



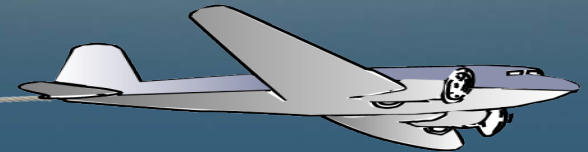
Federal Aviation
Administration

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

Donald Lampkins

*Navigation Services,
Lighting Systems Team
AJW-9142*

October 2010

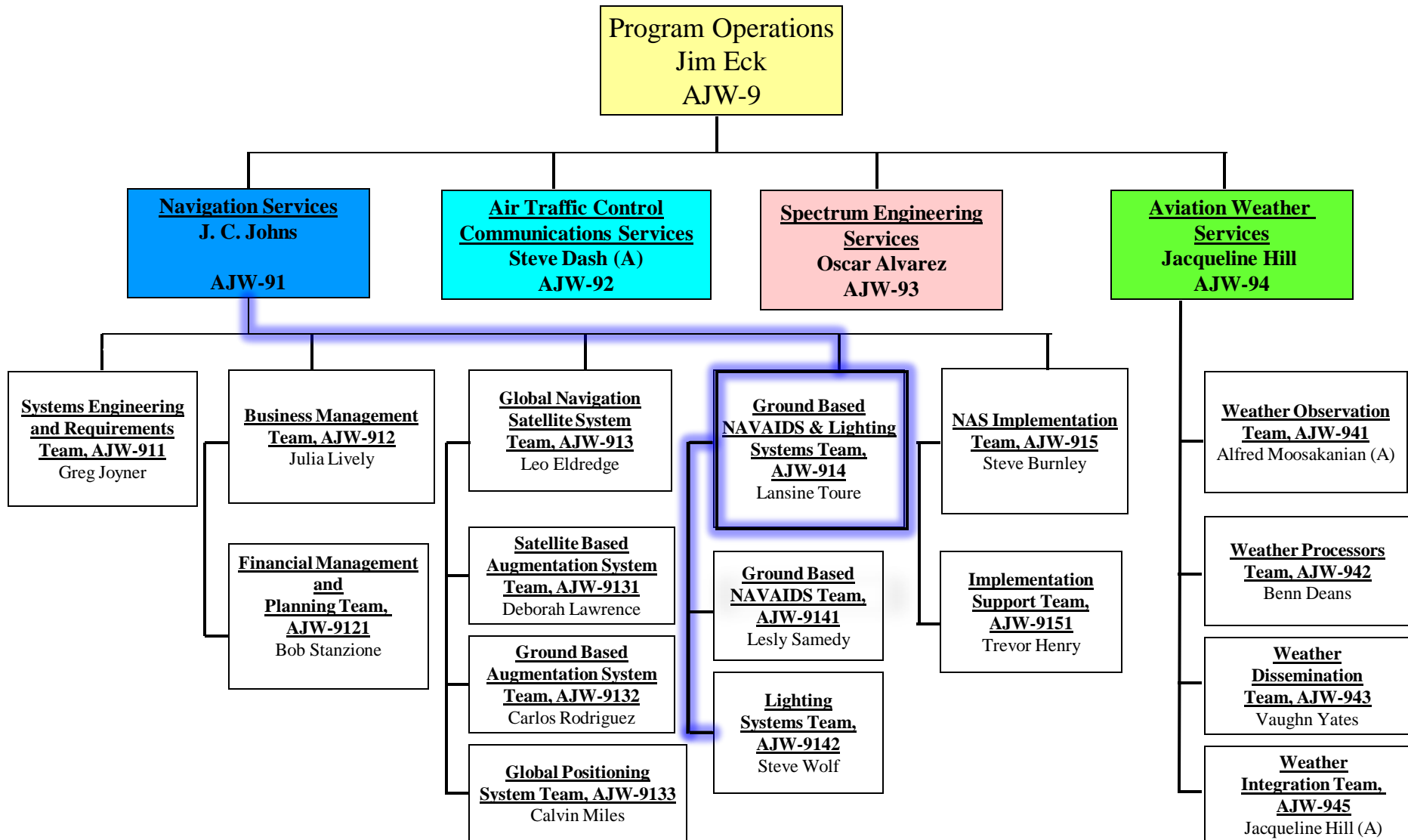


Overview

- Organizational Chart
- Lighting Systems Team
- NextGen Initiatives
- Tactical and Strategic Challenges
- Lighting Systems Team Initiatives
- FAA Acquisition Management System
- Specification Updates
- Procurement Opportunities



Technical Operations – Program Operations



Lighting Systems Team Contacts

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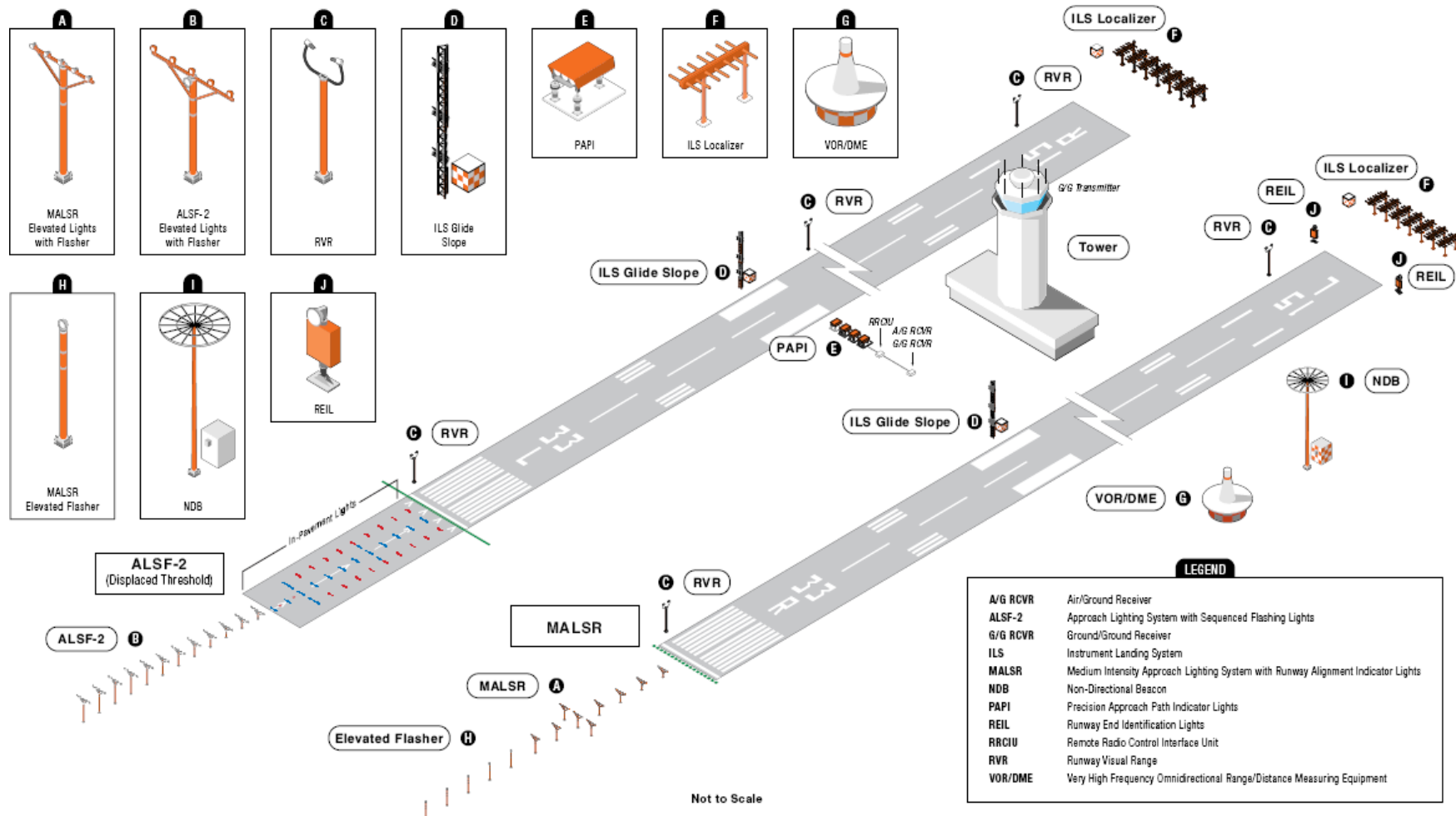
Lighting Systems Team Mission

- The mission of the Lighting Systems Team is to provide research, development and acquisition for safe, efficient, and reliable ground-based navigational and landing systems.





Navigation and Landing Equipment



Next Generation (NextGen)



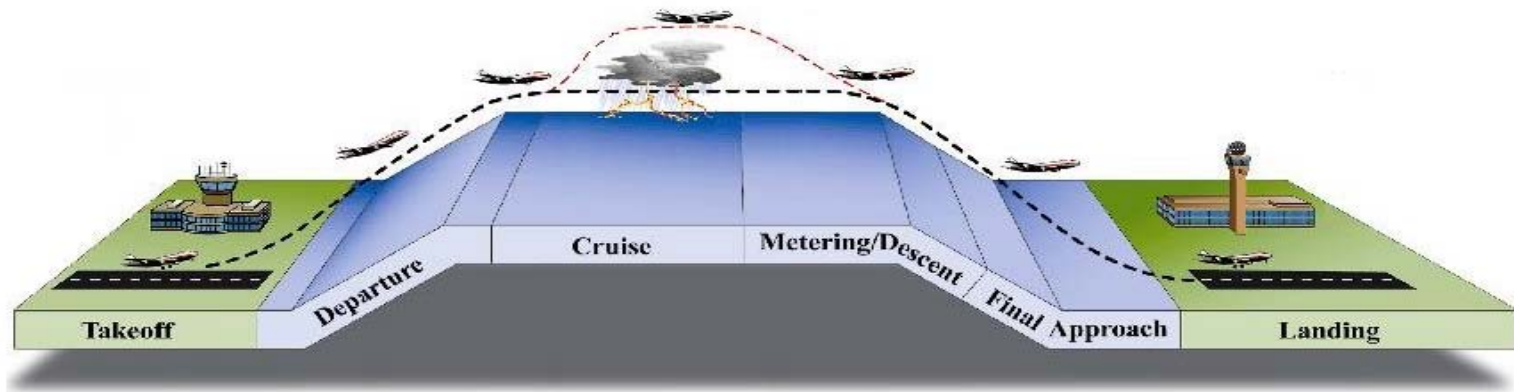
Next Generation (NextGen)

- The Next Generation Air Transportation System is being designed to support the needs of the nation in 2025 and beyond.
- NextGen consists of near-, mid-, and long-term goals that address many aspects of the operation of our National Airspace System (NAS)
- Safety is our most important product.
 - The challenge that we must meet each day is to maintain safety while maximizing the efficiency and effectiveness of the busiest airspace system in the world.
- NextGen encompasses all operations in the NAS: Gate-to-Gate.



NextGen Innovative Initiatives

- **In support of NextGen Goals:**
 - Improve Surface Situational Awareness, to help preclude runway incursions, maximize the use of ground facilities, and reduce the cost of ground operations
 - Maintain capacity at airports during Instrument Meteorological Conditions (IMC)
- **Support the safe and efficient movement of aircraft**
 - Gate-to-take-off on the airport surface
 - Approach and landing
 - Landing-to-Gate on airport surface



NextGen Initiatives

- **LOW VISIBILITY-Enhanced Flight Vision Systems (EFVS)**
 - Increased Runway Access in Low Visibility Operations
 - Improved pilot Situational Awareness In Low Visibility Conditions
- **OPTIMIZED NAVIGATION- Replace MALSR and PAPI Lamps with LED sources**
 - Energy Independent & Security Act of 2007
 - Reduced Maintenance & Increased Availability



EVS Definitions

- **Enhanced Vision System**
 - Electronic means to provide a display of the forward external scene topography through the use of imaging sensors, such as FLIR, MMW radiometry, MMW radar, and/or low light level image intensifying
- **Enhanced Flight Vision System**
 - EVS technology providing the additional flight information/symbology required in 14 CFR § 91.175 (m) on a HUD/equivalent



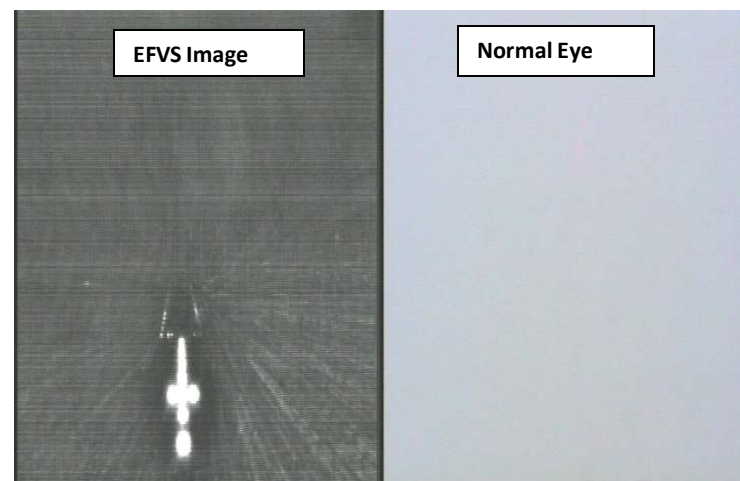
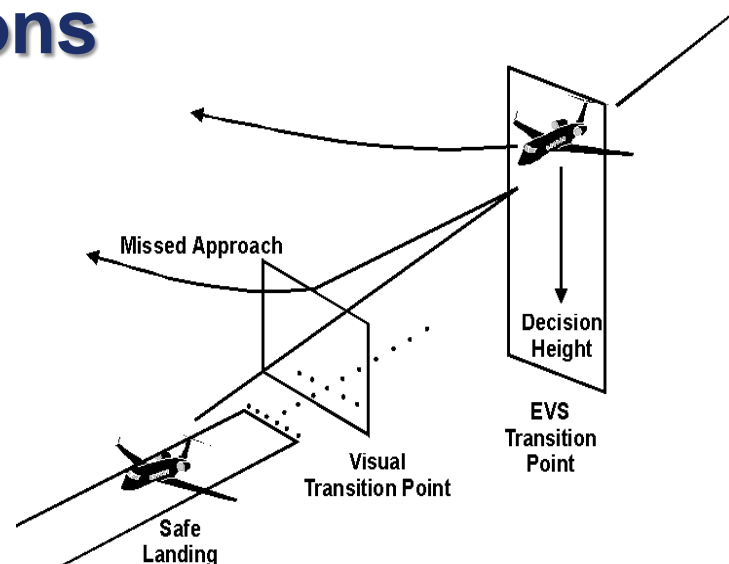
Note: EFVS devices were designed and manufactured based on using the IR signatures of incandescent lights as the input EFVS devices were designed and manufactured based on using the IR signatures of incandescent lights as the input.



Current FAA EFVS Operations

FAR 91.175

“The pilot determines that the enhanced flight visibility observed by use of a certified enhanced flight vision system is not less than the visibility prescribed in the standard instrument approach procedure being used;



Ground-Based Lighting Systems

- Navigation Services: Approach Lighting Systems
 - Provide visual cues to assist a pilot to line up on the runway centerline during the approach phase of flight;
 - Enhance the pilot's ability to recognize the runway environment and thereby allow the plane to continue its approach and land.
 - Provide visual cues to assist the pilot in achieving a “wings level” orientation prior to touch down.
- Navigation Services/Airports: Visual Aids
 - Provide situational awareness of the runway end
 - Provide situational awareness of the aircraft's position relative to the approach path (glide slope)
- Airports: Visual Aids
 - Provide runway and taxiway centerline and edge lighting and, along with signage, facilitate surface movement and surface situational awareness



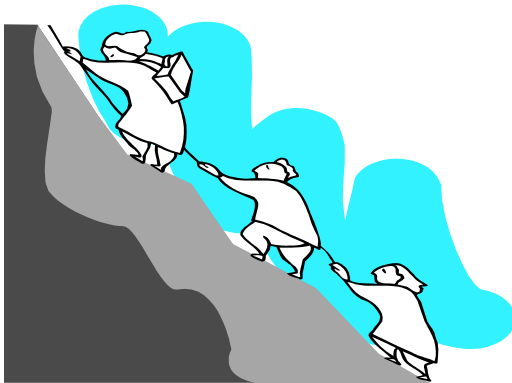
Historic Basis of Lighting System Design

- Lighting systems were designed to provide “*visual cues*” to pilots to promote safety and efficiency
 - In engineering terms, the Interface Control Document (ICD) assumed that the “receiver equipment” was MK-1 Eyeball
 - Lighting systems were designed and tested based on this premise, with a high regard for human factors.
 - The world has changed.
- Technology has brought the means to *enhance* MK-1 Eyeball capability and support better situational awareness to enable continuing operations -- even during various levels of IMC.
- Lighting Engineers Problem Statement: “...but that’s not what it was designed for!”



Good News

- Engineers are flexible.
- Technology is good.
- Innovation is welcomed.
- We like challenges.



Tactical and Strategic Challenges

- (T) Airports have already installed energy efficient lighting on taxiways and aids to navigation (PAPI, REIL) that are not visible with today's enhanced vision systems
- (T) US statute requires the phasing out of incandescent PAR 38 lamps by 2012
 - **(MALSR) uses PAR 38 lamps**
- (S) EFVS devices were designed and manufactured based on using the IR signatures of incandescent lights as the input
- (S) ALS' require large amounts of real estate be cleared and maintained and large numbers of lamps to be illuminated to provide visual cues to pilots



What's the Goal

- To synergize the historically visual aids to navigation and the current and emerging cockpit equipment to enable safe, efficient, and effective NAS operations – in the air and on the ground.
- Determine the actions/initiatives that need to produce solutions in the near-term.
- Determine the actions/initiatives that need to produce solutions in the mid- and far-term.
- Continue forward movement/increased benefits.
- Do no harm



Desired Outcomes

- Suggest a means to harmonize visual aids with enhanced vision systems that does not impede technology improvements and moves us forward.
- Suggest a means to reduce the footprint of ALS to maintain/improve capabilities at a lower life cycle operational cost.
- Suggest a realistic program/approach to reaching the solution.
- Drive/Insert technology both on the ground and in the air as appropriate to support the goal.
- Help us find the best path that maximizes benefits.



Lighting Systems Team Initiatives

- **Near-Term Initiatives**
 - MALSR Replacement Lamp Project
 - PAPI LED Project
 - REIL LED Project
- **Mid/Far Term Initiatives**
 - Footprint Reduction



MALSR Replacement Lamp Project

- **Objective:** To determine the LED/IR Lamp requirements through a system engineering process by developing requirements and evaluating concepts which includes prototype tests and operational capabilities demonstrations.
 - **Phase I:**
 - Conduct Feasibility Study to determine if integrating IR into a LED Par 38 and Par 56 fixture is achievable.
 - **Phase II:**
 - Procure prototype MALSR LED replacement lamps and conduct Concept Feasibility Tests
 - Procure MALSR LED replacement lamps and conduct an Operational Capability Demonstration with EFVS-equipped aircraft
 - **Phase III:**
 - LED Lamp First Article development
 - Design Qualification Tests
 - FAA Operational Evaluation



PAPI LED 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 REIL Project

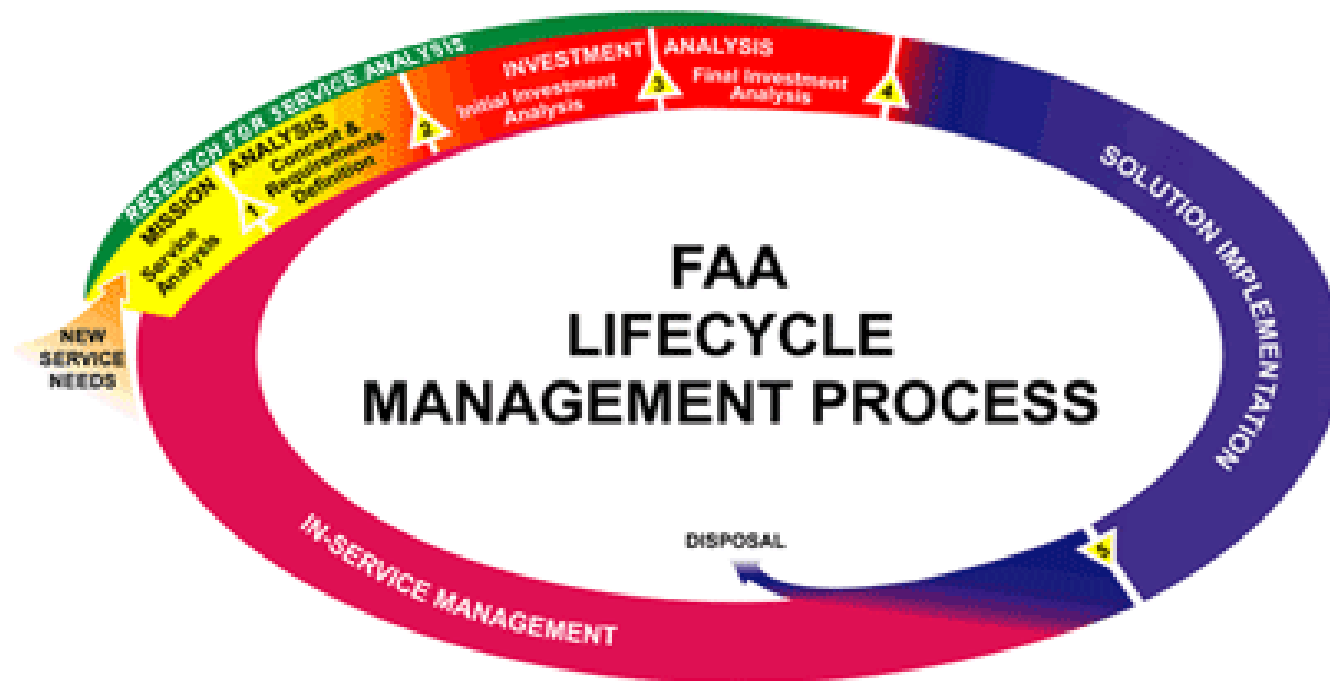
- **Objective:** The primary objective is to fully deploy LED REIL by using the System Development, Deployment and Implementation phases of FAA's Acquisition Management Systems (FAMS) process.
 - **Project Activities**
 - Evaluate Proof of Concept
 - Conduct Design Reviews
 - Conduct Design Qualification Review
 - Conduct Operational Test



Footprint Reduction

- Investigate the feasibility of reducing the current ALS Footprints (medium and high intensity) and provide proposed reduced footprints and/or light patterns while still maintaining the same level of effectiveness to support Categories I, II and III Instrument approach procedures.
- Establish alternative ALS footprint concepts supported by human factors and system design analyses
- Engage users, industry, academia, and lighting experts
- Assemble an FAA Technology Lighting (FATL) Team, consisting of Navigation Services, Flight Standards, Airports and Technical Center to establish metrics to be used to evaluate various approach lighting system configurations.
- Revalidate historical lighting system standards

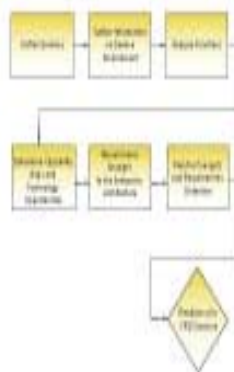




Research for Service Analysis

Mission Analysis

Service Analysis

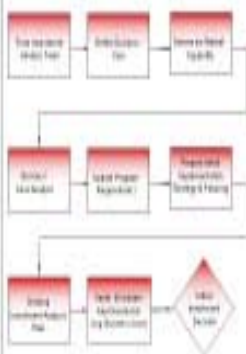


Concept & Requirements
Definition



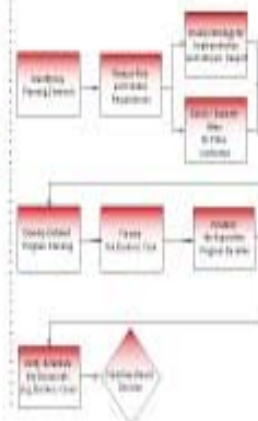
Investment Analysis

Initial Investment Analysis

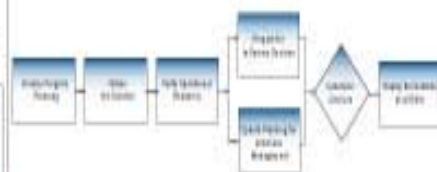


Final Investment Analysis

FAA AMS Lifecycle Management Policy



Solution Implementation

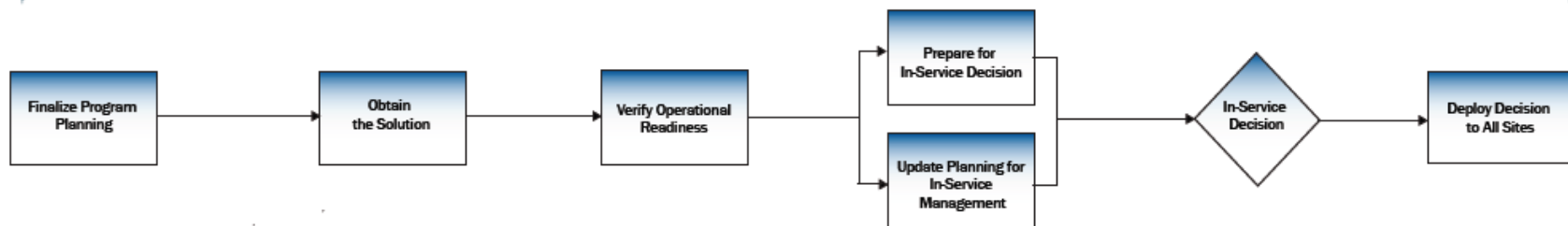


In-Service Management

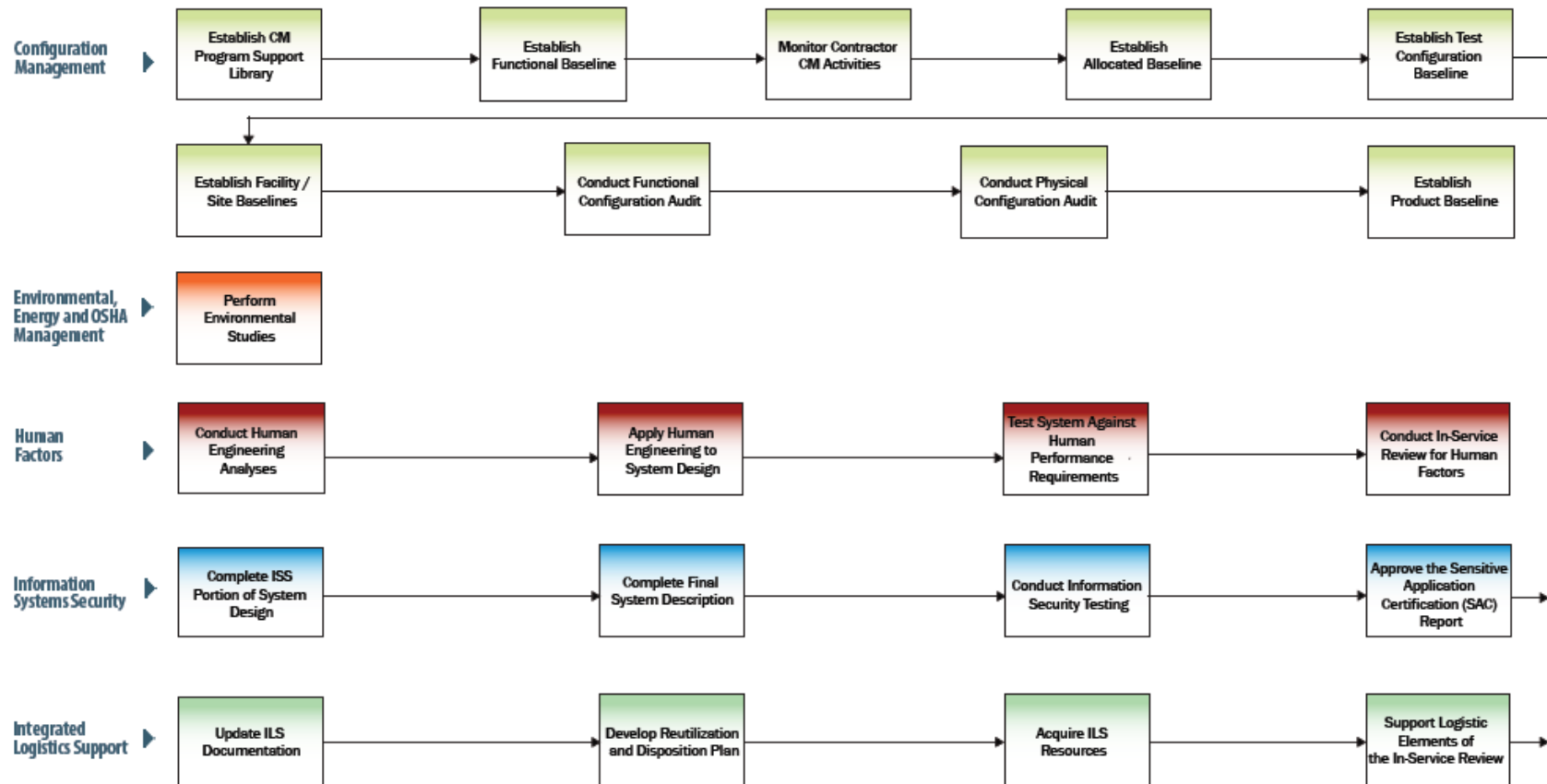


Functional Areas





Functional Areas



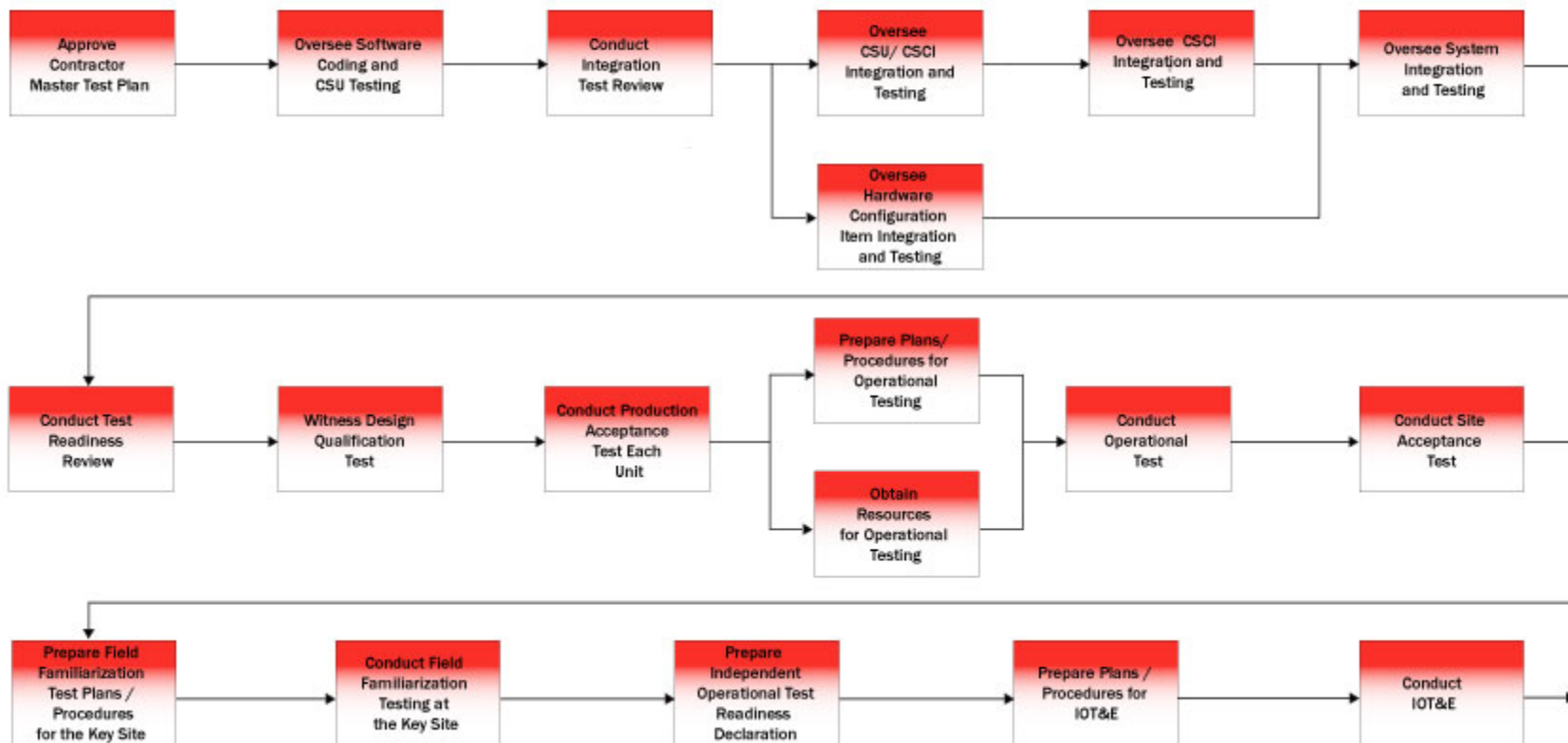
Risk Management



System Engineering



Test and Evaluation



Contracting

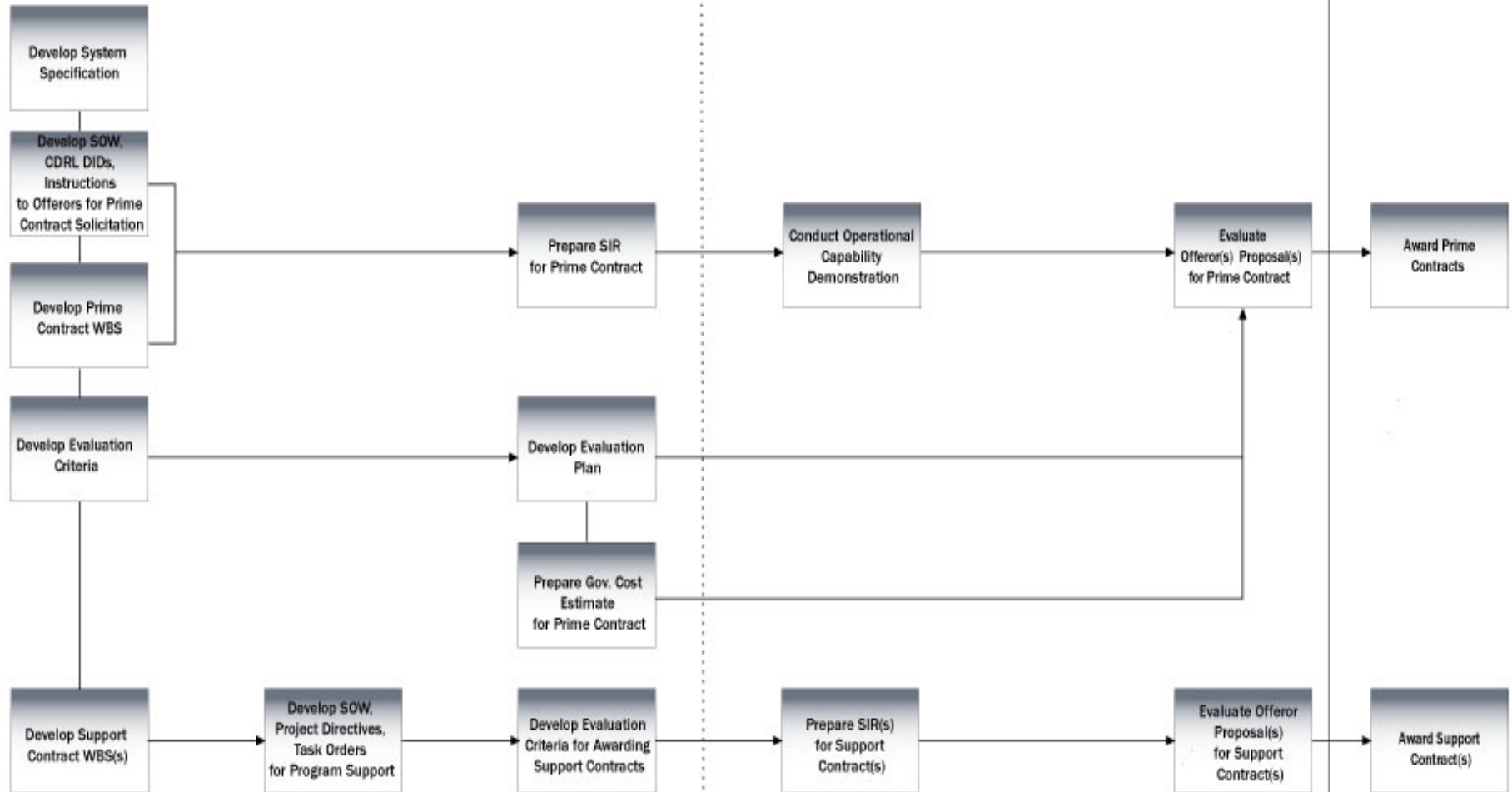
Developmental Hardware and Developmental Software

Investment Analysis

Initial Investment Analysis

Final Investment Analysis

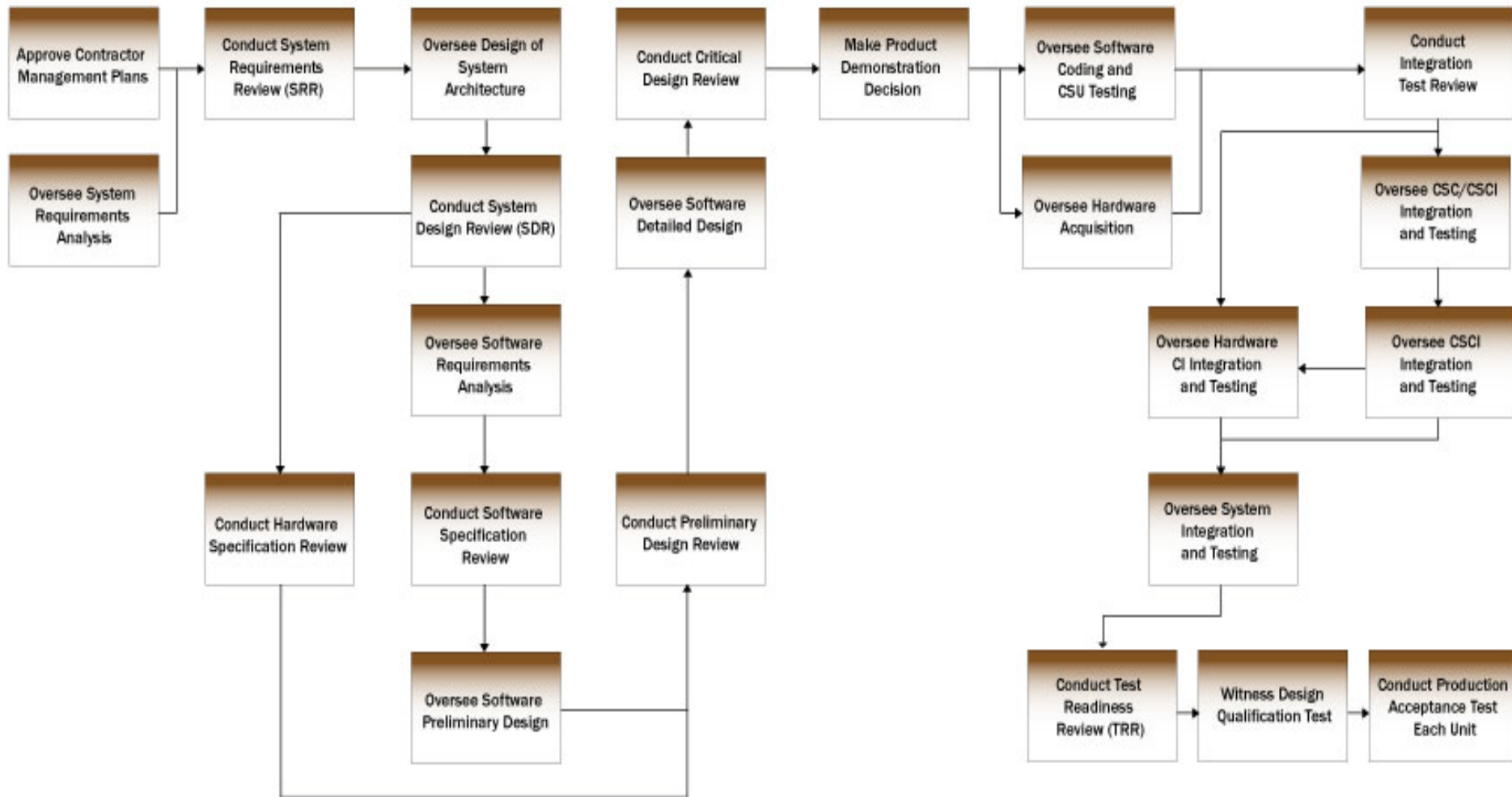
Solution Implementation



System Development

Commerically Available Hardware and Developmental Software

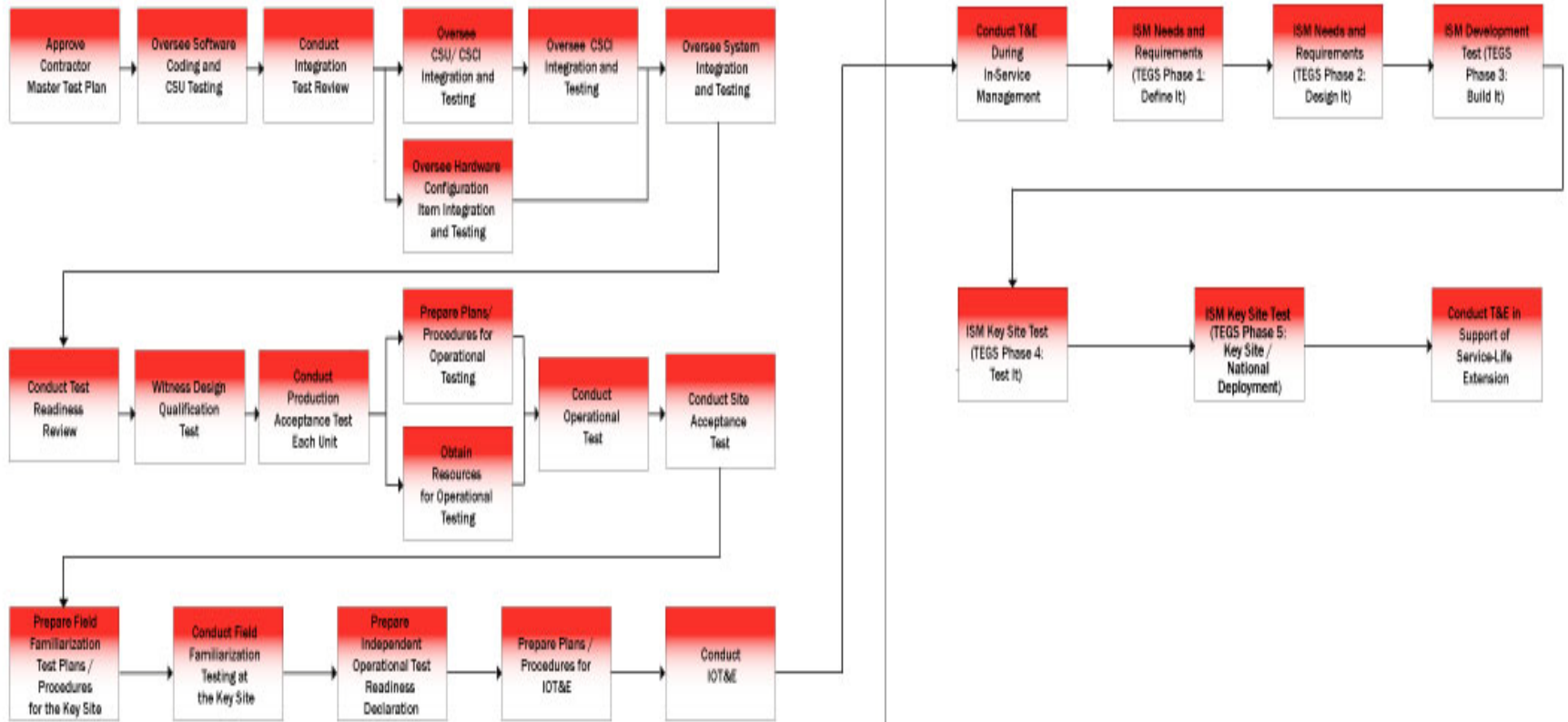
Solution Implementation

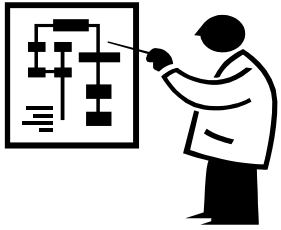


Test and Evaluation

Solution Implementation

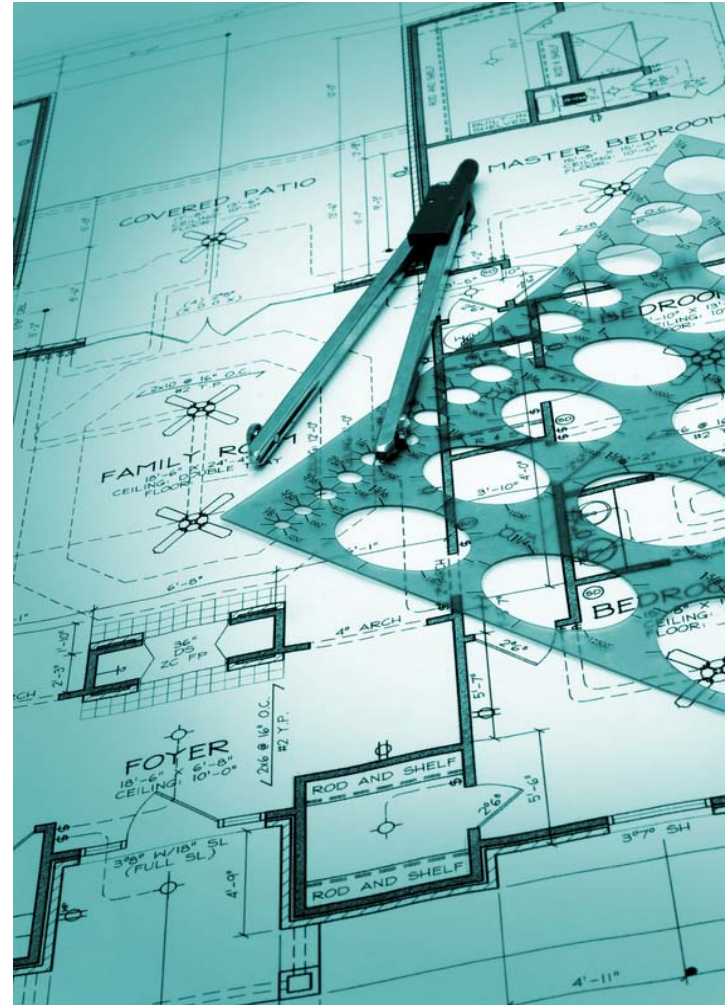
In-Service Management





Specification Updates

- **Semi-Flush Flasher Specification**
 - Anticipated Approval (December 2011)
- **Remote Radio Control System**
 - Anticipated Approval (February 2012)
- **MALSR Specification**
 - Anticipated Approval (March 2012)
- **ALSF-2 Specification**
 - Anticipated Approval (November 2012)



Procurement Opportunities

- **MALSR Equipment**
 - Release Procurement Information by 2nd Qtr FY11

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



Conclusion

- The Lighting Systems Team is Looking for New, Efficient and Economical Lighting Systems to Replace the Aging Infrastructure
- Strong Industry and Academic Involvement is a Must for us to Address Lighting Technologies
- The Lighting Systems Team Looks Forward to Working with Industry and Academia

