

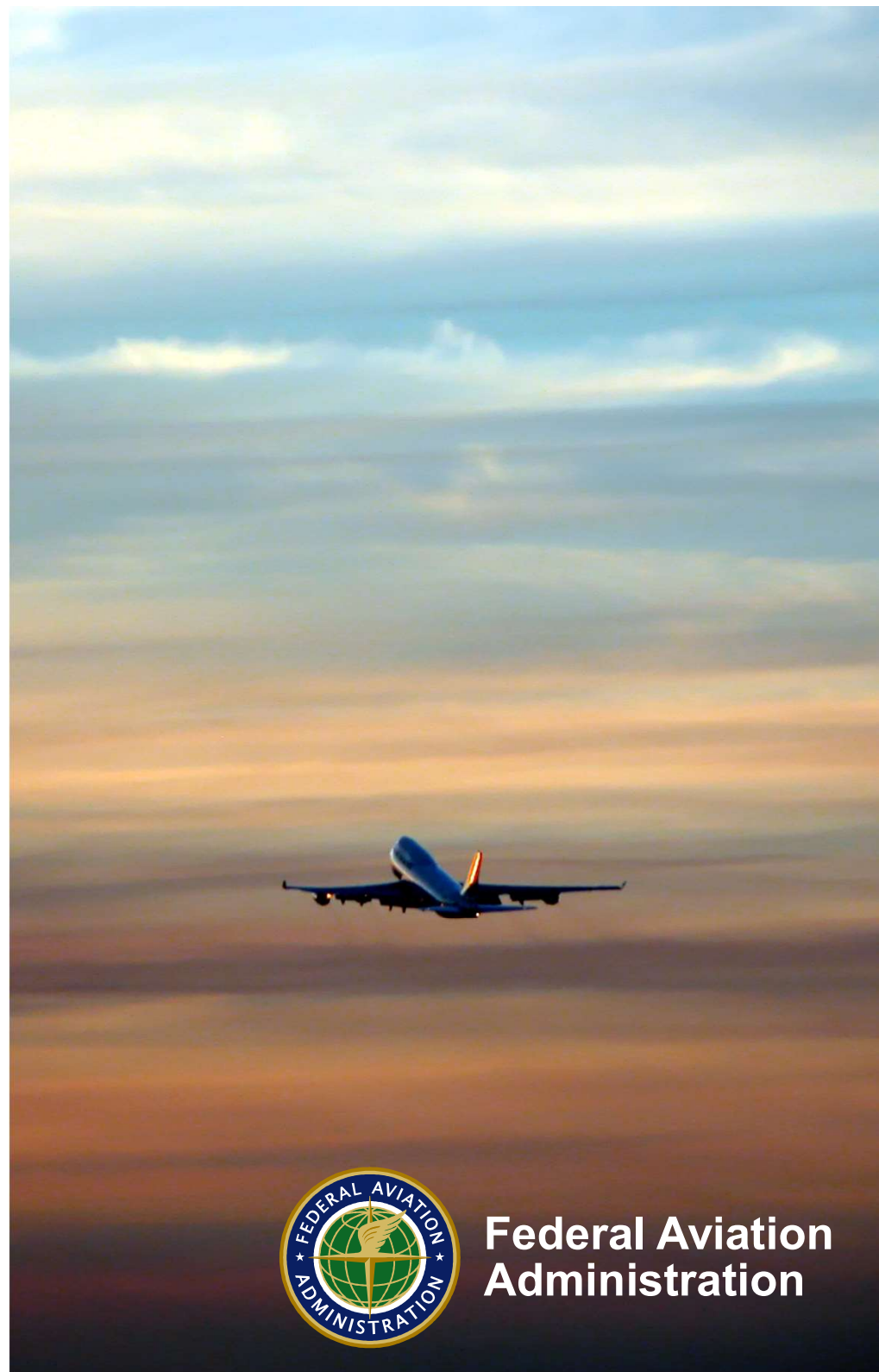
Runway Incursion Prevention through Situational Awareness (RIPSA)

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**Federal Aviation
Administration**



Runway Incursion Prevention through Situational Awareness (RIPSA) Solution Overview

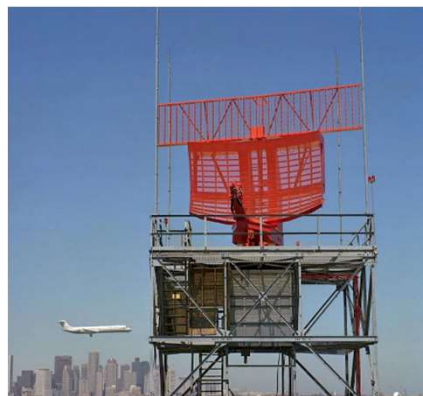
- RIPSA is aimed at reinforcing protection of the Runway Safety Area, by utilizing “direct to pilot” safety solutions capable of providing localized detection capabilities for all aircraft or vehicles at RI hotspot locations, such as hold short lines and runway intersections
 - Provides Situational Awareness only; not clearance to enter the runway
- Prime mission technology is non-cooperative targeted surveillance (Surface Movement Radar) with augmentation from cooperative sources (ADS-B) and Airport Surveillance Radar (ASR)
- RIPSA uses Surveillance input from the SMR, processes it using “Safety Logic” which drives a Field Lighting System (FLS) including in-ground Runway Entrance Lights (RELs) to indicate runway status
 - ATC can turn off FLS using “kill switch” in case of malfunction/interference



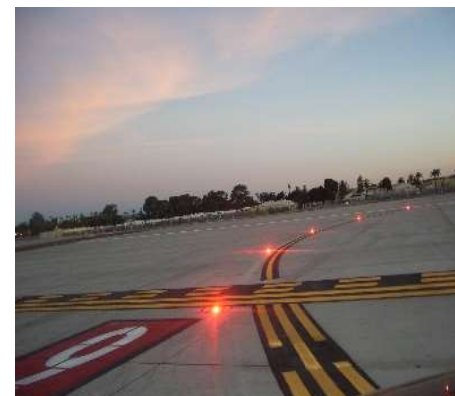
Surface Movement Radar (SMR)



ADS-B



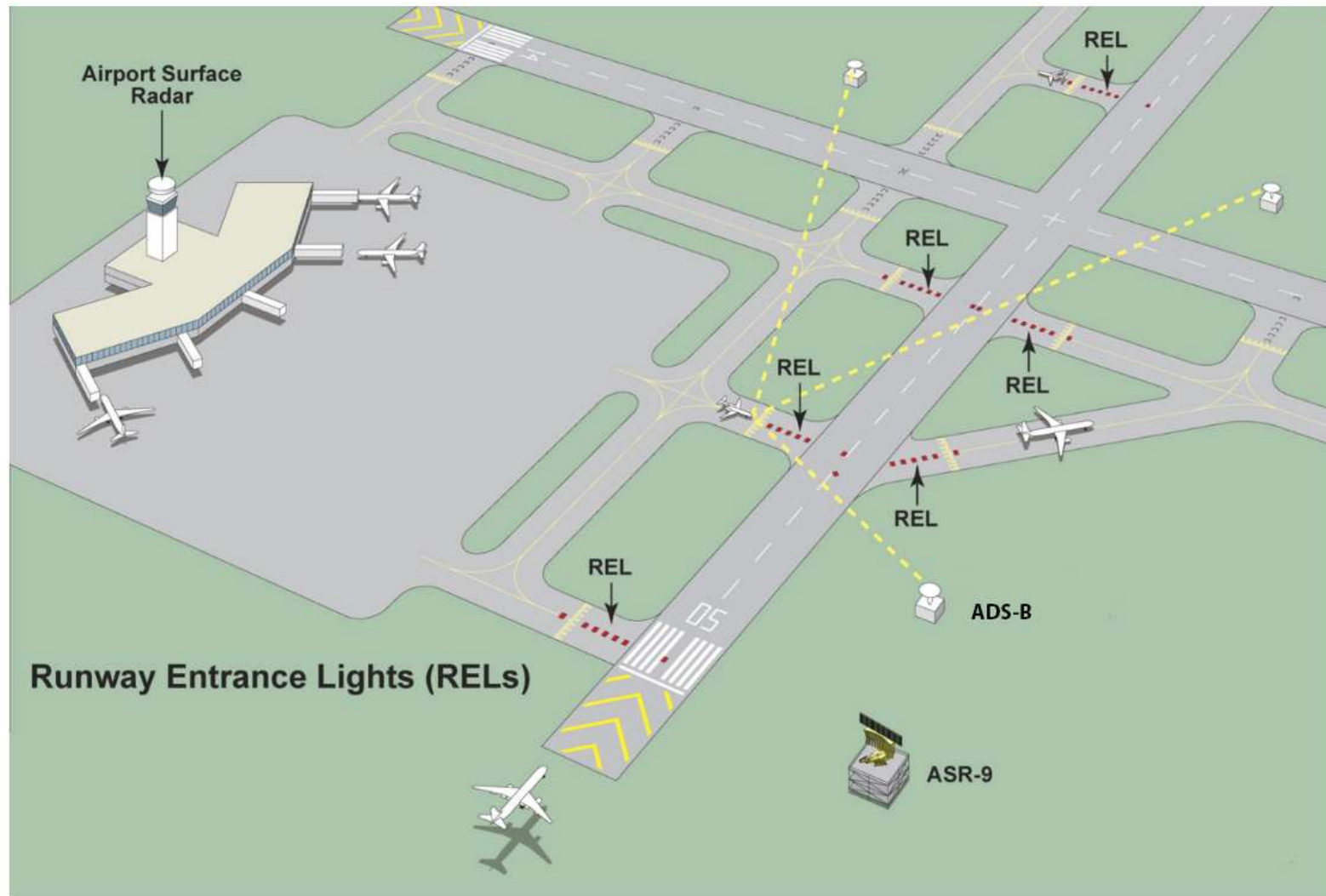
Airport Surveillance Radar/STARS



REL Operation



RIPSA Operational Concept



RIPSA consists of Surveillance Sensors, Safety Logic and fully automated RELs

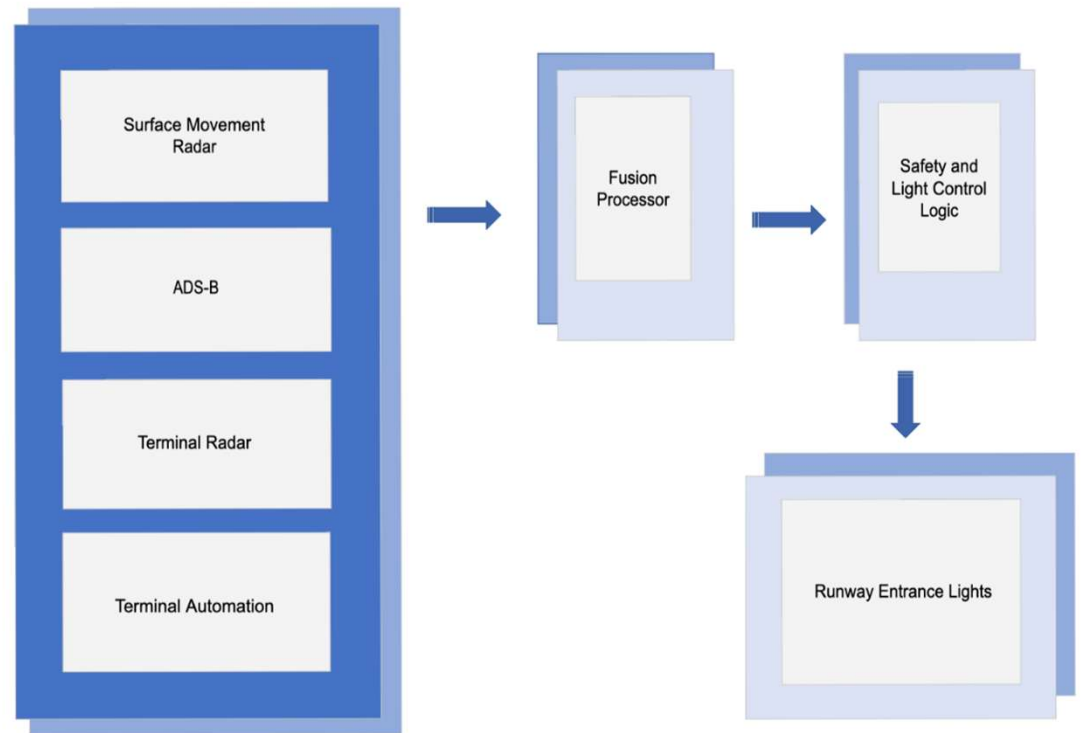


RIPSA Technical Flow Chart

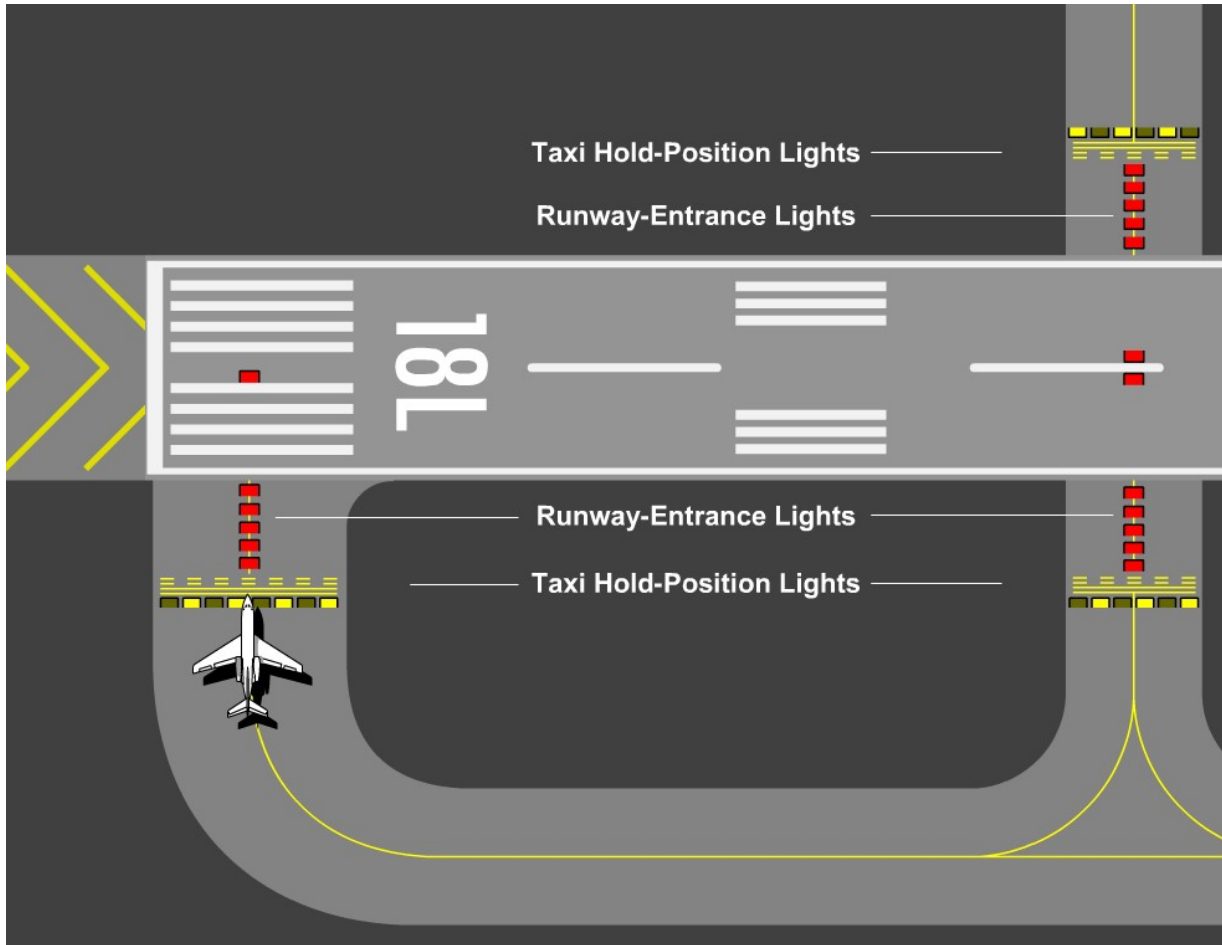
Surface Movement Radar (SMR) is Radar equipment specifically designed to detect all non-cooperative principal features on the surface of an airport, including aircraft and vehicular traffic.

Automatic Dependent Surveillance-Broadcast (ADS-B) is a function on an aircraft or surface vehicle that broadcasts position, altitude, vector and other information for use by other aircraft, vehicles and by ground facilities.

Standard Terminal Automation Replacement System (STARS) is a digital automation system capable of tracking all aircraft within the defined airspace using information from available FAA and U.S. Department of Defense (DoD) surveillance systems.



Runway Entrance Light (REL) Operational Concept



RELs are located between hold line and near/next to runway center line.

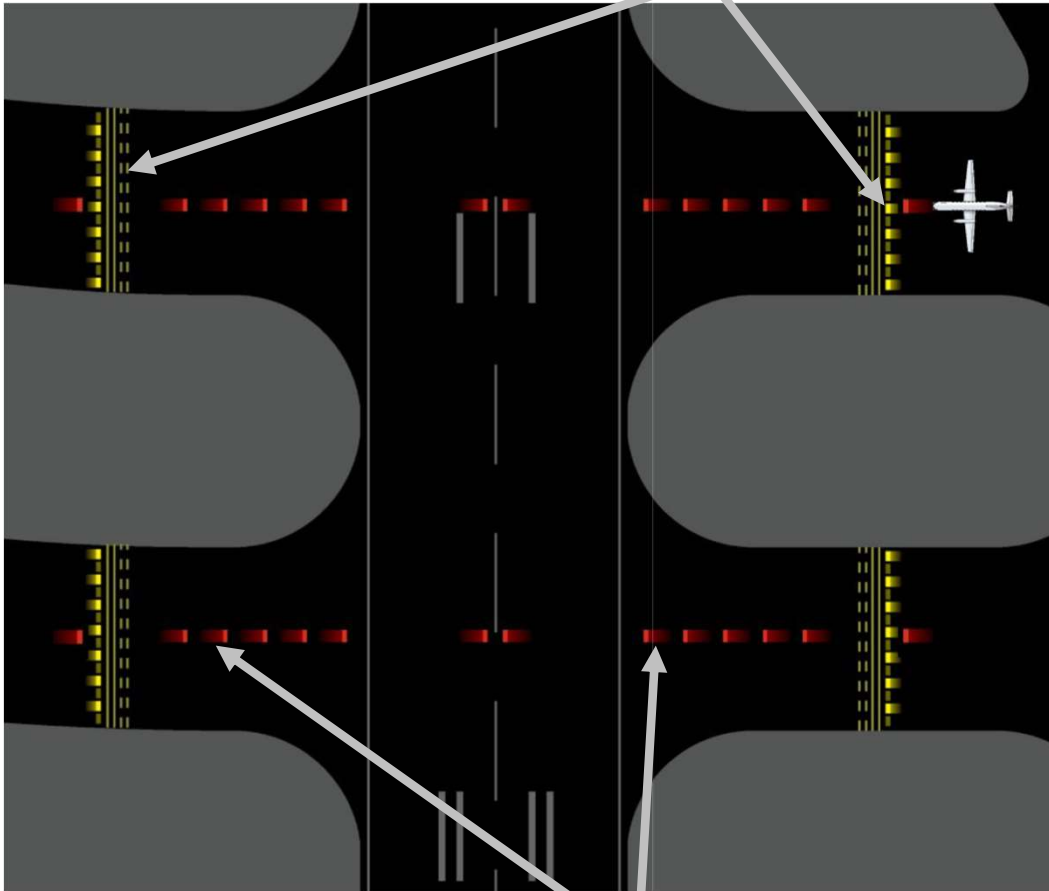
Red means STOP: Runway is unsafe to enter or cross. If cleared to enter or cross, alert ATC and clarify clearance.

Off means no alerts - Follow ATC clearance.



RELs Operational Requirements

Runway Guard Lights (yellow)



Runway Entrance Lights (red)

- RELs must accurately depict runway is unsafe to enter/cross
 - Red if runway not safe
 - Otherwise off (no illumination)
- RELs must not interfere with normal, safe operations
- RELs must operate automatically for each landing and departure



Placement, Direction and Intensity of RELs

- **RELs aligned with taxiway centerlines**
 - Taxiway centerlines straight at SAT
 - One REL is located adjacent to runway centerline
- **Light from all RELs is directed toward taxiway hold line**
- **Five standard intensity steps available**
 - For daytime operations, RELs will be set to step 5 in bright sunlight.
 - For nighttime operations, set to step 3 or one step higher than existing lights, set 4, TBD by Flight Standards.



REL Activations for Arrival and Departures

- **Arrivals**

- All RELs are simultaneously illuminated based on distance, 3/4 NM from the runway threshold. When the aircraft decelerates through 80 knots, RELs downfield are off except for the intersection the aircraft is approaching. All RELs are off when the aircraft slows to taxi speed (about 34 knots).

- **Departures**

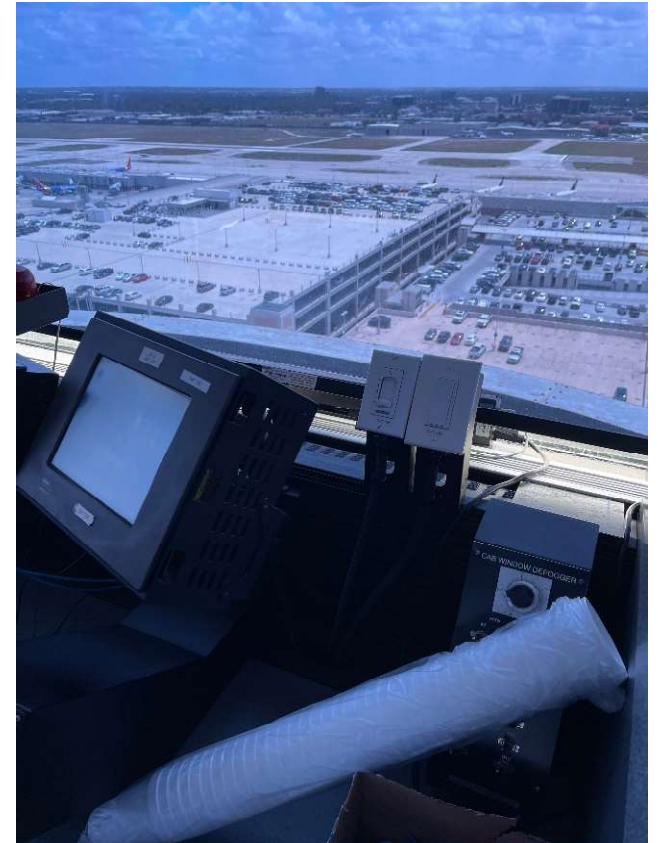
- All RELs in front of aircraft are illuminated when aircraft transitions from a taxi to a departure at 20 knots. All RELs are off when the aircraft transitions from a departure to an airborne status (wheels off ground and positive rate of climb).



FAA Tower Cab Kill Switch Location



RIPSA Kill Switch will be between positions 7 & 8



Kill Switch will be mounted on Slat Wall



RIPSA Evaluation Schedule

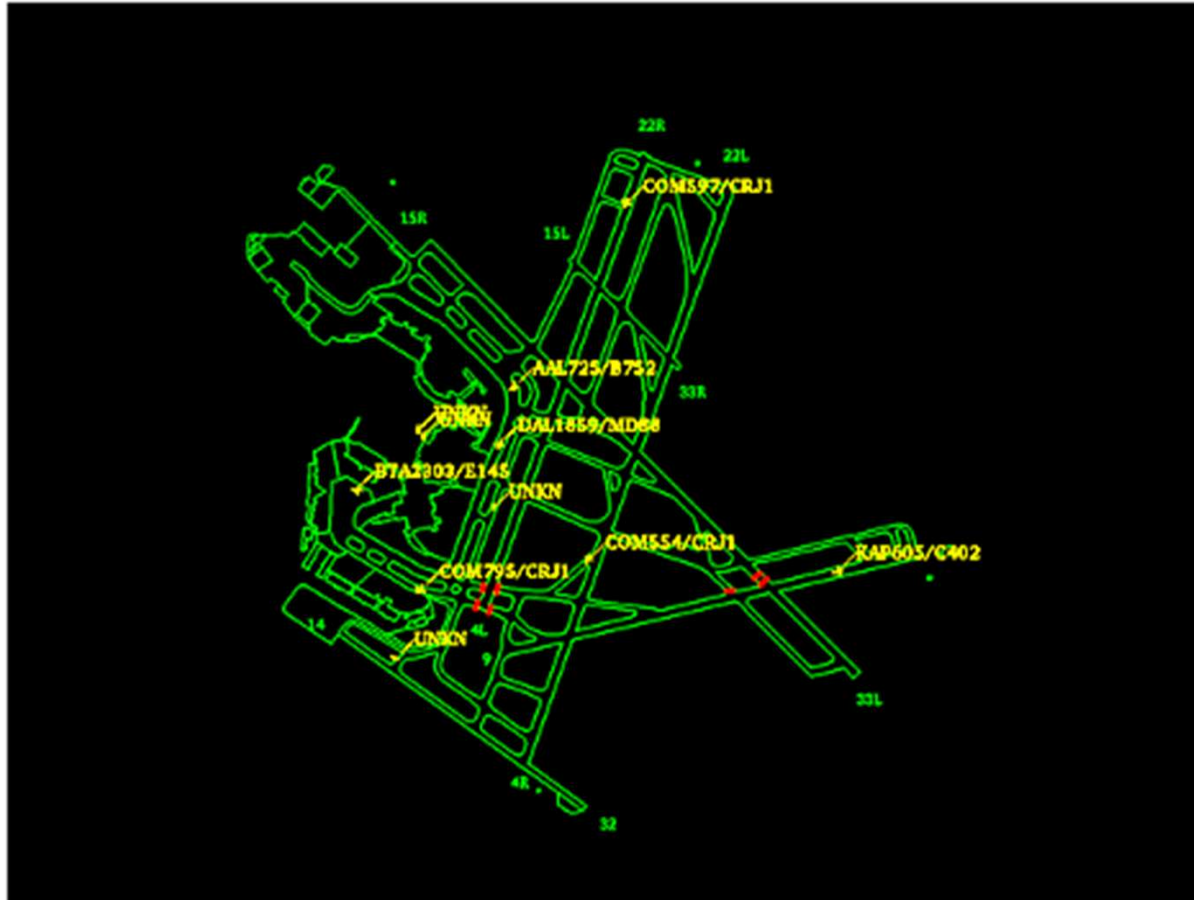
- Safety Risk Management Panel (SRMP) Oct 12, 2023
- Shadow Operations Jan - Mar 2024
- Pilot Outreach/Training Feb - Mar 2024
- Field Checkout/Test Readiness Review (TRR) Apr 2024
- ATC/Airport Operations Field Familiarization May 2024
- Test Readiness Decision (TRD) May 2024
- Operational Testing May 2024 - Sep 2025



Backup



RIPSA Maintenance Display



The Maintenance display will be located in the equipment shelter for system optimization and monitoring (BOS prototype display shown for reference)



Pilot/Vehicle Operator Procedures and Training



Pilot/Vehicle Operator Procedures

- **When RELs illuminate, the flight crew should remain clear of the runway.**
- **When cleared to takeoff, cross the runway, position and hold, or for immediate takeoff and RELs are illuminated, stop the aircraft and indicate to Air Traffic “Trans Air 123 stopped with red lights” and then wait for further clearance.**
- **If the aircraft crosses the hold line and the flight crew observes illuminated lights, then the flight crew should stop the airplane and notify ATC that “Trans Air 123 is stopped across the hold line because of red lights.”**
- **No new ATC procedures for RIPSA**



Key Points of Pilot / Vehicle Operator Training

- RELs indicate runway **status** only; they do not indicate clearance.
- Clearance will be provided verbally by ATC as under current procedures.
- When lights illuminate, the runway is unsafe to enter **or cross** and the pilots must stop immediately. Vehicle operators must also stop immediately unless directed otherwise by ATC to disregard the lights and cross.
- 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.



Pilot Information Sources

- **RIPSA information website**
- **Poster placed in pilot briefing rooms**
- **PowerPoint presentations**
- **Notices to Air Missions (NOTAMs)**
- **Articles published in AOPA, Private Pilot and other aviation related magazines**



RIPSA System Anomalies



Example of System Anomaly Requiring REL Shutoff

- **Controller issues clearance to enter or cross the runway.**
- **Pilot/vehicle operator responds that RELs are on.**
- **Controller responds with hold short instructions.**
- **Controller re-assesses the situation and determines the runway is safe to enter or cross.**
- **Controller asks the pilot/vehicle operator if the lights are still on.**
- **If lights are reported as still on, then RIPSA is malfunctioning - turn RELs off.**
- **Once lights are off, controller re-issues clearance or alternate instructions.**



Handling RIPSAs System Anomalies

- **If anomalies are impeding the flow of traffic, ATC will:**
 - Turn off the RELs using the manual shutoff switch
- **The system is returned to service by the RIPSAs test team after concurrence from ATC**
- **Unless the system is creating anomalies, it will remain on throughout the Operational Evaluation**
 - Operational Evaluation hours are TBD



RWSL System



Airport Surface Detection Equipment (ASDE-X)

- **Airport Surface Detection System — Model X (ASDE-X)** is an airport-wide surveillance system using radar, Multilateration, and satellite technology that allows air traffic controllers to track surface movement of aircraft and vehicles. It was developed to help reduce critical Category A and B runway incursions
- The ASDE-X alerts air traffic controllers of potential runway conflicts by providing detailed coverage of movement on runways and taxiways. By collecting data from a variety of sensors, ASDE-X is able to track non-transponder equipped and transponder equipped vehicles and aircraft on the airport movement area
- The data that ASDE-X uses comes from the following sources:
 - Surface surveillance radar located on top of the air traffic control tower and/or surface surveillance radar located on a remote tower
 - Multilateration sensors located around the airport
 - Airport Surveillance Radars such as the ASR-9
 - Automatic Dependent Surveillance-Broadcast (ADS-B) sensors
 - Terminal automation system to obtain flight plan data.



Runway Status Lights (RWSL)

- **Runway Status Lights is a fully automatic, advisory system designed to reduce the number and severity of runway incursions and prevent runway accidents while not interfering with airport operations. It is designed to be compatible with existing procedures and is comprised of Runway Entrance Lights (RELs) and Takeoff Hold Lights (THLs). ASDE-X surface surveillance is required for RWSL operation**
- **The FAA developed Runway Status Lights as part of an ongoing effort to explore new technologies. The system aims to improve aircrew and vehicle operator situational awareness through accurate and timely indications of runway usage**
- **Runway Status Lights tell pilots and vehicle operators to stop when runways are not safe. Embedded in the pavement of runways and taxiways, the lights automatically turn red when other traffic makes it dangerous to enter, cross, or begin takeoff. The lights provide direct, immediate alerts and require no input from controllers**



SAT Airport Diagram

