



**Federal Aviation  
Administration**

# **IES Government Contacts Subcommittee**

## **Runway Status Lights**

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Manager**

**Date: April 19, 2011**



# Background

- National Transportation Safety Board's "Most Wanted" Transportation Safety Improvements (Aviation) - Stop Runway Incursions/Ground Collisions of Aircraft
  - Action needed by the FAA (added to the list in 2001)
  - "Implement a safety system for ground movement that will ensure the safe movement of airplanes on the ground and provides direct warning capability to the flight crews"
- RWSL technology was developed and evaluated through the Runway Incursion Reduction Program (RIRP) to assess its performance and suitability for integration at high volume airports
- Successful operational evaluations at DFW, SAN, LAX and BOS airports (2005-present) established initial baseline of capability for NAS implementation
- The RWSL Program received approval to deploy RWSL to 23 airports on January 22, 2010
- The FAA will own, operate and maintain the entire RWSL system including the field lighting



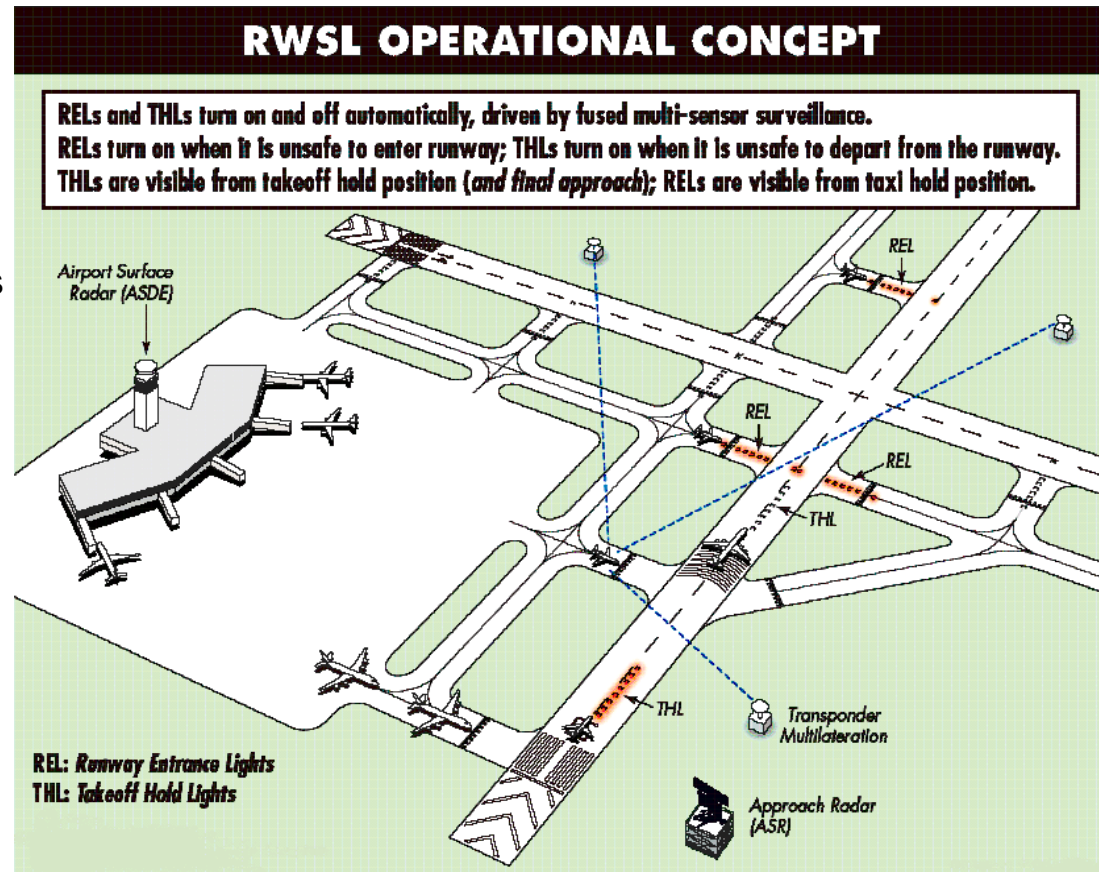
# RWSL Airports



# System Description

RWSL integrates airport lighting equipment with approach and surface surveillance systems to provide a visual signal to pilots and vehicle operators indicating that it is unsafe to enter, cross, or begin takeoff on a runway

- Designed to reduce the number of runway incursions without interfering with normal and safe airport operations
- Automatic, passive, system that provides an added layer of safety for the runway environment
- Increases situational awareness by displaying critical time-sensitive safety status information directly to pilots and vehicle operators
- Provides an immediate indication of the existence or forecast of a conflict
- Indicates runway status only; does not indicate clearance



# Program Implementation Status

- Operational Test & Evaluation (OT&E) conducted at the RWSL Production Key Site, Orlando International Airport (MCO)
- OT&E will be followed by Independent Operational Analysis (IOA)\*
- An In Service Decision is expected late this summer
- Construction and installation is in progress at 12 sites: Houston George Bush (near completion), Phoenix (near completion), Minneapolis, Las Vegas, Washington Dulles, Charlotte, Ft Lauderdale, New York La Guardia, Chicago, Seattle, New York JFK, Detroit
- Waterfall Schedule follows

\* Formerly Independent Operational Test & Evaluation (IOT&E)



# RWSL Waterfall

#	ID	Region	Airport	ORD
1	MCO	ASO	Orlando International Airport	Aug-11
2	PHX	ASW	Phoenix Sky Harbor International Airport	Dec-11
3	IAH	ASW	George Bush Intercontinental Airport	Jan-12
4	BWI	AEA	Baltimore-Washington International Airport	Mar-12
5	LAS	AWP	Las Vegas McCarran International Airport	Mar-12
6	CLT	ASO	Charlotte Douglas International Airport	May-12
7	LAX	AWP	Los Angeles International Airport	Sep-12
8	ATL	ASO	Hartsfield-Jackson Atlanta International Airport	Jan-13
9	SEA	ANM	Seattle-Tacoma International Airport	Apr-13
10	ORD	AGL	Chicago O'Hare International Airport	May-13
11	IAD	AEA	Washington Dulles International Airport	May-13
12	LGA	AEA	LaGuardia Airport	Jun-13
13	JFK	AEA	John F. Kennedy International Airport	Apr-14
14	DEN	ANM	Denver International Airport	May-14
15	MSP	AGL	Minneapolis-St. Paul International Airport	May-14
16	EWR	AEA	Newark International Airport	Jun-14
17	DTW	AGL	Detroit Metro Wayne County Airport	Aug-14
18	PHL	AEA	Philadelphia International Airport	Oct-14
19	DFW	ASW	Dallas/Ft. Worth International Airport	Dec-14
20	FLL	ASO	Ft. Lauderdale/Hollywood Airport	Mar-15
21	BOS	ANE	Boston Logan International Airport	Jul-15
22	SAN	AWP	San Diego International Airport	Oct-15
23	SFO	AWP	San Francisco International Airport	Dec-15
S1	PSF		Oklahoma City - NAS Engineering Program Support Facility (PSF)	N/A
S2	ILS		Oklahoma City - FAA Logistics Center/Depot	N/A
S3	ACA		Oklahoma City - FAA Academy	N/A

# Lighting Issues

- **The use of Commercial Off the Shelf (COTS) equipment (constant current regulators (CCRs), master light controllers (MLCs)) has several implementation difficulties. These include:**
  - a) Non-compliance with stricter requirements in FAA specifications and orders
  - b) Redevelopment to comply with life cycle maintenance requirements
  - c) Equipment is proprietary; documentation difficult to obtain from vendors



# Lighting Issues (continued)

- **Take-off Hold Lights (THL) and Runway Entrance Lights (REL) Light-Emitting Diode (LED) light fixtures have been certified**
- **LEDs will be installed at all RWSL airports except some of the four prototype airports**



# Back Up



# Runway Entrance Lights (RELs) and Takeoff Hold Lights Arrays (THLs)



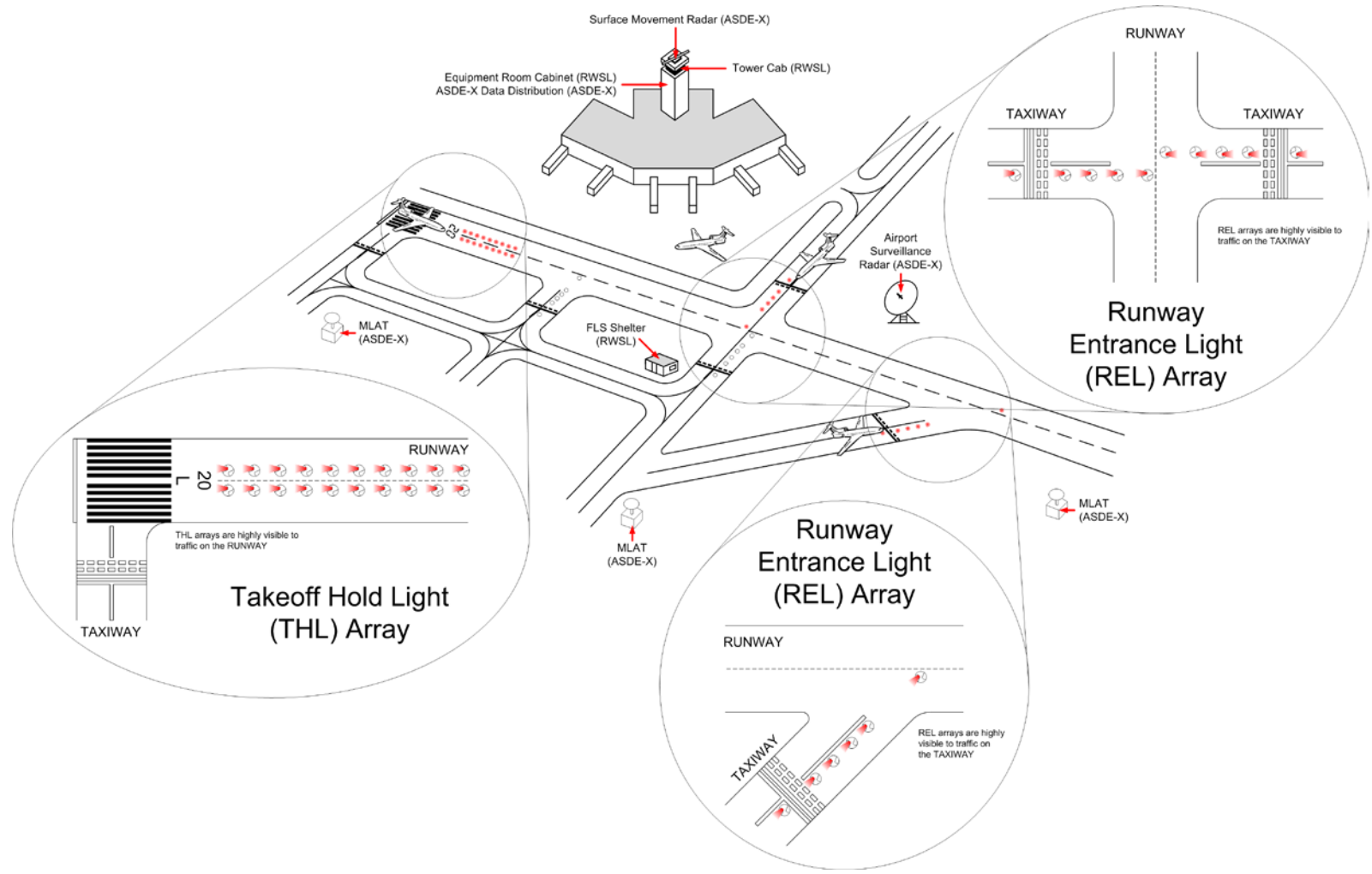
## Takeoff Hold Lights (THLs) L-850T

6' on either side of RW CL lights, spaced 100'  
for 1500' – 32 lights/array  
Start 375' from the runway threshold

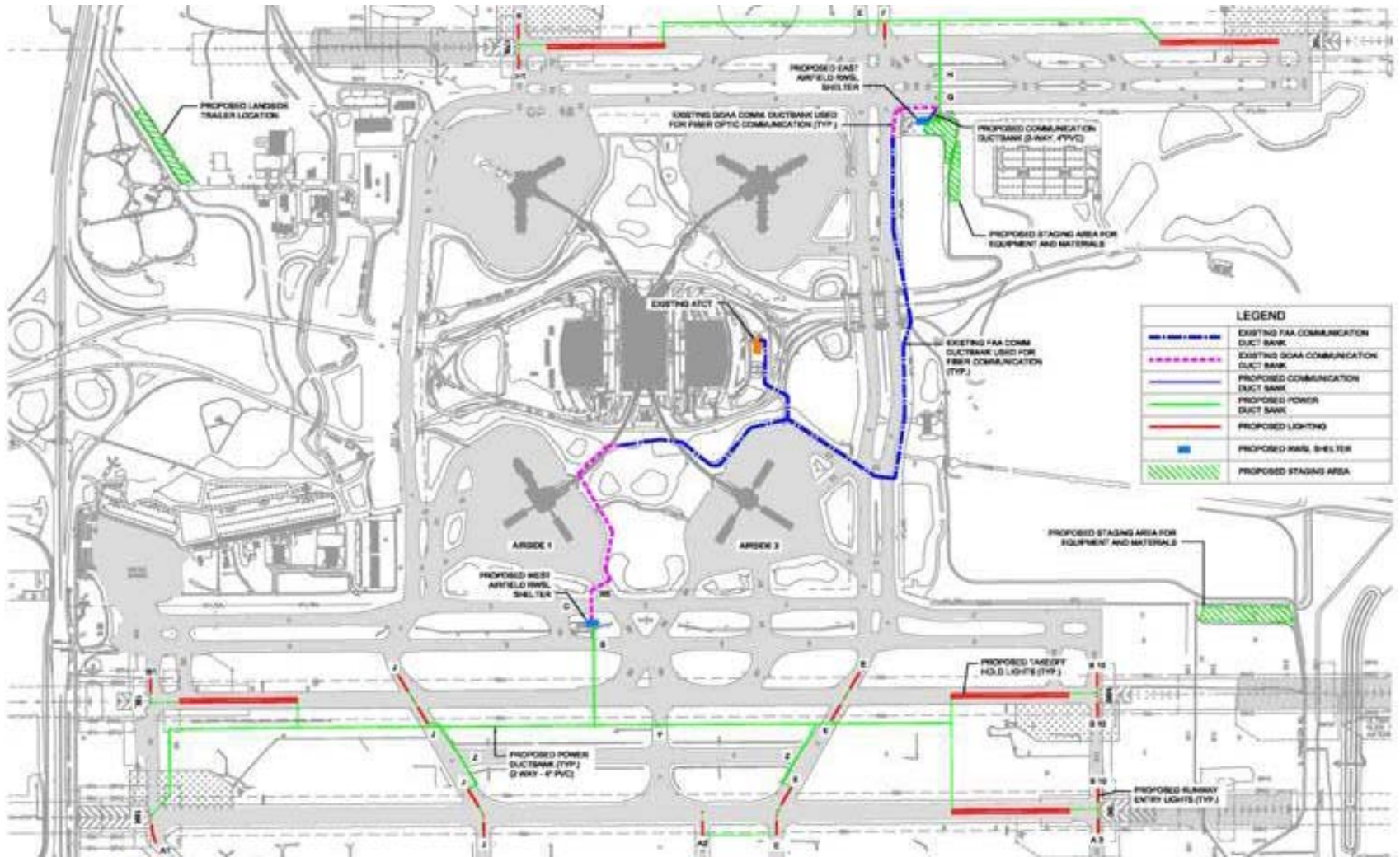
## Runway Entrance Lights (RELs) L-852S

6 lights minimum per REL array (Includes one  
on Runway center line)

# Conceptual Diagram of the RWSL System



# Orlando (MCO) Site Design

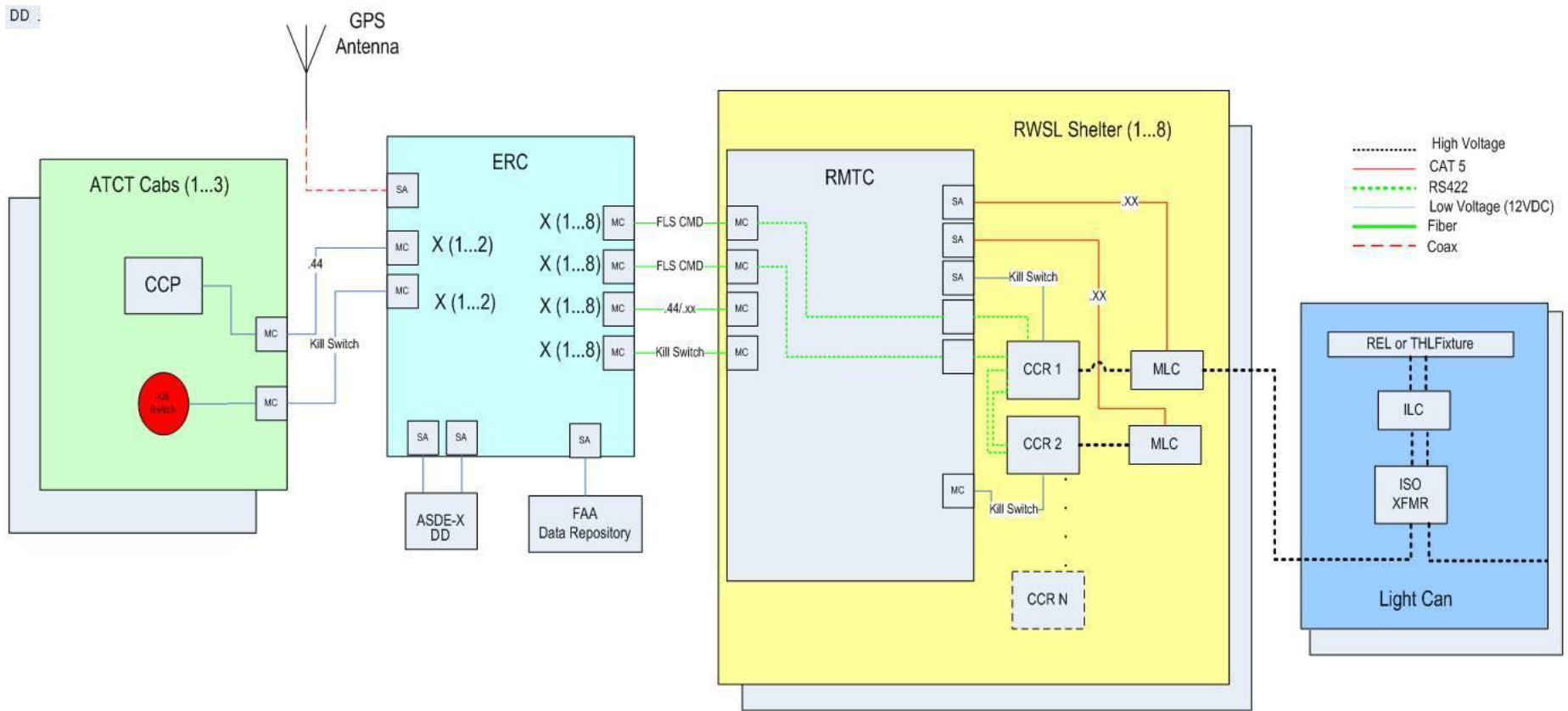


Runway Status Lights



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# Physical Architecture





# Shelter Component (Shelter)



- Up to 8 Shelters per airport
- 12 x 26
- HVAC options, fan/vent, power options, plus others.
- 2100, Safety and Work/Egress Clearances

# System Overview: Airfield Shelter



**RWSL FLS Shelter at 9300 Taxiway Road**

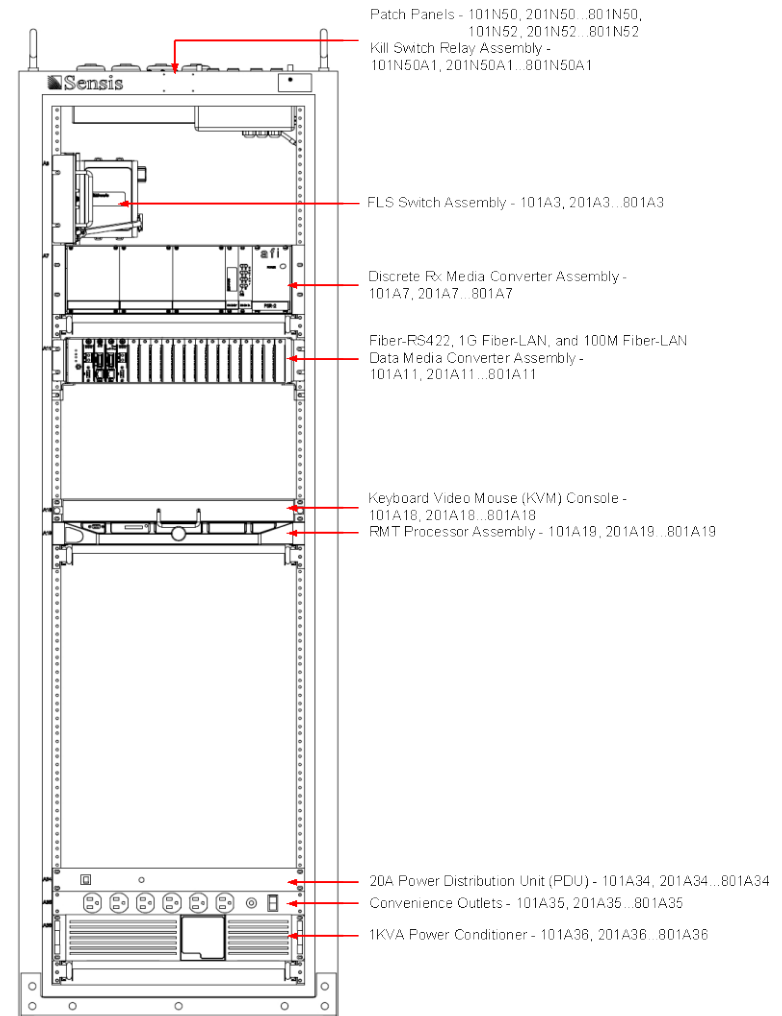


**RWSL Field Lighting System Shelter**



# System Overview: MCO Airfield Shelter

## MCO



**Remote Maintenance Terminal Cabinet (RMT) in shelter**

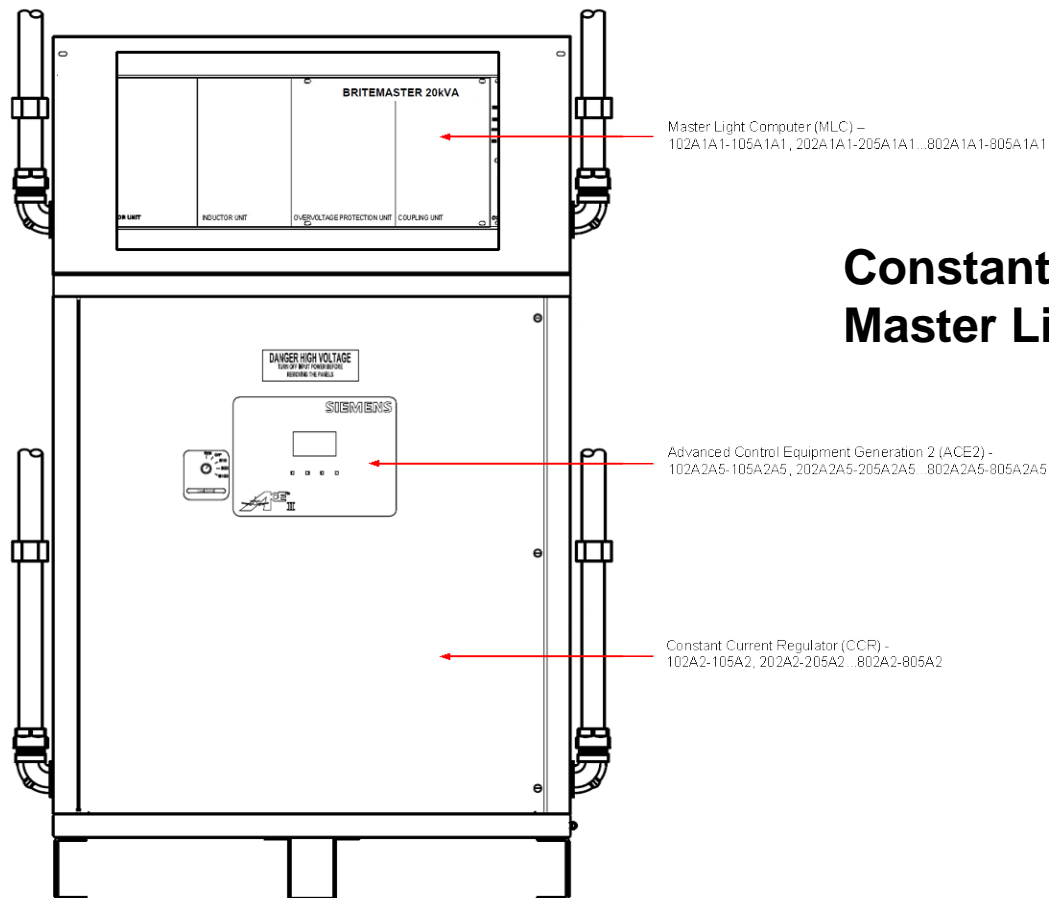
# Constant Current Regulator (Shelter)

- Maintains a constant current level throughout one series circuit loop.
- The current level is determined by the light intensity setting.
- ACE – Advanced Control Equipment (ACE)
- Up to 4 CCR per Shelter



# System Overview: MCO Airfield Shelter

## MCO



### Constant Current Regulator and Master Light Computer in shelter

# Master Light Controller (MLC) (Shelter)

- Receives light commands from the LC and sends communication signals to the individual light controllers.
- provide illuminate/extinguish control capability for the Individual Light Controllers on one circuit.
- Power line carrier modem
- ADB Brite III Master
- Custom Rack mounted above CCR

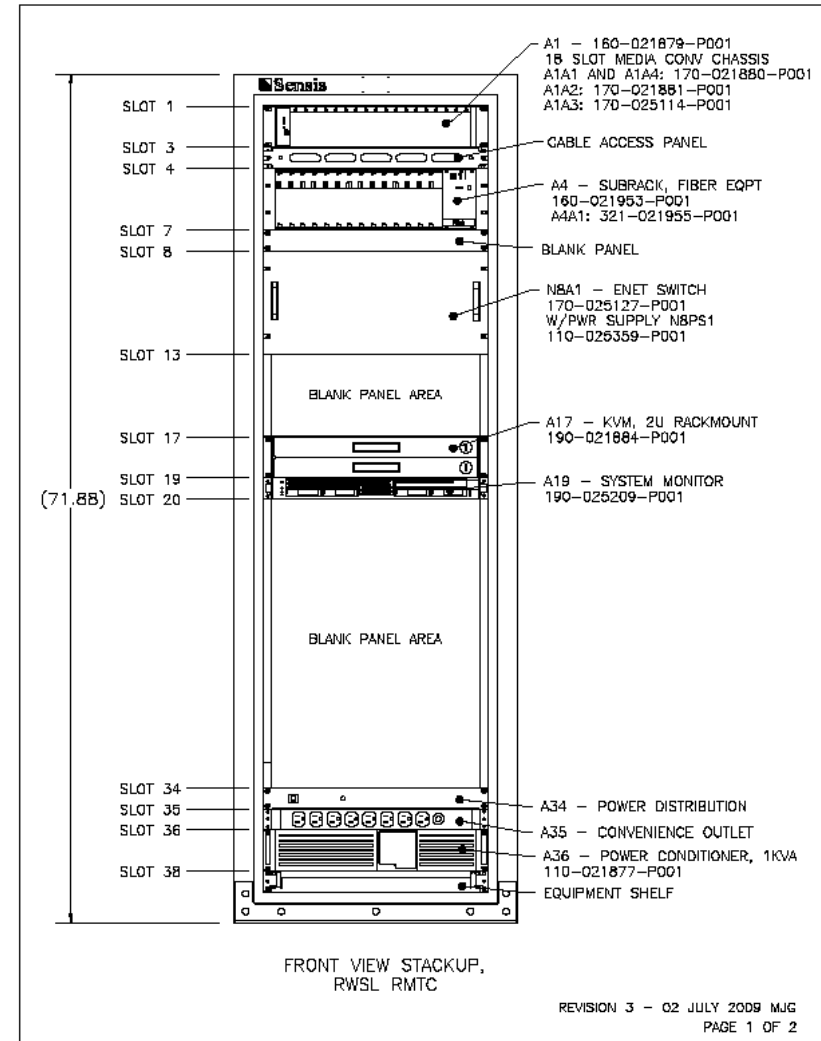


# Power Conditioner (Shelter)

- AC surge protection
- Transient protection
- Harmonic protection
- Protects all equipment in the Shelter except CCR and MLC

# Remote Maintenance Terminal (Shelter)

- RMT Cabinet (RMTC)
- Computer
- Standard KVM
- Media Converters
- Fiber Equipment
- Power Distribution
- Power Conditioner



# Power and Comms (Shelter)

- **Power**

- Disconnect Switch
- 480V Input Panel
- Utility Transformer
- Distribution Panel
- High Voltage Output Cabinet
- Series Cut-out (SCO) Power output box

- **Communications**

- Fiber Demarc - Corning LANscape P/N - WCH-04P
- Kill Switch Relay
- Cable Tray

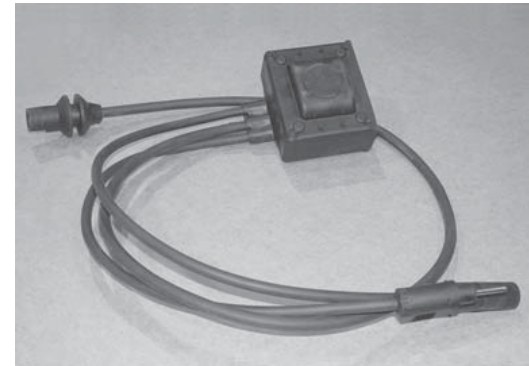


# Shelter Install Process

- **Procured through MMAC Shelter Program**
  - Current shelter contract is with Dupont Building, Inc. located in Sweet Lake, LA.
- **Define Requirements – 1month**
  - Shelter drawings returned to MMAC with Mfr. Install specifications
  - HVAC requirements
  - Wind loading
  - Incorporation of the CCR mount plate
  - Exterior/interior finishes and coatings
  - Structural building elements
- **Service Order – FAA PMO Orders FLS Shelter - 1 month**
  - Scope, Contents, Site, Schedule
- **MMAC Order – MMAC Places order to vendor- 10 weeks**
- **Shelter Received at MMAC – Placed into MMAC Inventory - 2 weeks**
- **Populate Shelter - 6 weeks**
  - Install
  - Test
- **Ship to site - 2 weeks**
- **Arrive on site - 1 day**
  - Need 7460 for crane
  - Install on FLS pad

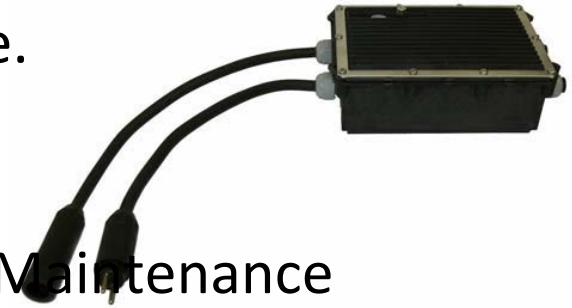
# Isolation Transformer (Field)

- Isolates the light fixture from the high voltage primary side of the series circuit.
- Power from CCR.
- Enhances safety for maintenance personnel.



# Individual Light Controller (ILC) (Field)

- Receives the command signals sent from the MLC over the series circuit.
- Illuminates and extinguishes the light fixture accordingly.
- Monitors the diagnostics of the light fixture.
- Unique Serial Numbers.
- Requires specific repair/replace logging at Maintenance Terminal or Remote Maintenance Terminal.
- Addressable, Low-Power, RF carrier-current modem



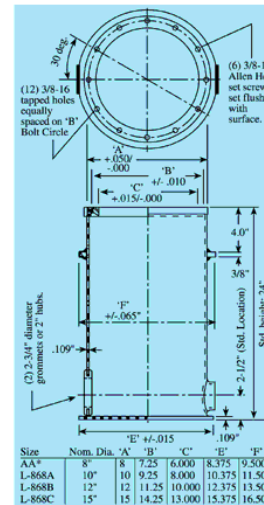
# Light Fixtures (Field)



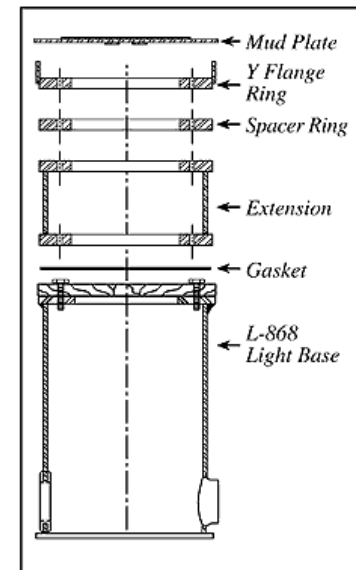
- THL fixtures conform to FAA AC 150/5345-46D Type L-850T.
- REL fixtures conform to FAA AC 150/5345-46D Type L-852S.
- LED lights are to be used.
- Key Site (Orlando) will be installed with Incandescent lights and later retrofitted with LED.

# Light Can (Field)

- 12" diameter x 24" height
- L-868
- Hot-dip galvanized
- 1" drain
- 6 bolts
- Plate Installed if fixture unavailable
- Submerged



L-868 Light Base



L-868 Installation Configuration

# Major Milestones Complete to Date

- Awarded contract to Sensis Corporation on October 16, 2008
- Conducted Preliminary Design Review at Sensis on March 2-6, 2009
- Conducted Critical Design Review at Sensis on July 21 – 24, 2009
- Conducted Factory Acceptance Test (FAT) on February 10, 2010
- Delivered system to Key Site -- Orlando International Airport (MCO) on February 19, 2010
- Completed Final Qualification Test (FQT) on August 4, 2010
- Conducted Site Acceptance Test (SAT) at MCO on August 4 – 16, 2010, however system did not pass System Stability Test
- SAT Regression Test event completed January 26

# System Description

- The RWSL system integrates approach and surface surveillance systems with airport lighting equipment to provide a visual signal to pilots and vehicle operators indicating that it is unsafe to enter/cross or begin takeoff on runway
- The system is fully automated based on inputs from surface and terminal surveillance systems
- Airport surveillance sensor inputs are processed through light control logic that commands in-pavement lights to illuminate red when there is traffic on or approaching the runway
  - **Runway Entrance Lights (REL)** provide a signal to aircraft crossing or entering runway from intersecting taxiway
  - **Takeoff Hold Lights (THL)** provide signal to aircraft in position for takeoff



# Final Product

- **REL – Runway Entrance Lights**

- RELs are illuminated when a aircraft of vehicle is traveling towards or on a runway at a certain speed, acceleration, and altitude.
- RELs are extinguished using anticipated separation (prior to actual taxiway clearance) to maintain current safe airport operations.

- **THL – Take-off Hold Lights**

- THLs are illuminated when a there is both a aircraft in a Take Off Hold region that is aligned with the runway, and there is a aircraft or vehicle in front of it on the runway.
- THLs are extinguished when the aircraft or vehicle is projected to leave the runway, allowing the use of anticipated separation to maintain current safe airport operations.

# Example of RELs



Runway Status Lights



# Example of THLs

