the equipment to current standards and reduces the potential severity of take-off and landing accidents by replacing rigid structures, and the entire approach lighting system, with lightweight and low-impact structures that collapse or break apart upon impact.

# Capital Investment Programs

- **NSRR** (Nav aids – Sustain, Replace, Relocate)

Sustains and/or replaces Approach Lighting Systems (ALS). The ALS includes MALSR for Category I approaches and ALSF-2 for Category II/III approaches. Additionally, NSRR supports the REIL and RLMS projects.

- **VNNQ** (Visual Nav aids for New Qualifiers)

Supports the procurement, installation, and commissioning of PAPI systems and REIL systems at new qualifying runways.

# Capital Investment Programs

- **VASI-PAPI** (Visual Approach Slope Indicator- Precision Approach Path Indicator)

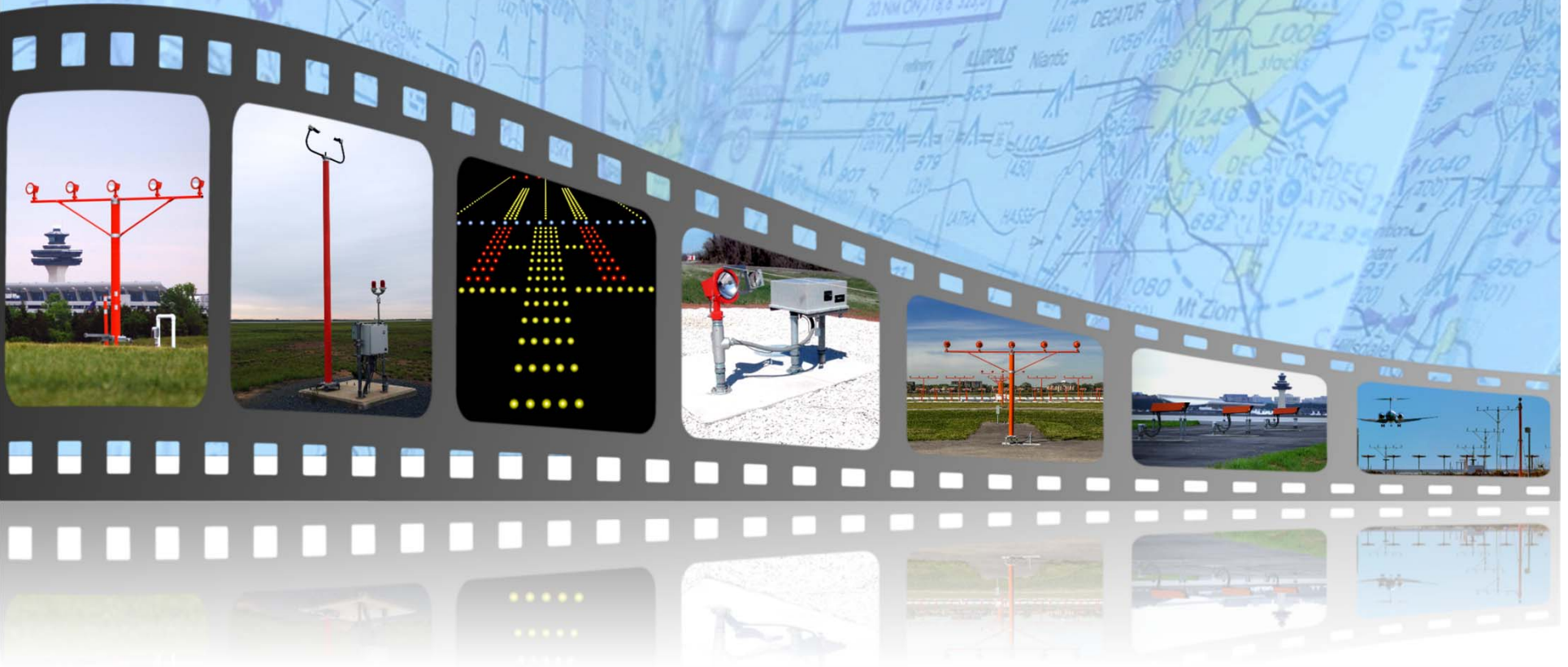
Supports the procurement, installation, and commissioning of PAPI systems in order to comply with ICAO's recommendation to replace the VASI lights with PAPI lights.

- **ILS** (Instrument Landing Systems)

Supports the installation of ILS and/or High Intensity Approach Lighting System. An ILS precision approach system is comprised of a grouping of electronic devices Localizer, Glide Slope, marker beacons and, in some cases, ancillary aids (DME, ALS, RVR, etc.)

# Active Procurements

LED PAPI; RRCS; RMLS; RRCIU; MALSR AIL

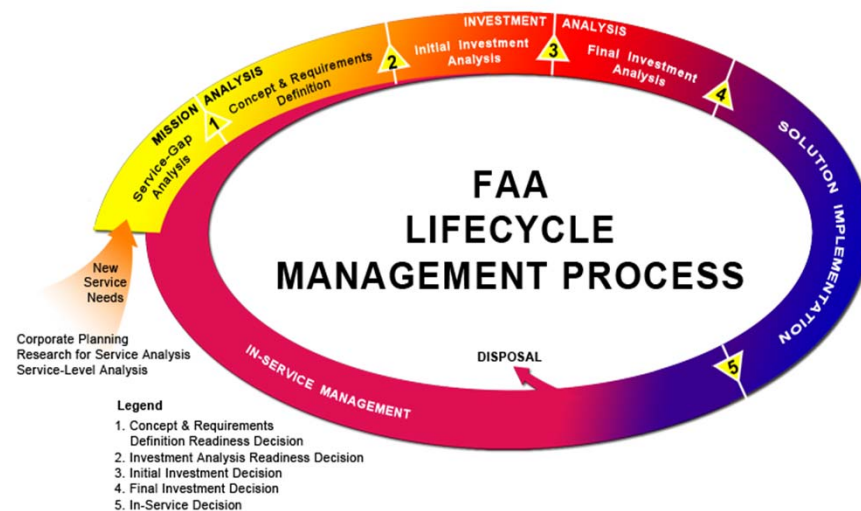


# LED PAPI Project

- **Objective:** The primary objective is to fully deploy LED PAPI by using the System Development, Deployment and Implementation phases of FAA's Acquisition Management Systems (FAMS) process

- **Project Activities**

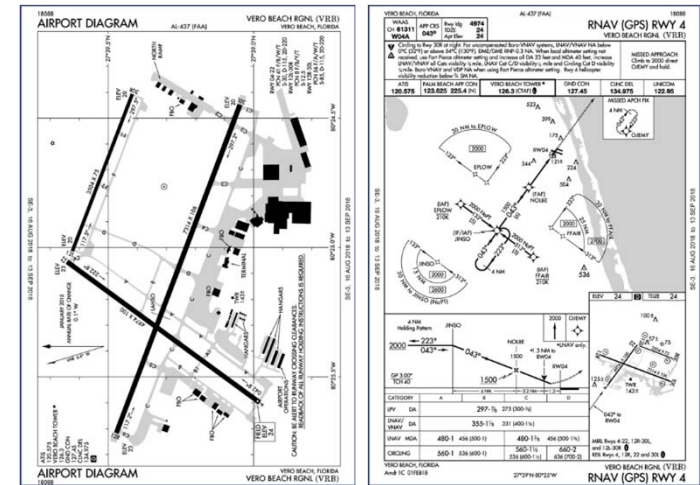
- Preliminary Design Review
- Critical Design Review
- Design Qualification Test
- Operational Test
- Configuration Audits
- Product Baseline
- In-Service Management



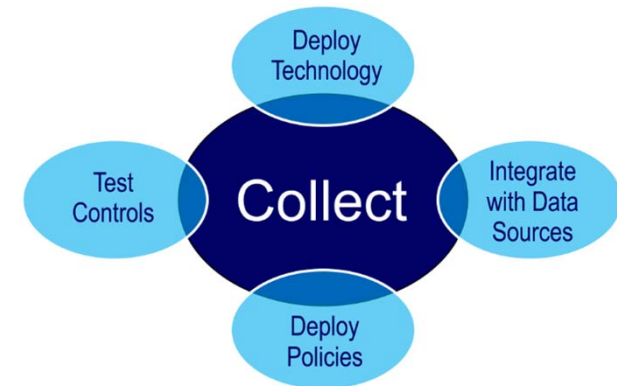
# LED PAPI Operational Analysis

- Installed and Commissioned LED PAPI systems at 13 sites

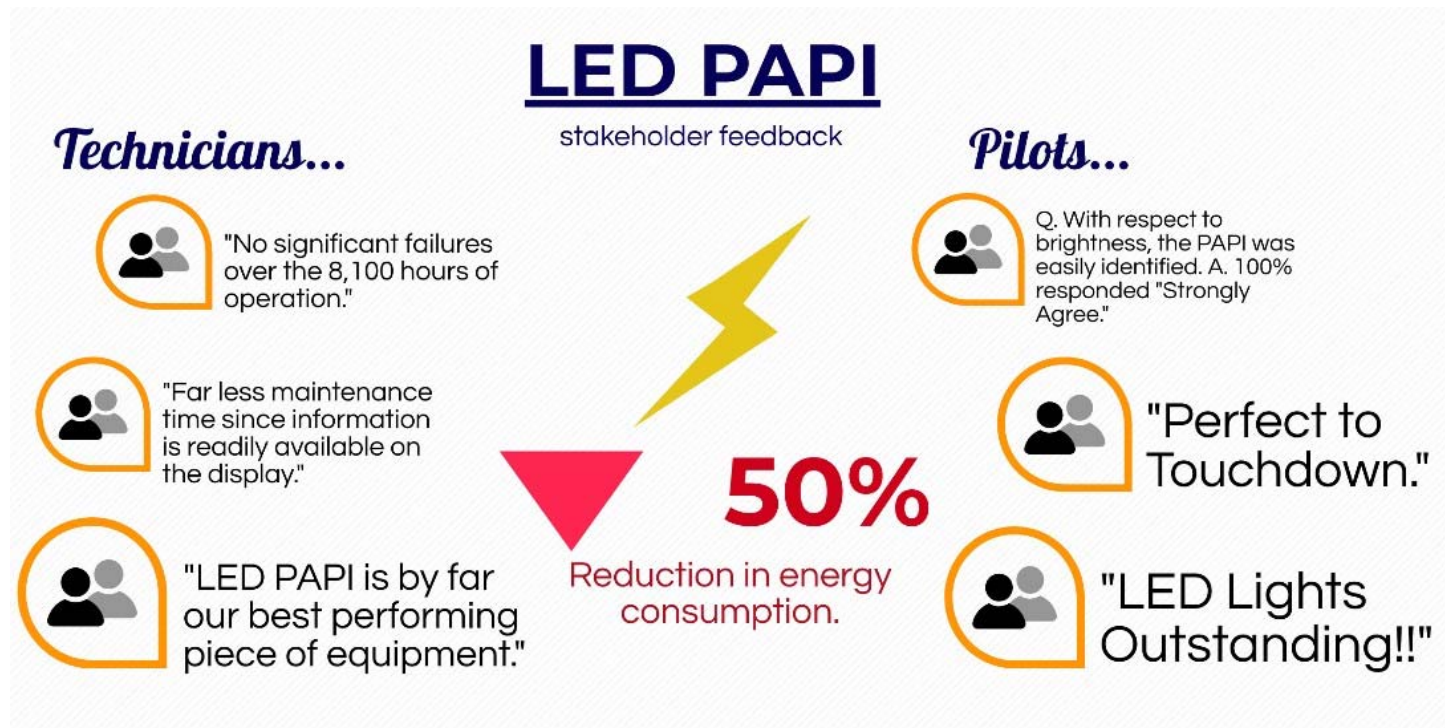
- Vero Beach, FL – Runway 04
- Flagstaff, AZ – Runway 03
- Harlingen, TX – Runway 35L
- Rochester, NY – Runway 22
- Atlanta, GA – Runway 10, 28
- Lakeview, OR – Runway 17, 35
- Tri City, TN – Runway 05
- Kearney, NE – Runway 18
- Idaho Falls, ID – Runway 03
- Appleton, WI – Runway 12
- Redmond, OR – Runway 11
- Redding, CA – Runway 16
- New Bedford, MA – Runway 32



- Collecting and analyzing reliability, maintainability, availability (RMA) and supportability data

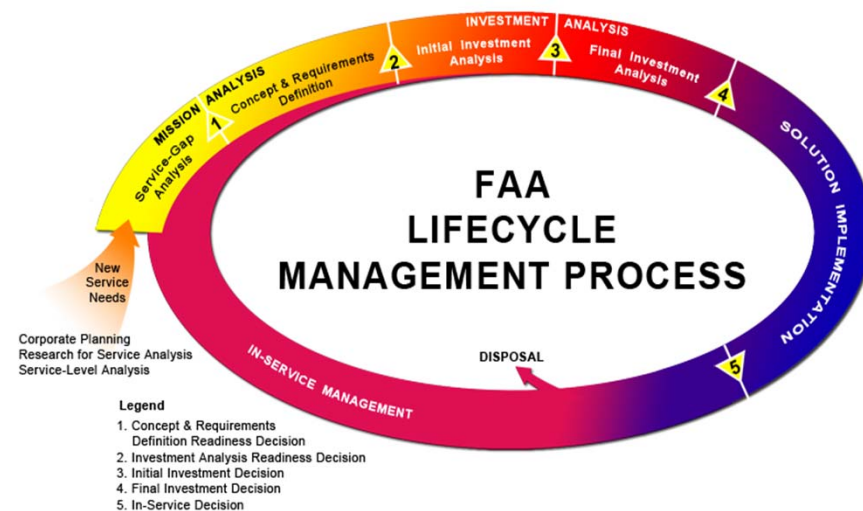


# LED PAPI Operational Analysis



# RRCS Project

- **Objective:** The primary objective is to fully deploy RRCS by using the System Development, Deployment and Implementation phases of FAA's Acquisition Management Systems (FAMS) process
  - Project Activities
    - Post Award Conference
    - Preliminary Design Review
    - Critical Design Review
    - Design Qualification Test
    - Operational Test
    - Configuration Audits
    - Product Baseline
    - In-Service Management



# RRCS Project

- **The RRCS procurement project is needed to address compliance with the National Telecommunications and Information Administration (NTIA) narrow bandwidth radio transmission requirements and parts obsolescence issues**
- **The current RRCS is authorized to operate on a wideband frequency due to a NTIA waiver negotiated by the FAA Spectrum Engineering Group, which expires in January 2021**



# RRCS Changes

- **Meet the NTIA requirements for narrowband transmission of less than 11kHz**
- **Integrate the transmitter and encoder into a single unit in the ATCT**
- **Integrate the receiver unit, the decoder unit, and the Remote Radio Control Interface Unit at the ALS**
- **Update the switch assembly with a touchscreen panel in the ATCT**
- **Provide positive status feedback when the associated ALS is turned on**
- **Provide alerts to the ATCT controller if an ALS or RRCS failure occurs**
- **Provide a modular hardware design to simplify routine or corrective maintenance, and to provide easier upgradeability in the future**

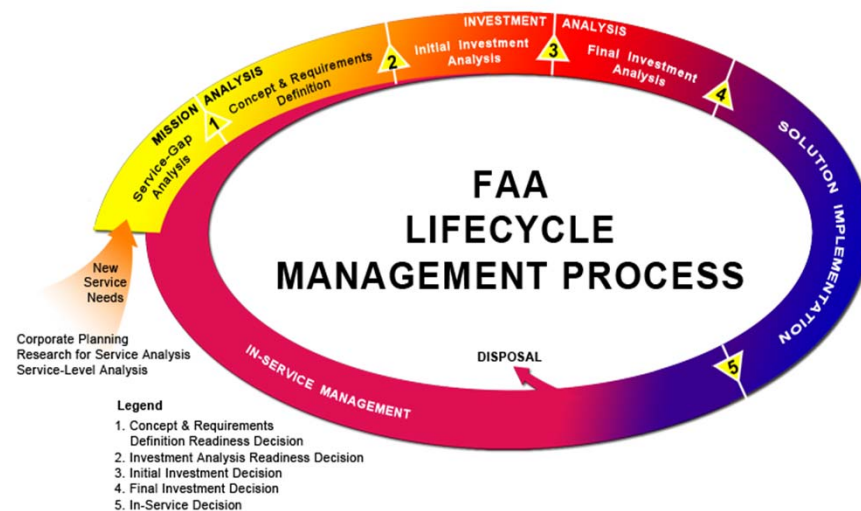
# RRCIU Project

- **Objective:**
  - To procure RRCIU to satisfy current requirements for Air to Ground and Ground to Ground controls
- **Status:**
  - Conducted RRCIU Verification Audit and Provisioning Conference
  - Conduct Production Acceptance Test for initial 13 RRCIUs
  - Procure 40 RRCIUs to support implementation projects



# RLMS Project

- **Objective:** The primary objective is to fully deploy RLMS by using the System Development, Deployment and Implementation phases of FAA's Acquisition Management Systems (FAMS) process
  - Project Activities
    - Post Award Conference
    - Preliminary Design Review
    - Critical Design Review
    - Design Qualification Test
    - Operational Test
    - Configuration Audits
    - Product Baseline
    - Solution Implementation
    - In-Service Management



# RLMS Project

- **Objective:**
  - To replace the constant current regulators and implement lamp monitoring on the Airflow and Godfrey ALSF-2 systems
- **Status:**
  - Conduct two (2) RLMS site surveys
  - Support RLMS installation activities at two sites
    - Wichita, KS
    - Omaha, NE



# Alternative Incandescent Lamps (AIL) Project



- **Objective:**
  - To approve AIL to support over 900 MALSR systems
- **Issue:**
  - GE discontinued lamps used in the MALSR system. Replacement Lamps are difficult to find.
- **Status:**
  - Tested four (4) lamps for photometric, chromaticity
    - Amglo (53w HIR)
    - Amglo (60w Halogen)
    - Sylvania (60w)
    - BLC (120W)

# Alternative Incandescent Lamps (AIL) Project

- **Requirements**

- The steady burning light beam pattern must be circular in shape.
- The steady burning main-beam pattern must be +/- 8°.
- Input Voltages
  - Low (50V)
  - Medium (75V)
  - High (120V)

Steady Burning Main Beam Avg. Intensity (cd)					
Low (4%)		Medium (20%)		High (100%)	
Min	Max	Min	Max	Min	Max
320	480	1600	2400	8000	12000

- **Recommendations**

- Using Amglo (60W) and Sylvania (60W)
- May start using BLC (120W)

# Next Generation Lighting

LED MALSR; LED ALSF-2; LED REIL



# LED Initiatives

- **Roadmap to the future**
  - Transition from current PAR-38 incandescent lamps to energy efficient LED technology
    - Developing alternative LED lamps that can use existing lamp fixtures to minimize cost of conversion
    - Establish a transition plan to replace incandescent lamps
    - Determining need for infra-red emission to support enhanced flight vision systems (EFVS) and Night Vision Systems (NVS)
  - Transition from current PAR-56 threshold lamps to LED technology
    - Rely on LED technology to improve reliability and maintainability and reduce ops costs



# LED Project Activities

- Incorporated Brightness to Luminous B/L ratio of 1.6 for white LEDs
- Conducted Flight Demonstration at FAA Technical Center to specifically address brightness issue
- Conducted EVFS Demonstration at Juneau, AK to collect images during low visibility condition using EVFS and Natural cameras.
- **Install LED PAR-38s at Savannah/Hilton Head Airport (SAV)**
- **Conduct Duration Testing at Joint Base Cape Cod (JBCC) in IFR conditions using EVFS and Natural cameras**
- **Install LED PAR-38s at various MALSR operational sites**
- **Test LED PAR-56 Prototypes at FAA Technical Center**



# In-Flight Questionnaire (Criteria Definitions)

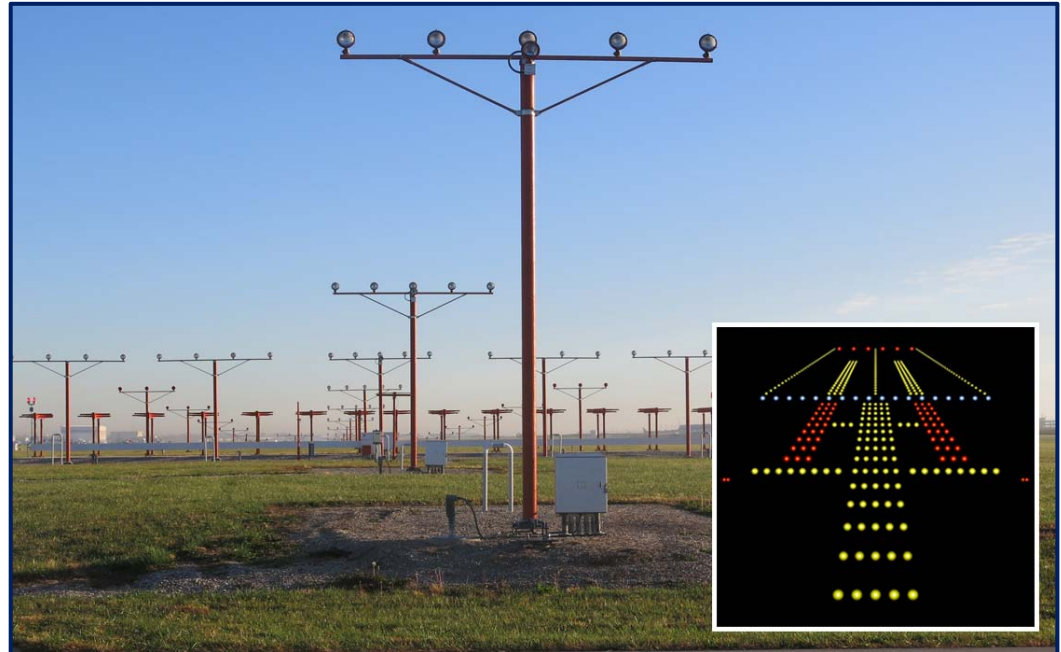
- **Global Brightness**: A measure of the overall brightness and compelling nature, to the exclusion of the remainder of the field of view (FOV)
- **Global Blooming**: A measure of the perceived amount of blocking of the lights to the surrounding visual
- **Brightness Direction Stability**: A measure of the apparent brightness of the light source as the angle of view changes
- **Depth Perception**: The visual ability to judge the relative distance of objects and the spatial relationship of objects at different distances

# In-Flight Questionnaire

- At what distance (in nautical miles to the nearest tenth) did you first acquire the MALSR for this runway?
- On a scale 1 to 5, where 1= *Unable* and 5= *Perfectly able*; how would you qualify your ability to identify the MALSRs with respect to **blooming?**
- On a scale 1 to 5, where 1= *Unacceptable* and 5= *Perfectly acceptable*; how would you qualify the impact of the MALSRs **brightness** in the context of type of operation?
- On a scale 1 to 5, where 1= *Unacceptable* and 5= *Perfectly acceptable*; how would you qualify the apparent brightness of the lighting cues in the context of **Directional Stability** during operation?
- On a scale 1 to 5, where 1= *Unable* and 5= *Perfectly able*; how would you qualify your ability to judge the relative distance of objects and the spatial relationship of objects at different distances in the context of **Depth Perception** during operation?

# ALSF-2 Initiative

- **Roadmap to the Future**
  - Evaluate potential for reducing footprint and number of lamps needed to support CAT II/III approaches
  - Leverage lessons learned from the MALSR program to implement Light Emitting Diode (LED) in the ALSF-2 design to the extent possible



# Future Lighting Systems Initiatives

- **Initiate a project to develop approach lighting systems using newer technology**
  - MALSR
  - ALSF
- **Initiate a project to develop sequenced flashers using LEDs**



# Specification and Procurement Opportunities



# Specification Updates

- **Radio Remote Control System;** *Approved (Mar 2016)*
- **LED REIL;** *Approved (Mar 2018)*
- **6850.2B Lighting Siting Criteria;** *Anticipated Approval (May 2019)*
- **MALSR;** *Started (Sept 2018)*
- **In-pavement Fixtures;** *Upcoming*

Reasons for Change
<ul style="list-style-type: none"><li>▪ Consolidation of Equipment</li><li>▪ Incorporated NTIA narrow bandwidth requirements</li><li>▪ Changes in Standards</li><li>▪ Changes in Testing Requirements</li><li>▪ LEDs</li><li>▪ Color Boundaries</li><li>▪ Photometrics</li><li>▪ Design vs. Performance</li><li>▪ Outdated Specifications</li></ul>

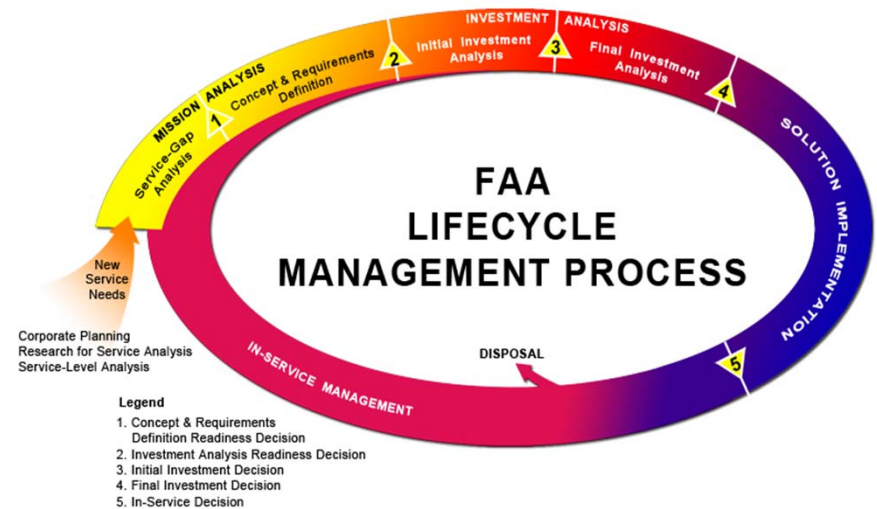
# REIL Specification Highlights

Requirement	FAA E Spec
<b>Flash Rate</b>	120 flashes per minute (FPM) $\pm 5\%$
<b>Flash Duration</b>	16.67 millisecond max allows use on ALSF/MALSR/REIL
<b>Flash Failure Detection</b>	Failure status shall be transmitted to the REIL main control cabinet (outside RSA)
<b>Flasher Aiming</b>	Adjustable vertically from $0^\circ$ to $25^\circ$ and horizontally $\pm 15^\circ$ about the runway centerline
<b>Photometric Requirements (candela)</b>	High- 8,000 to 20,000 Med- 800 to 2,000 Low- 150 to 450
<b>Color of Light</b>	4,000-8,000 $^\circ$ Kelvin
<b>Light Pattern</b>	$10^\circ$ vertical by $30^\circ$ horizontal

# Procurement Forecast

- Incandescent PAR-38
- LED PAR-38
- RVR
- Semiflush Fixtures

**Note:** You should monitor the FAA Contracting Opportunities Website for procurement opportunities

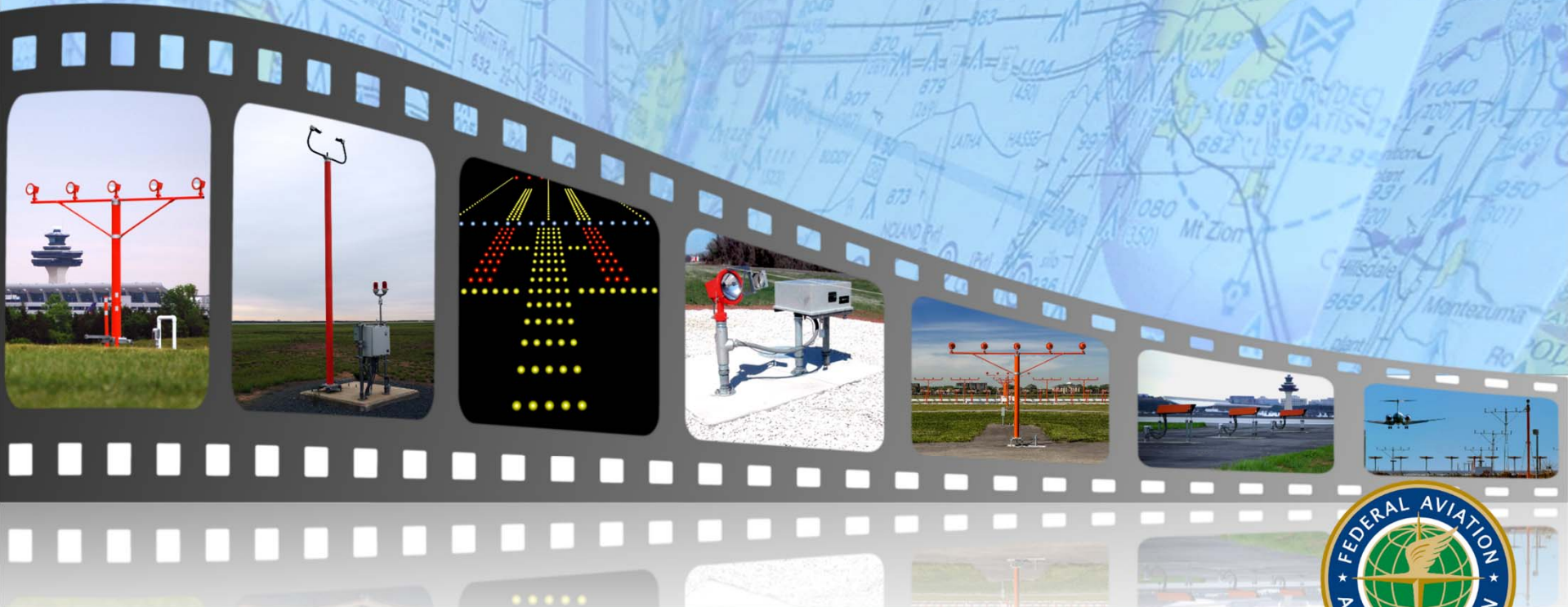


FAA Contracting Opportunities website: <https://faaco.faa.gov/>

**Disclaimer:** This forecast is for informational and marketing purposes only and does not constitute a specific offer or commitment by the FAA to fund in whole or in part any of the procurements referenced herein.

# Visual Guidance Lighting Systems

Questions?



IES Government Contacts Subcommittee  
April 2019



Federal Aviation  
Administration

