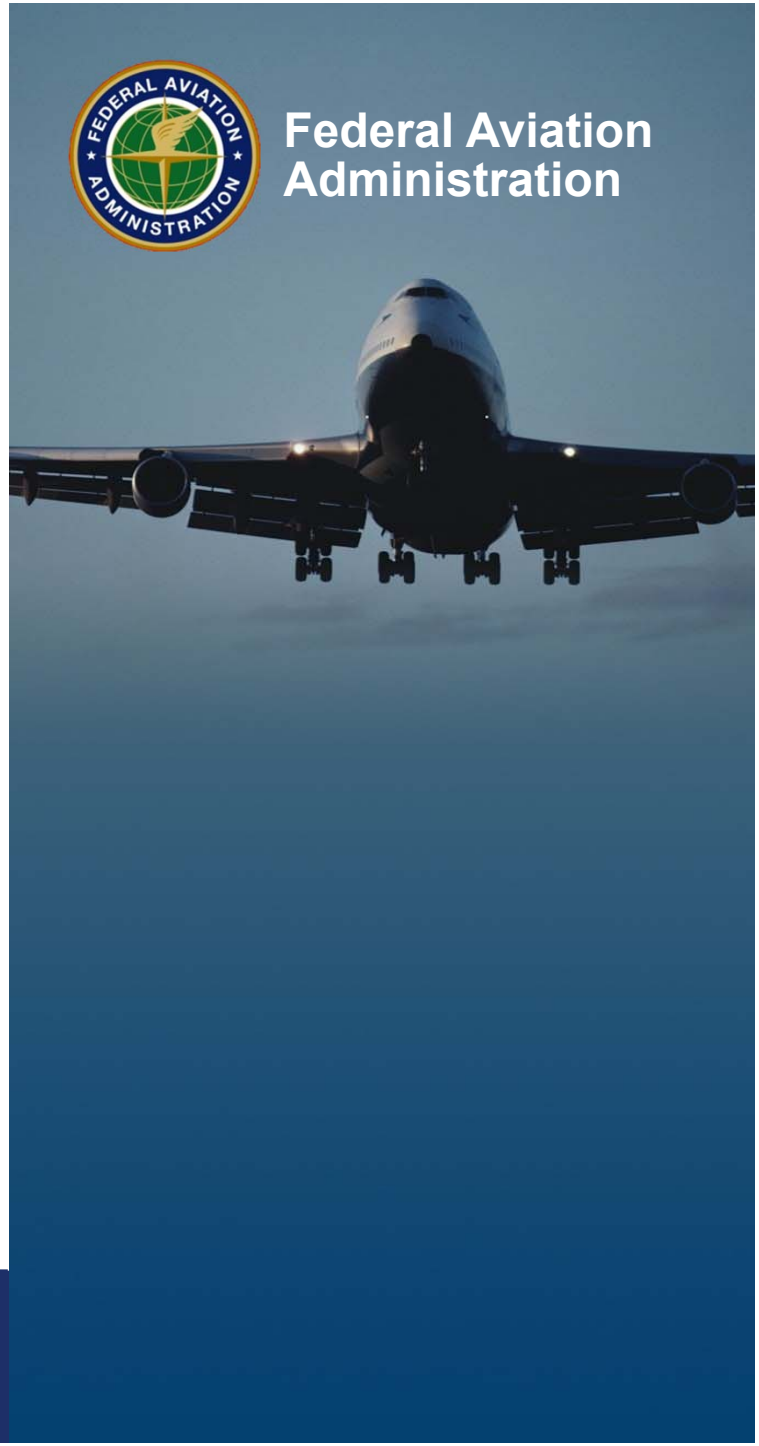
Illuminating Engineering Society (IES) Government Contacts Sub-Committee Meeting



Donald Lampkins

Navigation Programs,
Lighting Systems Team
AJM-3222

May 8, 2018

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
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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 & Steady Burners
- Low Impact Resistant (LIR) Structures
- Transformers
- Frangible Bolts
- Aiming Devices

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 – **(Navaids – 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 Navaids 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**)

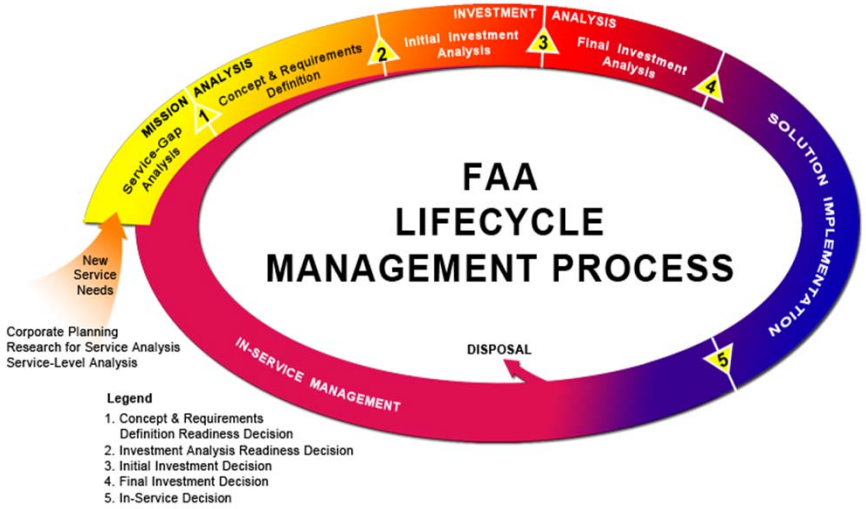
  Supports the installation of ILS and/or High Intensity Approach Lighting System. An ILS precision approach system is comprised of a grouping of electronic devices Localizer, Glide Slope, marker beacons and, in some cases, ancillary aids (DME, ALS, RVR, etc.)


Active Procurements
LED PAPI
RRGS
RMLS
RRCIU
MALSR

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.

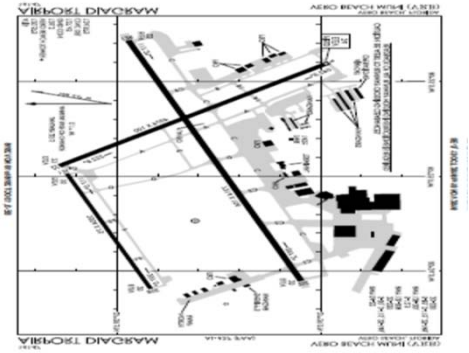
  - **Project Activities**
    - Preliminary Design Review
    - Critical Design Review
    - Design Qualification Test
    - Operational Test
    - Configuration Audits
    - Product Baseline
    - In-Service Management



LED PAPI Operational Analysis

- Installed and Commissioned LED PAPI systems at six (6) sites
  - Vero Beach, FL – Runway 04
  - Flagstaff, AZ – Runway 03
  - Harlingen, TX – Runway 35L
  - Rochester, NY – Runway 22
  - Atlanta, GA – Runway 10
  - Atlanta, GA – Runway 28

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



RRCS Project

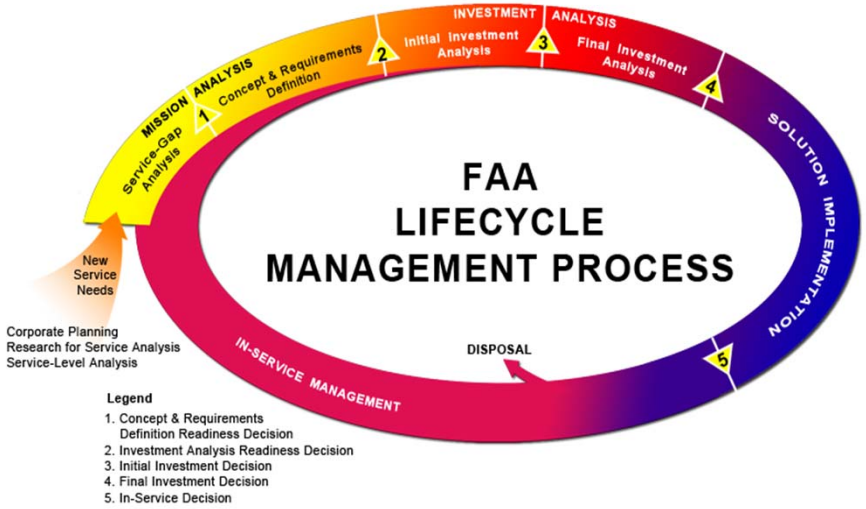
- The RRCS procurement project is needed to address compliance with the National Telecommunications and Information Administration (NTIA) narrow bandwidth radio transmission requirements and parts obsolescence issues

- 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 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



Replacement Lamp Monitoring System (RLMS)

- **Objective:**
  - To replace the constant current regulators and implement lamp monitoring on the Airflow and Godfrey ALSF-2 systems.

- **Status:**
  - Conduct four RLMS site surveys
  - Support RLMS installation activities at five sites
    - Covington, KY Rwy 36R
    - Fort Wayne, IN Rwy 05
    - Kansas City, MO Rwy 01R
    - Kansas City, MO Rwy 19R
    - Greensboro, NC Rwy 23L

Remote Radio Control Interface Unit (RRCIU)

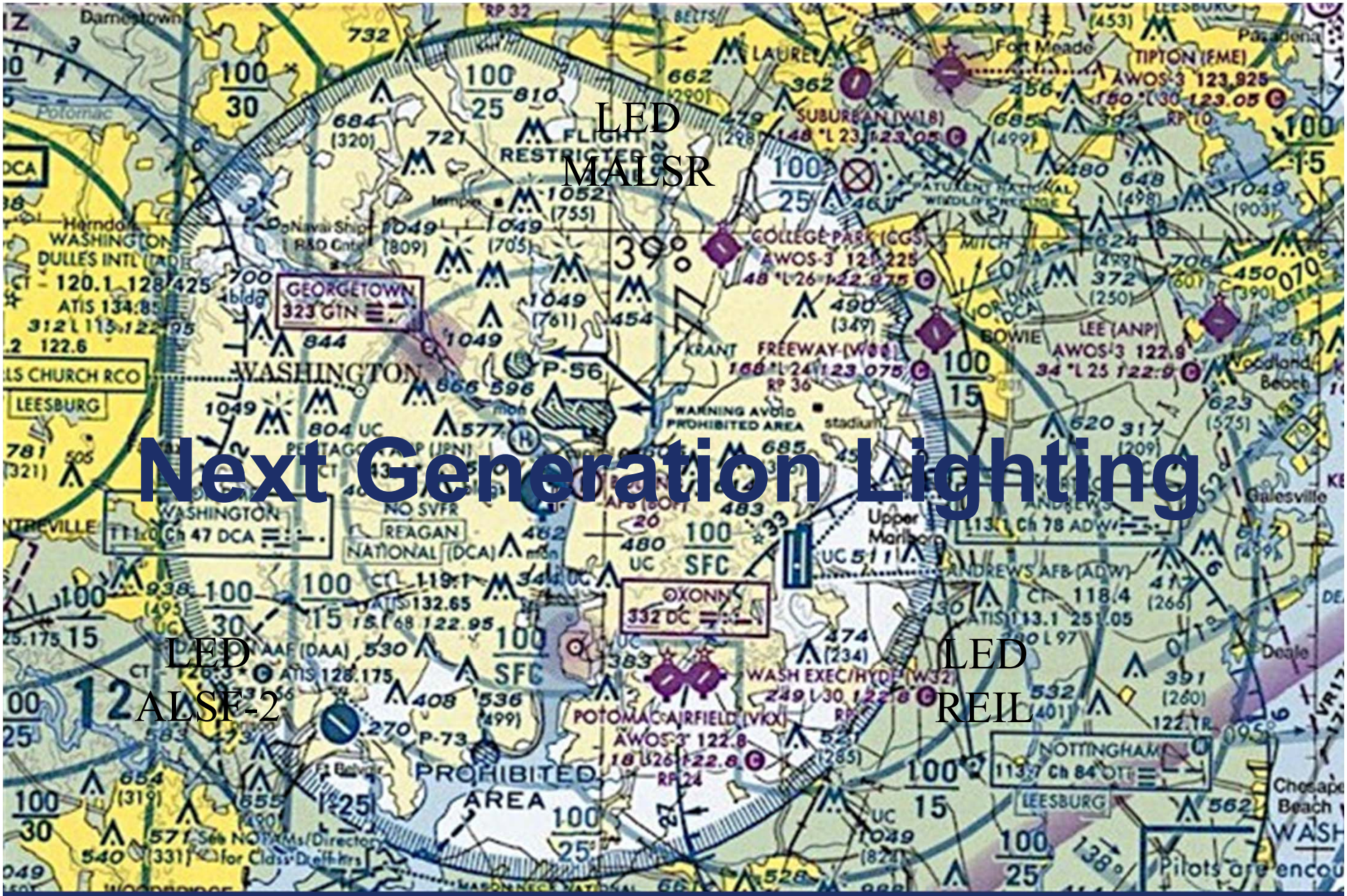
- **Objective:**
  - To procure RRCIU to satisfy current requierments for Air to Ground and Ground to Ground controls.

- **Status:**
  - Conducted RRCIU Verification Audit and Provisioning Conference
  - Conduct Production Acceptance Test for initial 13 RRCIUs
  - Procure 40 RRCIUs to support implementation projects

MALSR

- **Objective:**
  - The purpose of this project is to procure additional MALSR systems to replace and sustain existing MALSR systems in the National Airspace System (NAS)

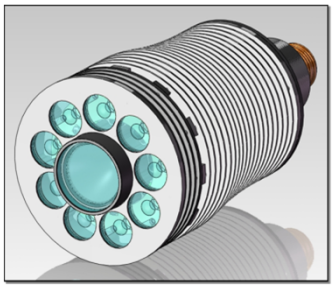
- **Status:**
  - Accept delivery of final system in May
  - Close out contract in June

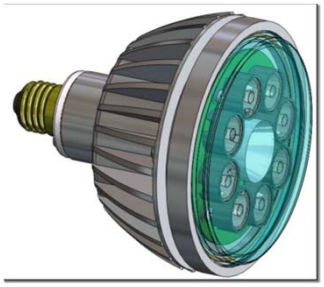


Next Generation Lighting

MALSR 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






Federal Aviation
Administration
FAA LED
SYMPOSIUM
October 7 – 8, 2014
Washington, DC


Federal Aviation
Administration
FAA SAFETY MANAGEMENT
PRELIMINARY HAZARD ANALYSIS
OF LIGHT EMITTING DIODE (LED)
LIGHTING IN
AIRCRAFT OPERATIONS

LED Symposium

- "LED turn off lights create appearance of aircraft or vehicle on runway."
- "The lights are so bright it floods the cockpit and blinds the Crew making it impossible to see beyond the lights right in front of you."
- "Green LED taxi lighting [is] extremely bright causing windscreen visibility problem."
- "The bright taxi lights are an unnecessary hazard. While they might not directly cause an accident they are more than capable of being another link in the accident chain. Is there any way that these lights can be dimmed?"
- "ABQ, within the last month, has converted to LED lighting over the entire airfield. This includes the runway lights, taxiway lights, and airfield marking. The excessive brightness, particularly in the approach and flare, can lead to a lack of depth perception and could lead to very poor landings and touchdowns."
- "The lights are so bright it leads to a loss of night vision not unlike a light being flashed directly in your eyes. The turn-off taxi lights are also disorienting as they reduce depth perception due to "flash" blindness."

Preliminary Hazards Analysis of LEDs

- Pilot concern about **glare** from high-intensity LED illumination reflecting off haze, fog, low-ceiling cloud decks, and windshield surfaces that compromises sight outside the aircraft;

- **Light intensity** cited as problematic for pilot's night vision when transitioning from "dimmed" cockpit lighting in-flight to bright illumination on final approach and taxi;

- Compromised visibility of LED lighting using Night Vision Goggles (NVGs) or other Enhanced Flight Vision Systems (**EFVS**) equipment that rely on infrared (IR); and

- Unmanned Aircraft Systems (UAS) IR-based sensors will have limited or no ability to sense LED illumination wavelengths, increasing the risk of collision with obstacles or other aircraft equipped with LED anti-collision markers.

Brightness/EFVS Issue Action Plan

- 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.
- Conduct Flight Demonstration 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-38 Prototypes at various MALSR operational sites

Flight Demonstration

Background

- The FAA Lighting Systems sub-team spearheaded modification of the Prototype PAR-38 LEDs to address the brightness issue

Objective

- The purpose of the Flight Demonstrations were to capture subjective inputs from pilots regarding the brightness of the Prototype PAR-38 LEDs

Established Criteria:

- Global Brightness and Blooming, Brightness Directional Stability, and Depth Perception

Flight Demonstration (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

Flight Demonstration (Scenarios)

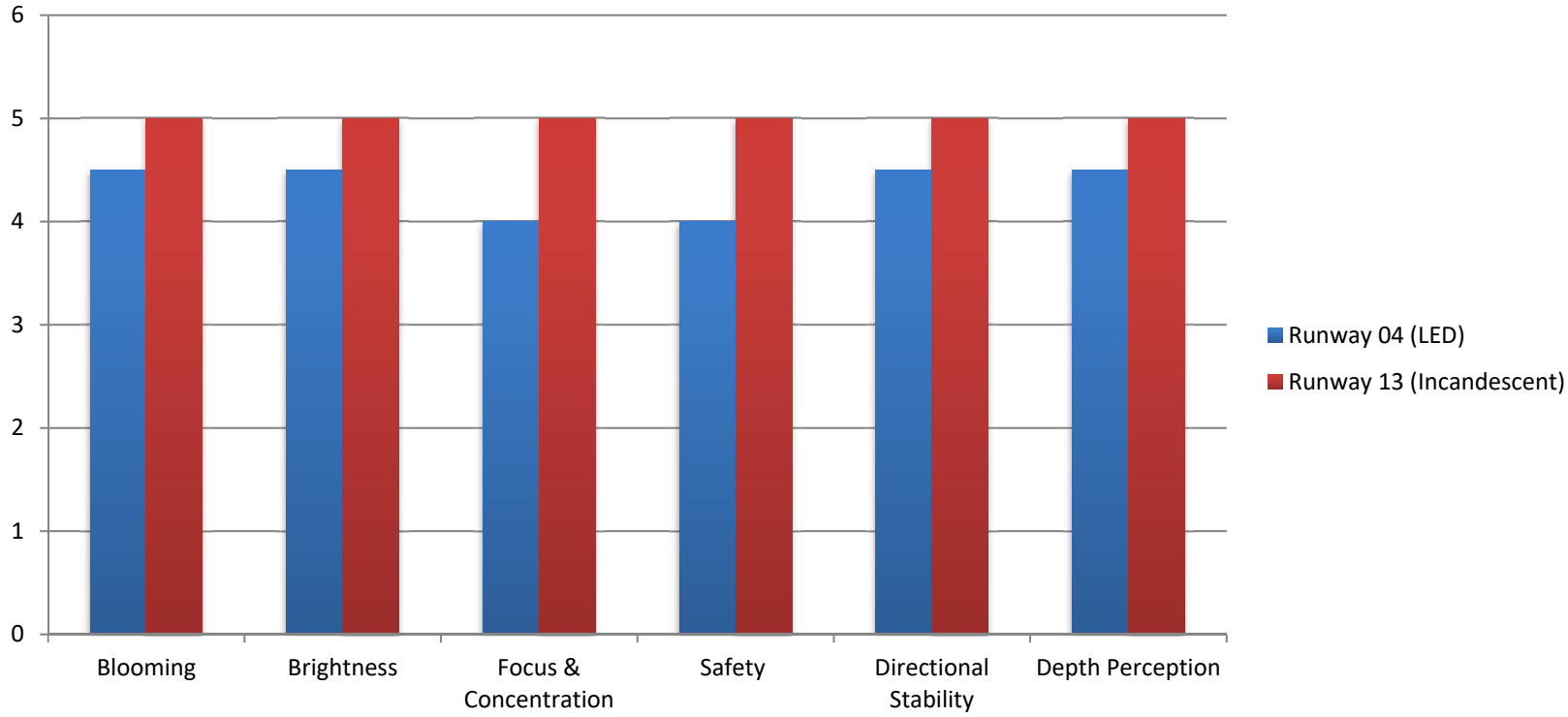
	Run #	Step	Rwy	Criteria
DUSK	1	2	4	Global Brightness and Blooming,
	2	2	13	Brightness Directional Stability,
				Depth Perception
NIGHT	3	2	4	Global Brightness and Blooming,
	4	2	13	Brightness Directional Stability,
				Depth Perception
	5	1	4	Global Brightness and Blooming,
	6	1	13	Brightness Directional Stability,
				Depth Perception

Flight Demonstration (Questionnaires)

- With respect to **blooming**, the MALSR configuration was easily identified
- During approach to the runway, the **brightness** of the MALSR was appropriate for the operation
- During the approach, the MALSR system allowed **focus and concentration** on the operation
- The lighting configuration allowed you to complete the approach **safely**
- The lighting cues provided **Directional Stability**
- The lighting cues provided **Depth Perception**

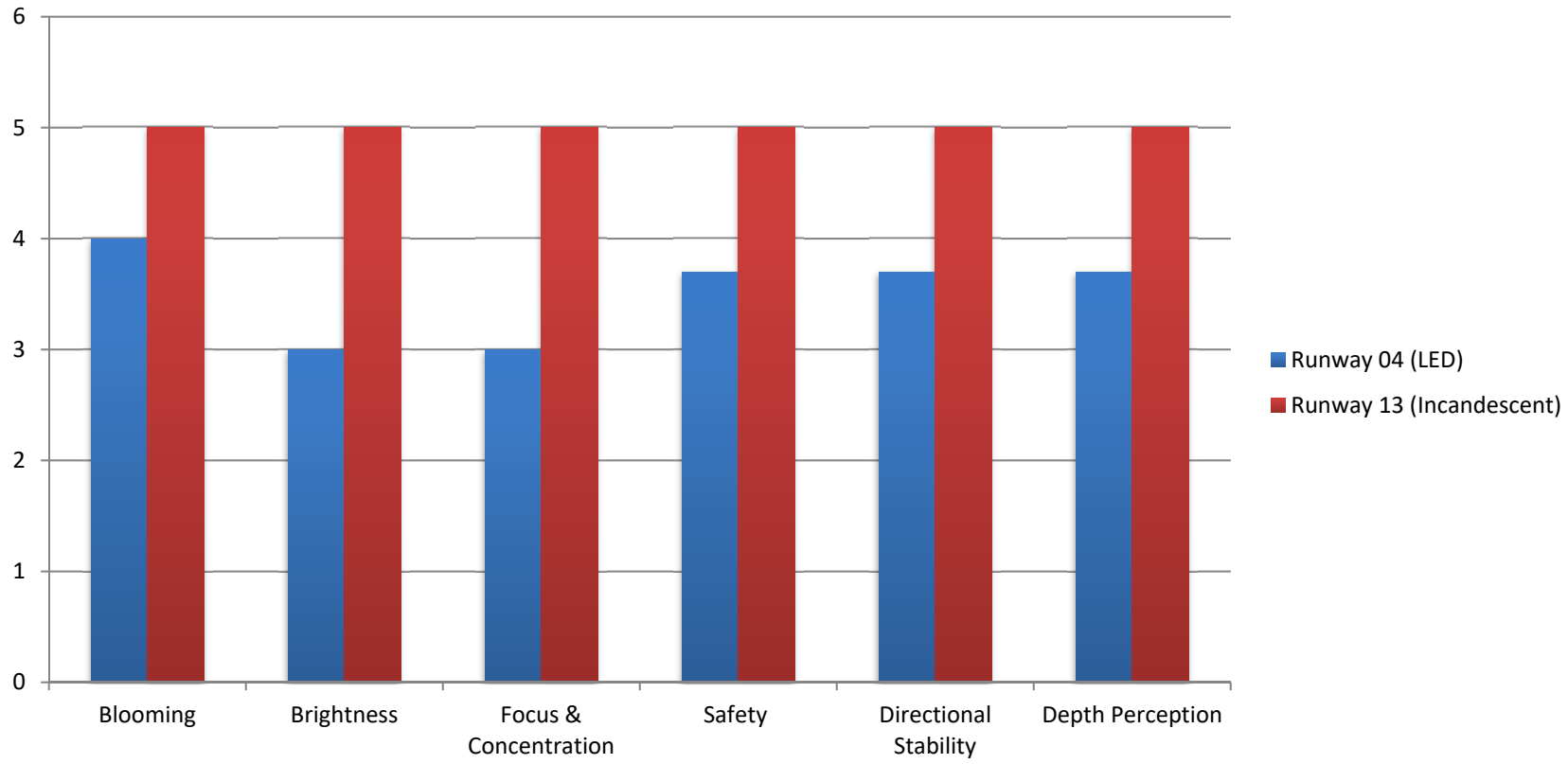
Flight Demonstration Activities

- **Results on intensity setting 2 at dusk:**



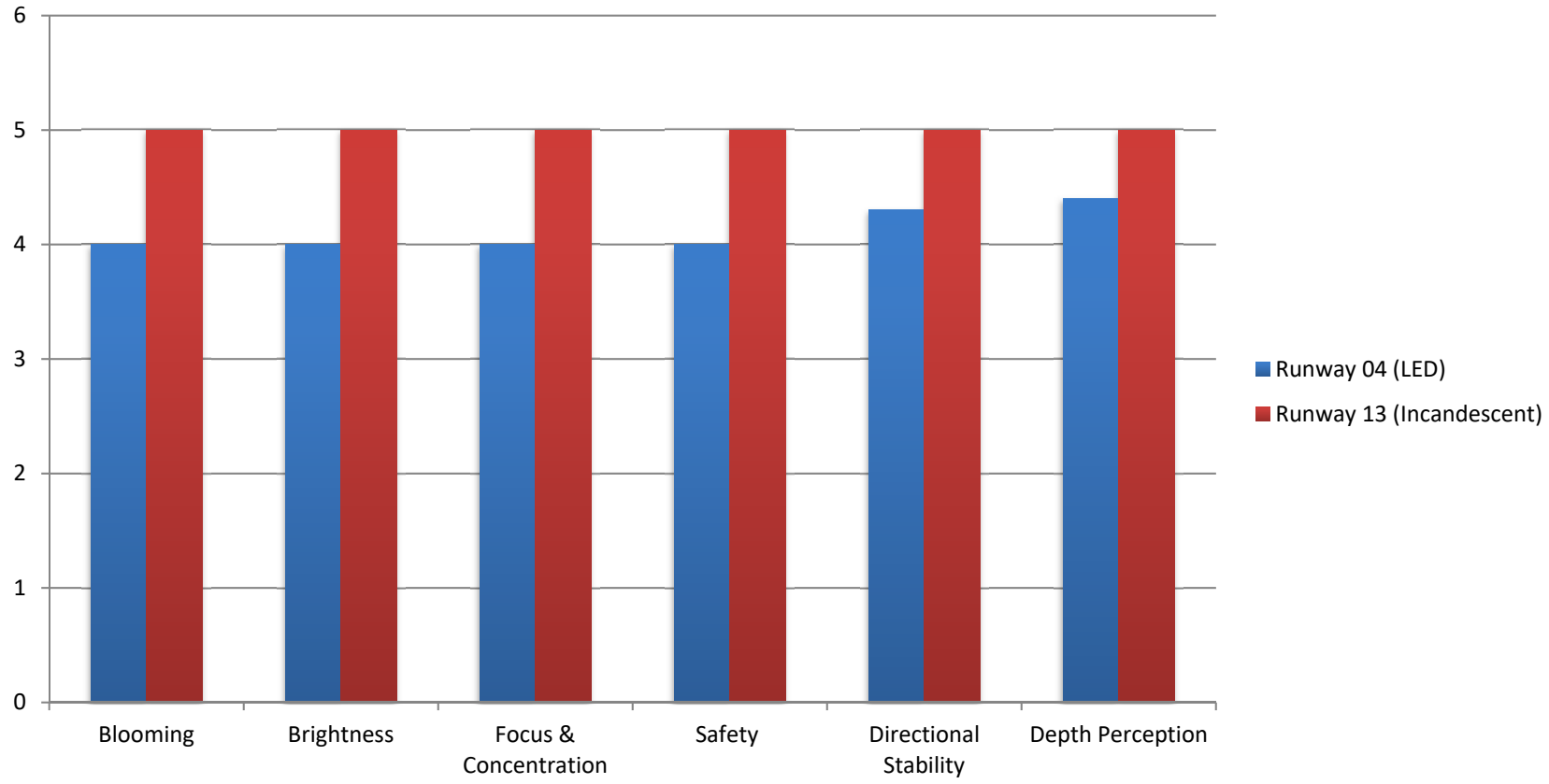
Flight Demonstration Activities

- **Results on intensity setting 2 at night:**



Flight Demonstration Activities

- **Results on intensity setting 1 at night:**



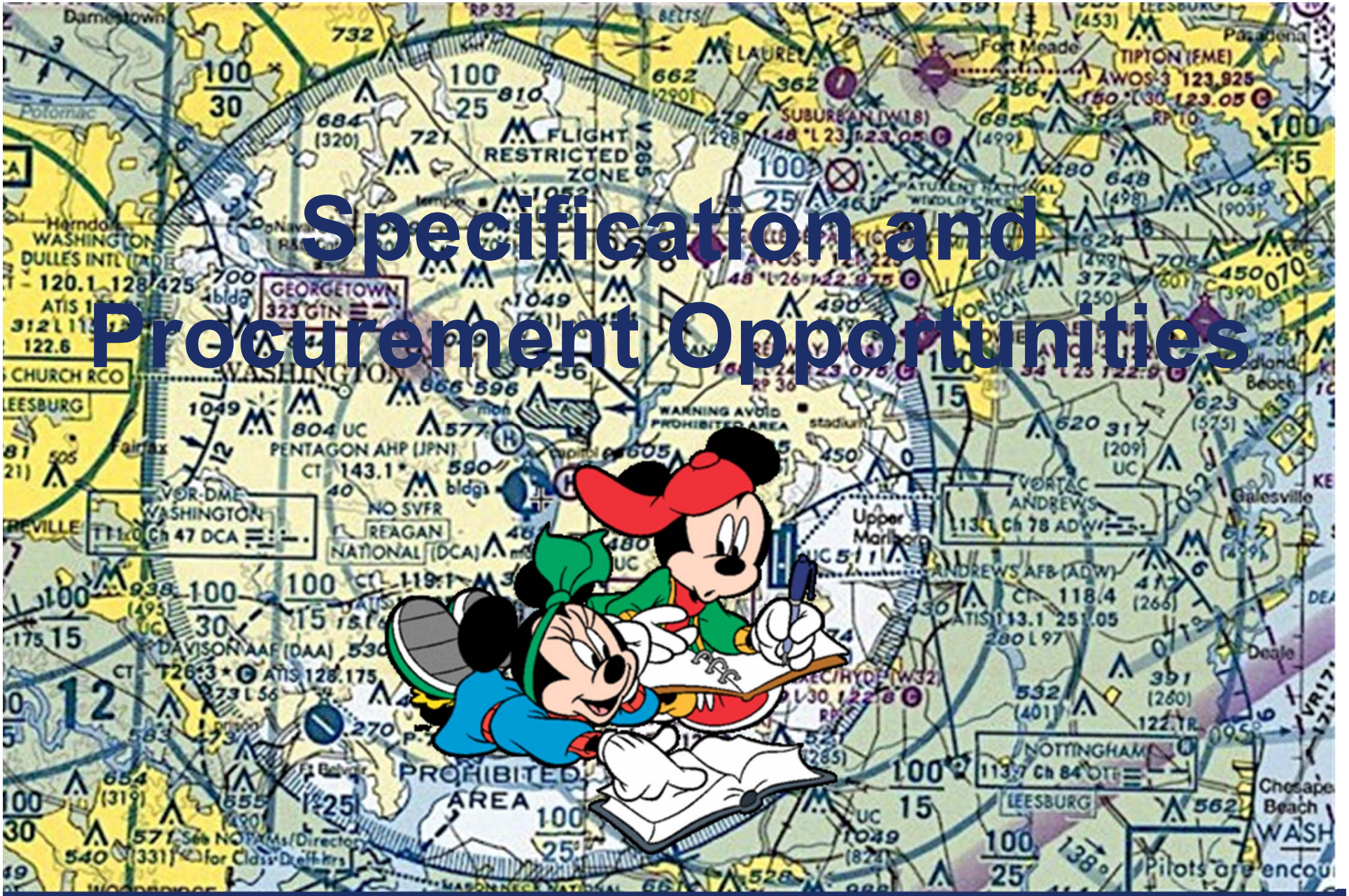
ALSF-2 Initiative

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

- **ALSF-2/MALSR**: Conduct Analysis on the feasibility of reducing the footprints of these lighting systems
- Redesign **MALSR** system based on newer technology
- Redesign **ALSF-2** system based on newer technology


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 (Sept 2018)
- **MALSR**
  - Anticipated Start (Sept 2018)
- **In-pavement Fixtures**
  - Upcoming

Reason for Changes

- Consolidation of Equipment
- Incorporated NTIA narrow bandwidth requirements
- Changes in Standards
- Changes in Testing Requirements
- LEDs
- Color Boundaries
- Photometrics
- Design vs. Performance
- Outdated Specifications

RRCS Specification 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

6850.2B Revision (Significant Proposed Updates)

- Precision Approach Path Indicator (PAPI) Obstacle Clearance Surface (OCS) (Paragraph 503c). Rewritten to include current flight evaluation criteria in accordance with FAA JO 8200.1, United States Flight Inspection Manual

- Pier and Other Rigid Structure Installation (Paragraph 209d). Revision of threshold criteria for the distance between the light plane and rigid structure installations

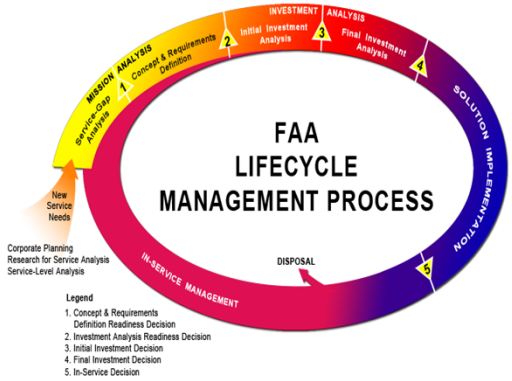
- Siting PAPI on a Runway with an electronic Glideslope (Paragraph 502)

- Radio Control Configuration Selection (Appendix B table 1). FSS criteria removed from table

REIL Specification Highlights

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

Procurement Forecast



- REIL
- MALSR
- Semiflush Fixtures

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

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

Questions