Runway Status Lights
BOS Operational Evaluation Training for Air Traffic Controllers

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Outline

• Runway Status Lights (RWSL) Overview

• BOS RWSL Adaptation for Operational Evaluation

• RWSL Light Logic
  – Runway Entrance Lights (RELs)
  – Takeoff Hold Lights (THLs)
  – Runway Intersection Lights (RILs)

• Pilot & Air Traffic Control Protocol

• Air Traffic Control RWSL in Boston Tower
Boston Runway Status Lights (RWSL) Overview

- **Runway Status Lights purpose**
  - Prevent runway accidents
  - Reduce frequency and severity of runway incursions
- **How do Runway Status Lights do this? By increasing pilot and vehicle operator situational awareness**
  - RELs provide a *visual indication* that it is unsafe to cross or enter a runway
  - THLs provide a *visual indication* that it is unsafe to takeoff from a runway
  - RILs provide a *visual indication* that it is unsafe to enter a runway-runway intersection

- **RWSL at BOS consists of RELs, THLs and RILs**
High-level Operational Requirements

• Lights must operate automatically for each operation
  – No controller action required
• RELs must accurately indicate that runway is unsafe to enter or cross
  – RELs turn ON (red) when the RWY is unsafe
  – RELs turn OFF when the RWY is safe
• THLs must accurately indicate that runway is unsafe for departure
  – THLs turn ON (red) when the RWY is unsafe
  – THLs turn OFF when the RWY is safe
• RILs must accurately indicate that runway intersection is unsafe to enter or cross
  – RILs turn ON (red) when the RWY is unsafe
  – RILs turn OFF when the RWY is safe
• Lights must not interfere with normal safe ATC and airport operations
• Lights indicate status only, never clearance to proceed
• Lights are timed to allow for use of anticipated separation by ATC
RWSL Generic Operational Concept

RWSL safety logic uses fused surveillance to automatically illuminate lights - *directly* warning pilots that a runway is unsafe.

**RELs:** Runway Entrance Lights  
**THLs:** Takeoff Hold Lights  
**RILs:** Runway Intersection Lights

*Runway Entrance Lights (RELs)*
RELs mean STOP! The runway is unsafe to enter or cross.

*Takeoff Hold Lights (THLs)*
THLs mean STOP! The runway is unsafe for takeoff.

*Runway Intersection Lights (RILs)*
RILs mean STOP prior to runway intersection ahead!

Airport Surface Detection Equipment (ASDE)
RWSL Adaptation at BOS

- **RELs (7) at selected intersections**
  - 4L/22R at E and K
  - 4R/22L at E (east)
  - 9/27 at C (north)
  - 15R/33L at D (west)

- **THLs (2) at full-length takeoff points on 9 and 15R**

- **RILs (2) on 9 at 15R/33L (west of intersection) and on 15R at 9/27 (north of intersection)**

**THLs and RILs on runway 9 share 18 fixtures**
Configuration of Runway Entrance Lights (RELs)

RELs are red when it is unsafe to enter the runway

- RELs along taxiway centerline for last-second situational awareness
- Distinct from Surface Movement Guidance and Control System (SMGCS) stop bar
Protocol for Pilots & Vehicle Operators Viewing Red RELs

• If RELs illuminate red, the runway is unsafe to enter or cross and the pilots should stop immediately

• When the lights are off, pilots/vehicle operators may not enter or cross the runway without ATC clearance
  – In some instances (anticipated separation), RELs may be illuminated while the clearance is being given, but should be turned off by the time the controller has finished issuing the clearance

RELs indicate runway status only; they do not indicate clearance!

DO NOT CROSS RED LIGHTS even if cleared by ATC
Configuration of Takeoff Hold Lights (THLs)

THLs are red when it is unsafe to depart

- BOS THL configuration is double-row/1,500 feet longitudinally along Runway 9 and 15R centerlines
Protocol for Pilots Viewing Red THLs

• If in position and hold or line up and wait on the runway and THLs illuminate red:
  – *Pilots should remain in position for takeoff*

• If takeoff roll has begun and illuminated THLs are observed:
  – *Pilots should safely stop the aircraft and notify ATC that they are stopped because of red lights*

• If aborting the takeoff is impractical for safety reasons:
  – *Pilots should proceed according to their best judgment of safety (understanding that the illuminated THLs indicate the runway is unsafe for departure) and contact ATC at the earliest opportunity*

THLs indicate runway status only; they *do not indicate clearance!*

**DO NOT CROSS RED LIGHTS even if cleared by ATC**
Configuration of Runway Intersection Lights (RILs)

RILS are red when it is unsafe to enter a runway intersection

RILs are installed as a 3000 foot long double row on either side of Runways 9 and 15R centerlines
Protocol for Pilots and Vehicle Operators Viewing Red RILs

• If RILs are illuminated red, the runway intersection is unsafe for entry or crossing
  – A pilot or vehicle operator seeing illuminated RILs should safely stop!

• If stopping is impractical for safety reasons
  – Pilots or vehicle operators should proceed according to their best judgment of safety (understanding that the illuminated RILs indicate the runway intersection is unsafe to enter or cross) and contact ATC at the earliest opportunity

• In critical conflict situations
  – Pilots or vehicle operators should utilize the information from RILs (intersection is unsafe) then take the appropriate actions to prevent a collision according to your best judgment of safety

RILs indicate runway status only; they do not indicate clearance!

DO NOT CROSS RED LIGHTS even if cleared by ATC
RWSL Protocol for ATC

• No new national procedures for RWSL

• Controllers are expected to use best judgment and applicable paragraphs from 7110.65 and 7210.3

• Do not clear pilots to takeoff through RED THLs

• Do not clear vehicle operators through runway intersection ahead with RED THLs

• Do not clear pilots or vehicle operators to cross/drive through RED RELs or RILs
  If RWSL is illuminating lights abnormally, then a supervisor should disable RWSL. Do not clear pilots/vehicle operators through red lights.
RWSL Operational Evaluation Test Displays

Test RWSL Display with example THLs on due to traffic

RWSL displays are not for operational use
- THLs and RILs shown as red bars (at installed locations)
- Bars turn red and blank consistent with lights turning on and off
- Aircraft also shown (similar to ASDE-X situational display)

RWSL is displayed at ATC supervisor’s area and at the flight data position
- Press small black button labeled “RWSL” to bring up RWSL display (light activity only) on existing PC display at flight data position
- Dedicated RWSL monitor added to Supervisor’s area will display RWSL light activity and a commander window for RWSL interaction (turn lights on/off, adjust intensity levels, etc.)
RWSL Commander Window Layout - 1 (DRAFT-will exclude RELs for OpEval)

- **Airport Configuration (RWSL changes automatically)**
  - ATC may also set configuration with dropdown menu

- **LAHSO Enabled (checked is ON, unchecked is OFF)**
  - Supervisor/CIC must enter LAHSO availability.
  - LAHSO on/off status will show on RWSL display also

- **Closed Runway Option**
  - Supervisor/CIC should enter runway closure state
  - LAHSO on/off status will show on RWSL display also
  - When a runway is closed, the THLs will illuminate for any track in position for takeoff, regardless of other traffic on the runway
  - When a runway is no longer closed, supervisor/CIC should change its state back to open

- **Surveillance input (RWSL changes automatically, ATC may also change manually)**
  - “Limited” mode means RWSL is not using ASDE-3 and countdown timer until scheduled start of ASDE-3 use is displayed under “Control description”
  - To eliminate false surface radar targets if they occur, switch to limited mode and back to normal mode
RWSL Commander Window Layout - 2 (DRAFT-will exclude RELs for OpEval)

- **Lighting Controls**
  - Manual adjustment of light intensity (if necessary)
  - BOS will decide light levels (day/night), RWSL changes intensity automatically

- **Light Types (RWSL ON/OFF)**
  - These buttons are for turning RWSL system on by light type (i.e. THLs or RILs)
  - “Auto” is RWSL ON (lights turn on/off with safety logic)
  - “Off” means RWSL logic is not operational (soft kill)

- **Maintenance mode for field lighting tests**
  - "On"/"Off" means manual on/off: selected lights will be on/off regardless of traffic (RWSL logic is overridden)
  - When maintenance testing is complete, click all the "auto" buttons in the "Types" section above
  - This will result in the maintenance buttons being unselected and RWSL will return to normal, automatic function

- **Soft kill switch – all RWSL OFF**
  - This turns RWSL off and should only be used if RWSL is malfunctioning
  - To return system to normal operation, click all the "auto" buttons in the types section above, then select the desired light intensities
How to shut off RWSL

Unless the system is creating anomalies RWSL will remain on continuously throughout the Operational Evaluation. Development of a Local SOP may be required for BOS.

Example requiring RWSL shutoff
- Controller issues takeoff clearance
- Pilot responds that THLs are on
- Controller responds with cancel takeoff clearance instructions
- Controller re-assesses the situation and determines the runway is safe
- Controller asks the pilot if the lights are still on

If lights reported still on, RWSL malfunctioning, turn it off:
- Disable lights using commander window SOFT KILL (easier recovery to service)
- Turn off RWSL OFF using HARD KILL switch (quickest)

Once lights are off, ATC re-issues clearance or alternate instructions
- Rebroadcast ATIS message with RWSL activity omitted
- Return RWSL to service (after malfunction is resolved) and rebroadcast ATIS message with RWSL activity included
Operational Evaluation Schedule and Tasks

• **Daily testing**
  – Commencing on or about May 24th, 2010
  – Duration of 3 months – option to extend if successful
  – All weather conditions present, all flows, 24/7

• **BOS air traffic supervisors in BOS TWR**
  – Verify ATIS states RWSL test in progress (or not if RWSL turned off)
  – Call or beep MITLL if problem occurs with RWSL

• **ATC may voluntarily assist in identifying RWSL anomalies:**
  – False Activation (FA) = light on inadvertently
  – Missed Detection (MD) = light off inadvertently
  – Interference (I) = interruption of traffic caused by light
    • For example, a pilot may hesitate to accept a clearance or actually call the controller to question a clearance that is not consistent with an illuminated light even though the clearance is correct and the resulting action would be safe.

• **BOS air traffic controllers in BOS TWR cab**
  – React as trained if pilots or vehicle operators question red lights
  – DO NOT CLEAR THROUGH RED LIGHTS
Questions & Discussion