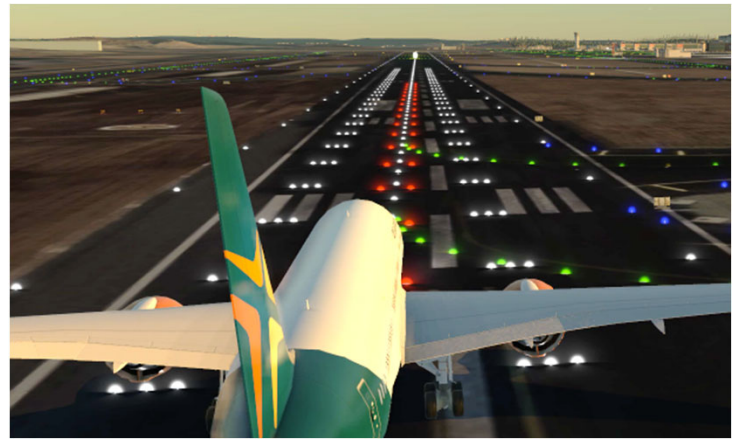


Runway Status Lights



System Overview

- The CORTEX SAFE-r Runway Status Lights (RWSL) system is a supplementary safety solution to an airport's core Airfield Ground Lighting (AGL) network
- The RWSL is an independent and autonomous solution providing additional situational awareness, above the standard Air Traffic Control (ATC) clearances without any intervention of ATC or impacting their operations of the airfield
- The RWSL system provides immediate awareness of runway occupancy intended to reduce the risk of incursions involving the incorrect presence of an aircraft, vehicle or person on the runway
- The system is **completely scalable** and can be tailored based on an airport's operations and 'hot spots' with greater risk of incursions.

Runway Incursion Safety Layer

The CORTEX SAFE-r system provides reliable automated light activation using our latest LINC 360 powerline carrier communication technology and Axon EQ LED airfield lighting fixtures to provide a safety layer to help reduce the chance of these common incursions:

- Incorrect entry of an aircraft or vehicle onto the runway protected area
- Incorrect runway crossing by an aircraft or vehicle
- Take-off prior to vacating aircraft clearing the runway
- Take-off while an aircraft or vehicle has incorrectly entered onto the runway

Mode of Operation

- The system can be used in any visibility condition and independently from the operational runway category
- A RWSL Control Panel is provided, however there is no need for ATC personnel to actively monitor the system
- Brightness intensity can be configured to follow day-twilight-night location parameters or synchronized with the stopbars
- The system can be switched OFF using a kill switch provided to the Air Traffic Controller to bypass the system and extinguish all red RWSL lights
- The system uses transponders along with surveillance tracks to determine the locations of aircraft, vehicles and people on the maneuvering areas
- The RWSL performs as an independent system, utilizing dedicated constant current regulators, AGL circuits, powerline controllers, computers, network fibers and communication devices

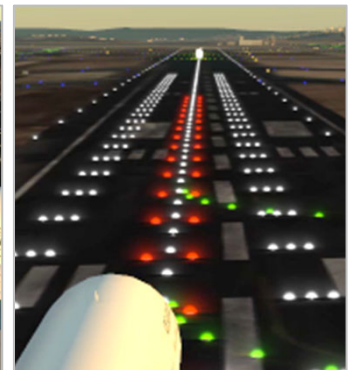
RWSL Philosophy

The CORTEX SAFE-r acquires traffic information from surface and approach surveillance systems via the airport's Multi Sensor Data Fusion (MSDF) system and automatically controls REL and THL airfield ground lighting directly without any intervention, immediately providing a visual warning of a potential unsafe condition.

The system uses our latest LINC 360 powerline carrier communication technology allow direct individual control and monitoring of the REL and THL airfield light fixtures.



Runway Entrance Lights



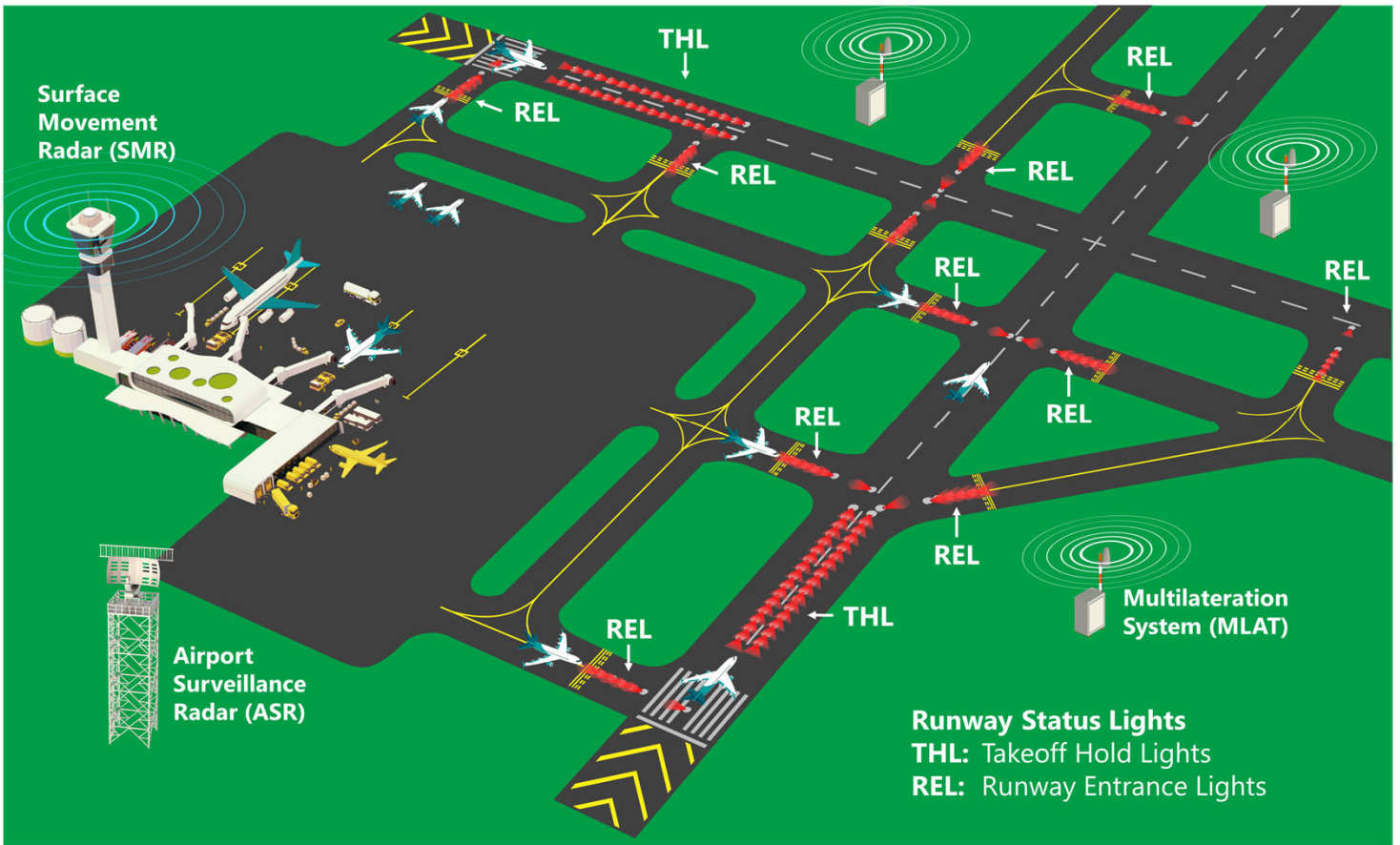
Takeoff Hold Lights

Runway Entrance Lights (REL)

- Series of red unidirectional in-pavement lights installed parallel to taxiway centerline lights from the hold line to the runway edge; one light is installed at the runway centerline
- Automatically illuminated via the surveillance information from the MSDF
- RELs illuminate if it is unsafe to enter or cross a runway
- RELs extinguished indicates safe to proceed after ATC clearance is given

Takeoff Hold Lights (THL)

- Series of red unidirectional in-pavement lights installed on each side of the runway centerline lights at hold points and at takeoff hold zones
- THLs extend in pairs, starting at 15m from beginning of the runway and continue every 30m for at least 450m
- Automatically illuminated via the surveillance information from the MSDF
- THLs illuminate when an aircraft is in position for departure and the runway is occupied by another aircraft, vehicle or person indicating it is unsafe to takeoff



SAFE-r System Components

The CORTEX SAFE-r RWSL is a fully integrated system that includes the RWSL safety logic, control logic and airfield ground lighting fixtures. Optionally, the surveillance equipment (surveillance sensors plus surveillance processor) can also be provided for a complete RWSL solution.

AxonEQ Lights

FAA certified fixtures that have been specifically designed for the RWSL application:

- The AXON EQ Runway Entrance Light Inset, 8" or 12", Certified in accordance with L-852S(L)
- The AXON EQ Takeoff Hold Light Inset, 8" or 12", Certified in accordance with L-850T(L)



LINC 360 Powerline Carrier Technology

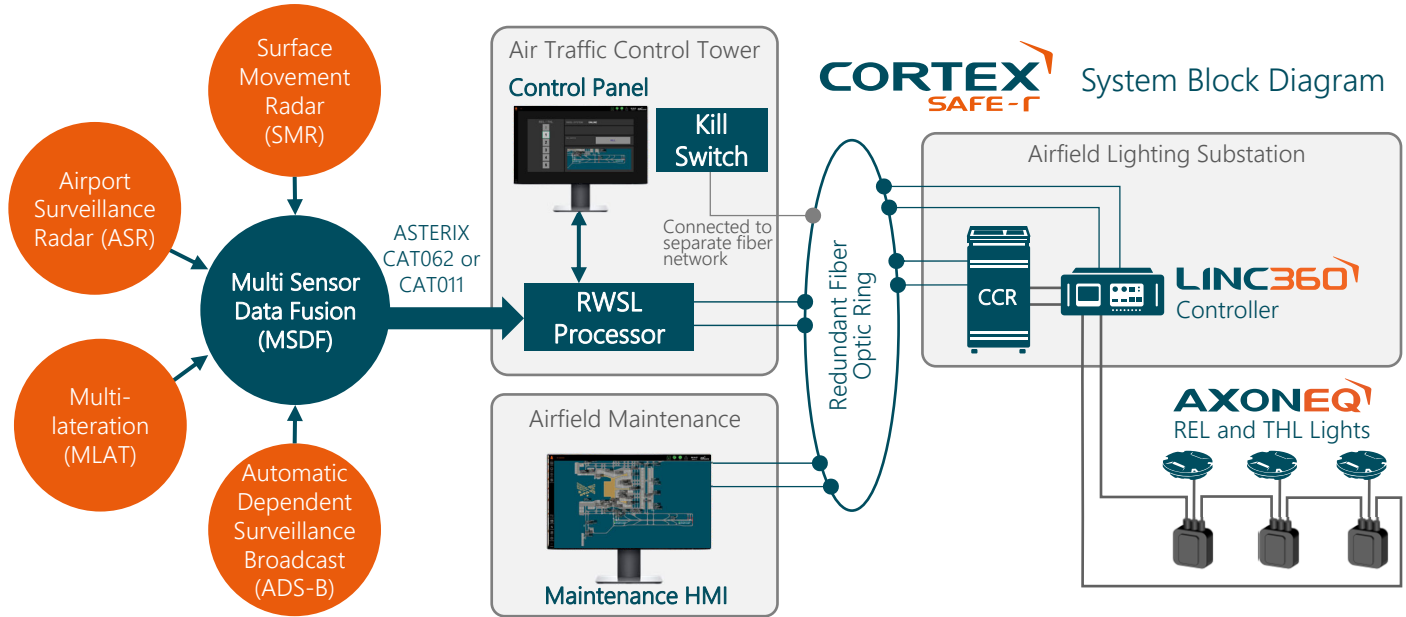
The most robust and high-performing powerline communication technology providing a real-time view of the airfield. The LINC 360 technology delivers immediate and precise control of the individual REL and THL fixtures with true two-way data transmission on the powerline (series circuit)



Multilateration System (MLAT) Options

The MLAT system can be either supplied by ADB SAFEGATE or we can interface with an airport's existing MLAT equipment.

- If providing new MLAT equipment, we can complete a surveillance coverage analysis to determine quantity and locations of the equipment.
- If interfacing to existing or other manufacturer's surveillance it must comply with related standards including Eurocae ED-87(Latest version), SMR surveillance compliance with ED-116 and MLAT surveillance compliance with ED-117A



SAFE-r Logical System Overview

The CORTEX SAFE-r system is a fully integrated system in which surveillance and sensor information is 'fused' or combined using a Multi Sensor Data Fusion (MSDF) to form a unified picture of the precise location and identification of aircraft and vehicles on an airfield.

Surveillance and Sensors

Airport's use multiple surveillance and sensor equipment to acquire information related to an aircraft or vehicle's identification, location, direction and speed including:

- **Surface Movement Radar (SMR)** – Detects and tracks the movement of objects on or near the surface of the airport, such as aircraft and vehicles (without transponder)
- **Airport Surveillance Radar (ASR)** – A secondary surveillance radar that works in conjunction with an aircraft or vehicle's transponder capable of calculating the aircraft direction and location in real-time
- **Multilateration (MLAT)** – Interrogation signals are transmitted by MLAT sensors, and an aircraft or vehicle's transponder will reply allowing the MLAT sensor to determine the aircraft or vehicle position
- **Automatic Dependent Surveillance Broadcast (ADS-B)** – The MLAT sensors can also receive and process aircraft GPA position from their ADS-B transmissions

Surveillance Data Standards

This 'data fused' surveillance information from the MSDF is exchanged with the CORTEX SAFE-r RWSL Processor using precise specifications established by EUROCONTROL. Our system supports the following standards:

- **EUROCONTROL CAT062** - Specification for Surveillance Data Exchange ASTERIX Part 9 Category 062, which describes the message structure for the transmission of System Track Data
- **EUROCONTROL CAT011** - Specification for Surveillance Data Exchange - Part 8 Category 011, which describes the message structure for the transmission of A-SMGCS surveillance and flight plan data, alerts, flight plan data update, hold bar status

RWSL Processor

The RWSL Processor receives the fused surveillance and sensor data from the MSDF and interfaces directly with the AGL Processor performing the following tasks:

- Determines required light intensity if manually changed at the RWSL Control Panel in the Air Traffic Control Tower
- Determines the on/off state of the REL and THL lights
- Sends on/off lighting commands to AGL Processor

RWSL Control Panel & Kill Switch

The RWSL Control Panel is installed in the ATCT, however no active control or monitoring of the system is needed by ATC personnel. Co-located with the control panel is a Kill Switch used to overrule the RWSL system and deactivate the RWSL CCR's and lights if needed.

Airfield Ground Lighting (AGL) Processor

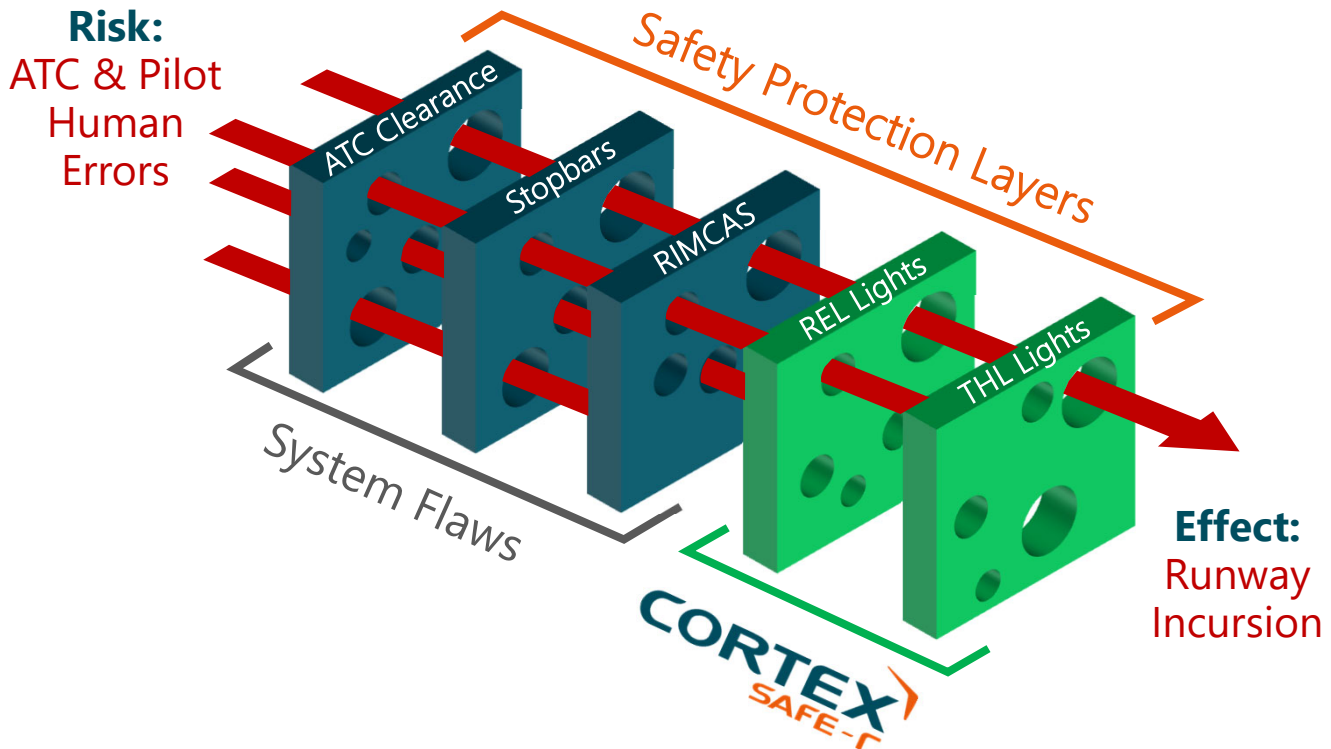
The AGL Processor receives the airfield lighting commands from the RWSL Processor and performs the following tasks:

- Sends REL and THL on/off control commands to the LINC 360 Controller
- Process feedback from the LINC360 controller regarding the status of REL and THL lights
- Sends brightness intensity changes to the constant current regulator (CCR)
- Transfers this status to the RWSL Control Panel and Maintenance HMI's

LINC 360 Controller

The LINC 360 receives the AGL Processor commands and executes the following tasks:

- Turns on/off the appropriate REL or THL lights
- Changes the brightness intensity of the CCR
- Receives status feedback from REL and THL lights and transmit to the AGL Processor



Enhancing an Airport's Safety Model

The CORTEX SAFE-r runway status lights system is designed to improve situational awareness for flight crew and airport vehicle drivers providing another layer of safety to an existing safety model. These RWSL safety layers operate without any human interaction mitigating the human factor risks.

Safety Protection Layers

The diagram above is an example of how airports have in place several layers of protection and alerting systems to help avoid incursion incidents including, but not limited to:

- **ATC Clearance:** An authorization by Air Traffic Control (ATC), for the purpose of preventing collision between known aircraft, for an aircraft to proceed under specified conditions within controlled airspace.
- **Stop bar:** A row of red, unidirectional, steady-burning in-pavement lights installed across an entire taxiway or runway, and elevated steady-burning red lights on each side. Stop bars were originally developed as a safety net to prevent traffic entering inadvertently an active runway and requires manual operation by ATC.
- **RIMCAS:** An incursion alerting system installed at airports around the world to protect and avoid incursions on runways and taxiways.

Additional SAFE-r Protection Layers

The SAFE-r system adds two (2) additional independent safety layers that work in conjunction with any airport safety model while running independently from other existing systems and processes in place:

- **REL Lights:** Autonomous visual indicator to pilots and vehicle drivers when it is unsafe to enter or cross a runway.
- **THL Lights:** Autonomous visual indicator to pilots that the runway is unsafe for takeoff.

For more information about the product, including manuals and certifications, please see the Product Center on the ADB SAFEGATE website: www.adbsafegate.com.

Product specifications may be subject to change, and specifications listed here are not binding. Confirm current specifications at time of order.