



IESALC | ILLUMINATING ENGINEERING SOCIETY of NORTH AMERICA
AVIATION LIGHTING COMMITTEE

IES Aviation Lighting Committee Fall Conference 2012
October 14-18 → St. Pete Beach, FL

ADVANCES IN AIRFIELD ELECTRICAL INSPECTIONS, MAINTENANCE AND MANAGEMENT USING THE LATEST GIS AND GPS TECHNOLOGIES

Date: October 17, 2012

Presented by: Alex Gertsen

Eagle Integrated Solutions – *Your Airfield
Solutions Partner*



Traffic Court



Global Positioning System (GPS)



Points of Discussion

- GPS as a Runway Safety Tool for Airfield Vehicle Operators
- FAA Research - Development of an Airport Ground Vehicle Runway Incursion Warning System (RIWS)
 - FAA Advisory Circular – AC-150/5210-25
- Airfield Electrical Inspections and Maintenance Management with GPS and GIS



Background on GPS

- Constellation of 24-32 orbiting satellites
 - Operated by US Air Force
 - Signal is free
- Around since 1970's
- 1983 - Korean Air Lines Flight 007
 - Becomes Available for Civilian Use
- 2000 – Selective Availability (SA) Discontinued
- Other Similar Systems:
 - Russian GLObal NAVigation Satellite System (GLONASS)
 - European Union - Galileo

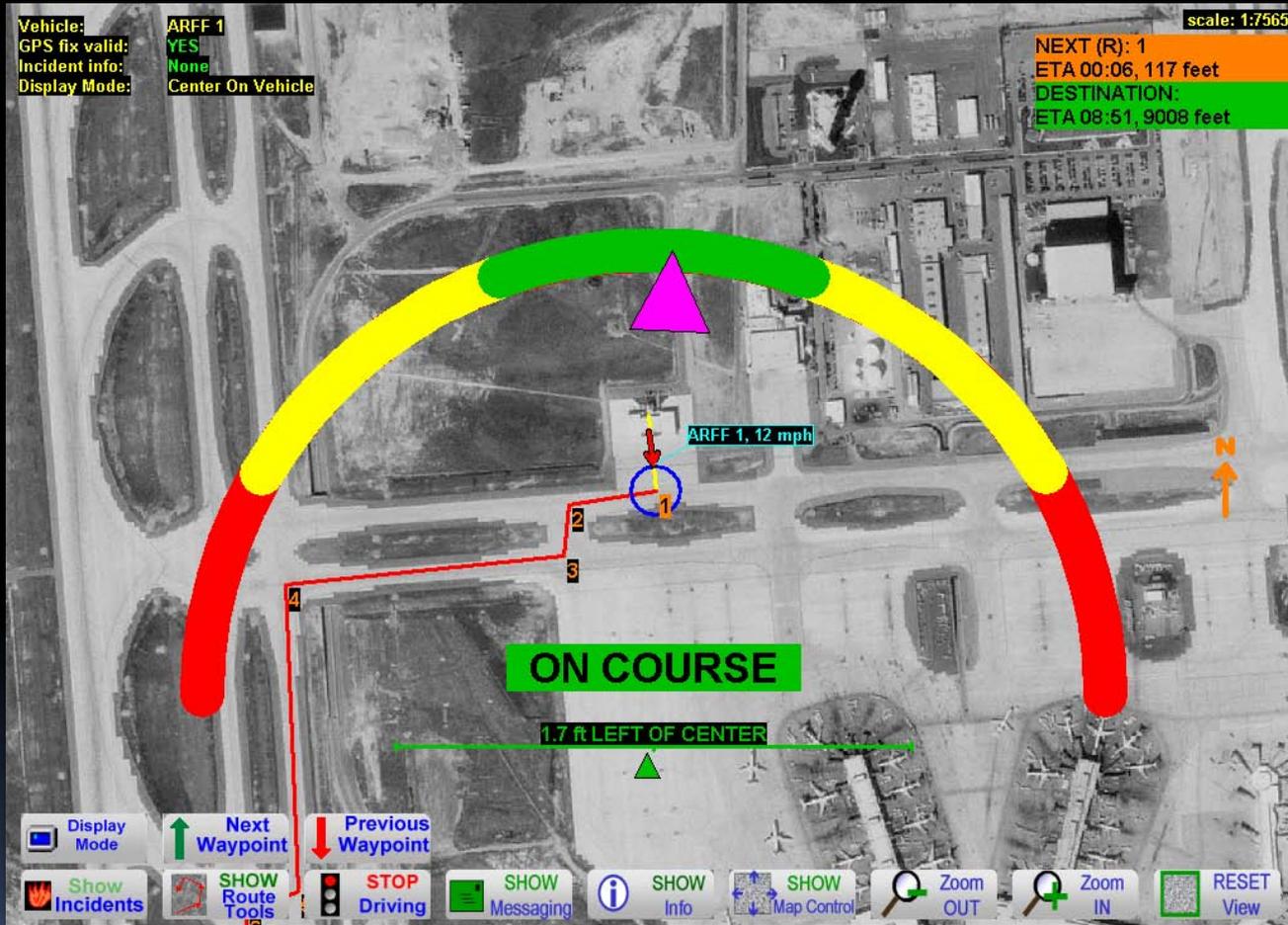


GPS as a Runway Safety Tool

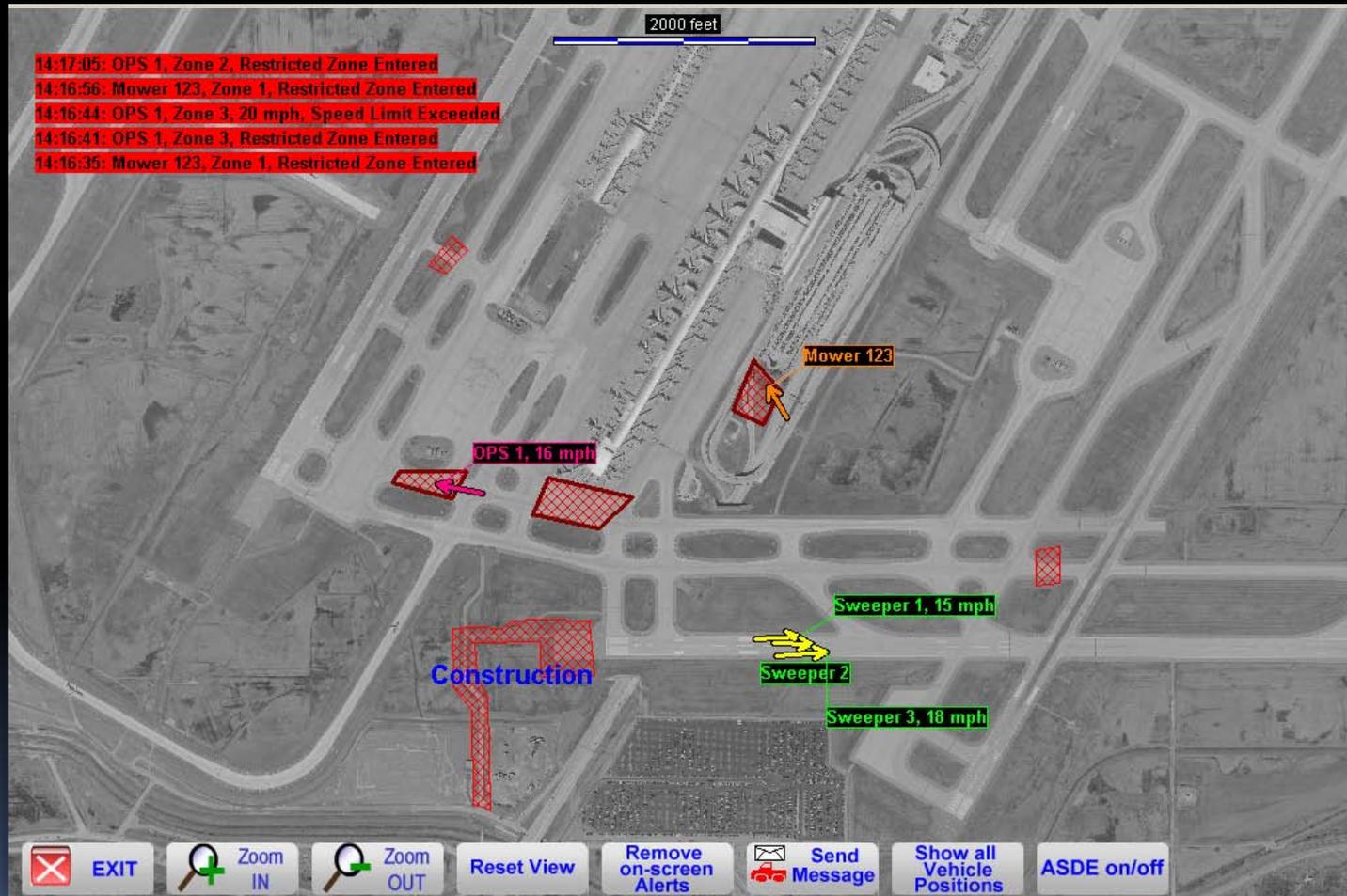
- Moving Map Display
 - Situational awareness for vehicle operator
 - Navigation assistance
 - Visual alerts
 - Audible alerts
- Airfield Display
 - Overall situational awareness of locations of vehicles and aircraft
 - Alerts on vehicle actions



Airfield Navigation - DEVS



Situational Display



GPS as a Runway Safety Tool?



GPS as a Runway Safety Tool?

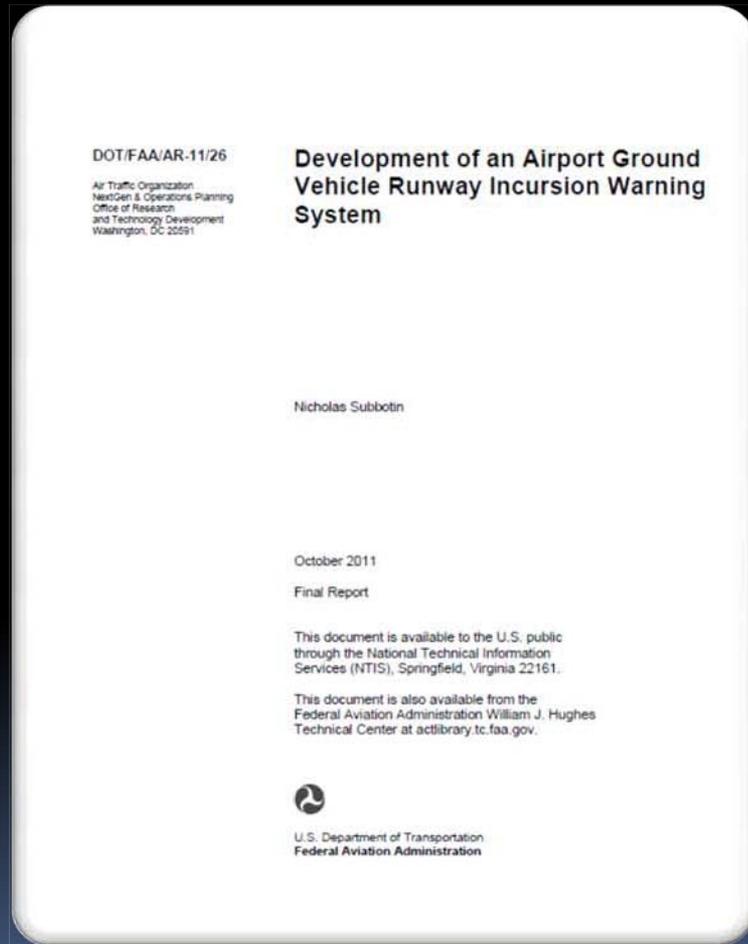


Airport Ground Vehicle Runway Incursion Warning System (RIWS)

- FAA to Evaluate Current Navigation Devices for Use in Airport Vehicles
 - Recommend Performance Criteria that Could Prevent Runway Incursions
 - Provide Criteria for Minimum and Optimal Features
 - Provide Cost Estimates for the Procurement of the Equipment



Airport Ground Vehicle Runway Incursion Warning System



- Evaluation conducted at the FAA William J. Hughes Technical Center located at the Atlantic City International Airport (ACY)
 - Nick Subbotin - Principal Researcher
- Final Report – October 2011

www.airporttech.tc.faa.gov/safety/downloads/



Airport Ground Vehicle Runway Incursion Warning System

I.D. Systems



Preconfigured

Team Eagle



Custom

Airport Ground Vehicle Runway Incursion Warning System (RIWS)

- RIWS System to Help Minimize Potential of Runway Incursions
 - Visual and Audible Proximity and Alert Area Warnings
 - Holding Position Markings
 - Runway Safety Areas (RSA)
 - ILS Critical Area
 - Precision Obstacle Free Zone (POFZ)
 - Movement Area
 - Custom Area
 - Intended to **Supplement** not Replace Airport Familiarity, Situational Awareness, and ATCT Instructions

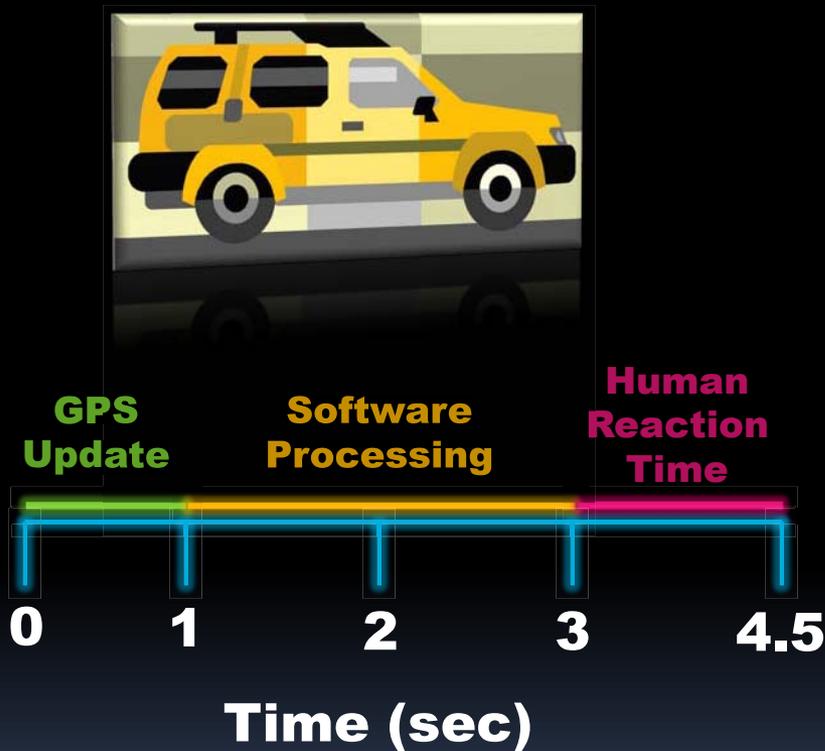


FAA Research

SPEED (mph)	SPEED (ft/sec)
10	15
20	30
30	44
40	59
50	74
60	88
70	103



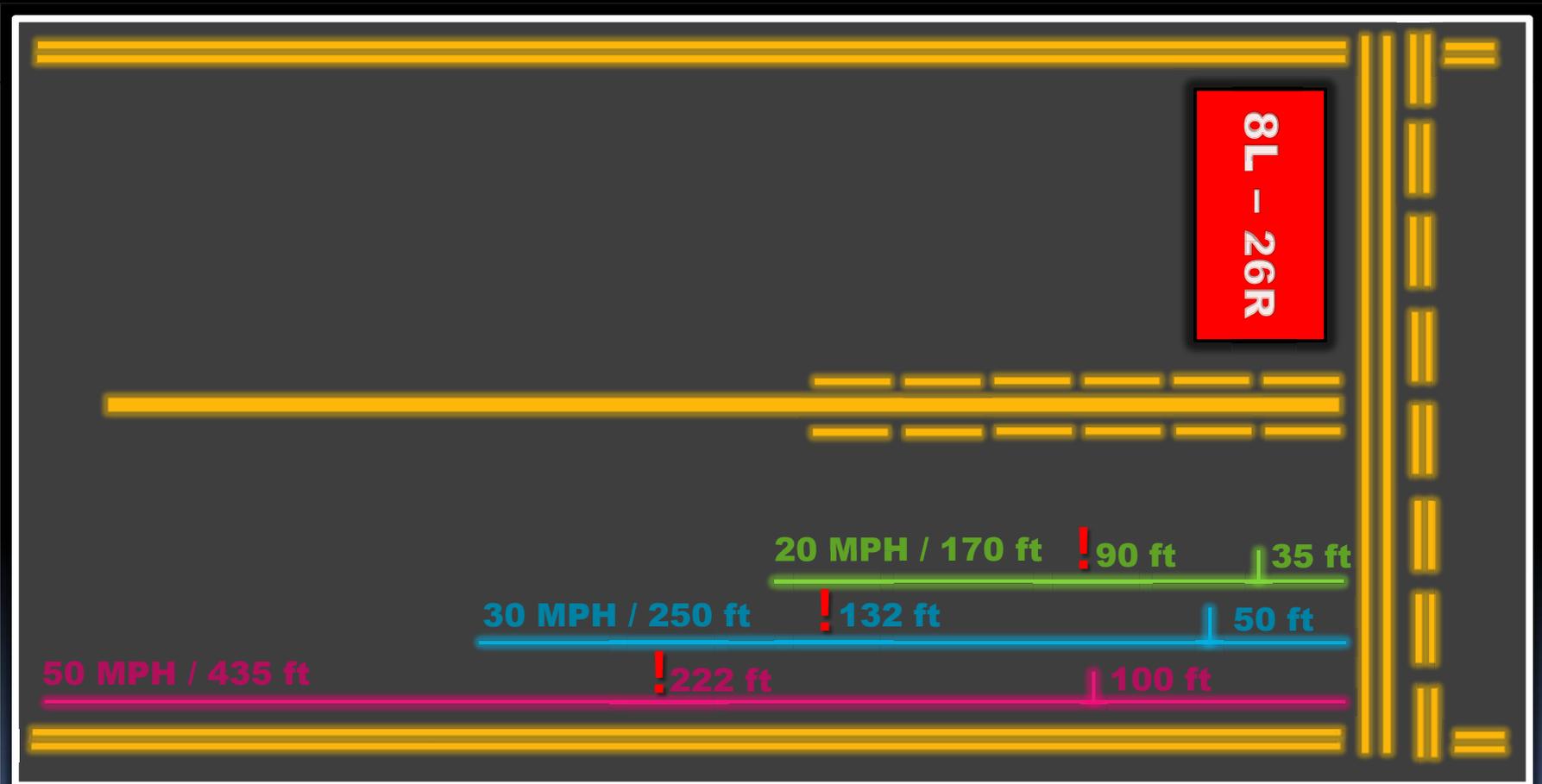
FAA Research Summary



SPEED	DISTANCE COVERED IN 4.5 SEC
10 mph	70 ft
20 mph	135 ft
30 mph	200 ft
40 mph	265 ft
50 mph	335 ft
60 mph	400 ft
70 mph	465 ft



Distance Traveled in 4.5 Seconds



FAA Advisory Circular 150/5210-25



U.S. Department
of Transportation

Federal Aviation
Administration

Advisory Circular

Subject: Performance Specification for Airport Vehicle Runway Incursion Warning Systems (RVWS) Date: 9/28/2012 AC No: 150/5210-25
Initiated by: AAS-100 Change:

1. What is the purpose of this advisory circular (AC)?

This advisory circular (AC) provides a performance specification for airport vehicle runway incursion warning system (RVWS) equipment.

2. What is the scope of this AC?

This AC contains minimum performance specifications for systems and equipment airports use to provide a warning to drivers on an airfield about a potential runway incursion. This AC discusses two types of detection systems: a preconfigured, commercial off the shelf (COTS) system; and a system with custom hardware and software.

3. To whom does this AC apply?

The Federal Aviation Administration (FAA) recommends the guidance and specifications in this AC for procuring airport runway incursion warning system equipment. In general, use of this AC is not mandatory. However, it is mandatory for all equipment acquired through the Airport Improvement Program (AIP) or the Passenger Facility Charge (PFC) Program. See Grant Assurance No. 34, Policies, Standards, and Specifications, and PFC Assurance No. 9, Standards and Specifications. See http://www.faa.gov/airports/aip/grant_assurances/ for additional information about grant assurances.

4. Are there any related documents?

a. FAA ACs. Refer to the most recent version of the following ACs:

<u>AC 150/5210-5</u>	<u>Painting, Marking, and Lighting of Vehicles Used on an Airport</u>
<u>AC 150/5210-19</u>	<u>Driver's Enhanced Vision System (DEVS)</u>
<u>AC 150/5210-20</u>	<u>Ground Vehicle Operations on Airports</u>
<u>AC 150/5220-23</u>	<u>Frangible Connections</u>
<u>AC 150/5220-26</u>	<u>Airport Ground Vehicle Automatic Dependent Surveillance-Broadcast (ADS-B) Out Squitter Equipment</u>
<u>AC 150/5300-13</u>	<u>Airport Design</u>
<u>AC 150/5340-1</u>	<u>Standards for Airport Markings</u>
<u>AC 150/5340-18</u>	<u>Standards for Airport Sign Systems</u>
<u>AC 150/5340-30</u>	<u>Design and Installation Details for Airport Visual Aids</u>

- Provides Minimum Operational Performance Specifications
- Culmination of research and evaluation at the William J. Hughes FAA Technical Center
- Released September 2012

www.faa.gov/airports/resources/advisory_circulars/



Airport Ground Vehicle Runway Incursion Warning System – Alerting Functionality

- Accuracy <10 feet (3 meters) 95% of the time
 - Minimum 1 Second Update
- Proximity warning traveling 0-10 mph
 - 20 ft Either Side Receiver Location
 - Minimum 60 ft in Advance of the Vehicle's Direction of Movement
- Over 10 mph
 - Warning Increases 6 ft in for Every 1 mph Increase in Speed



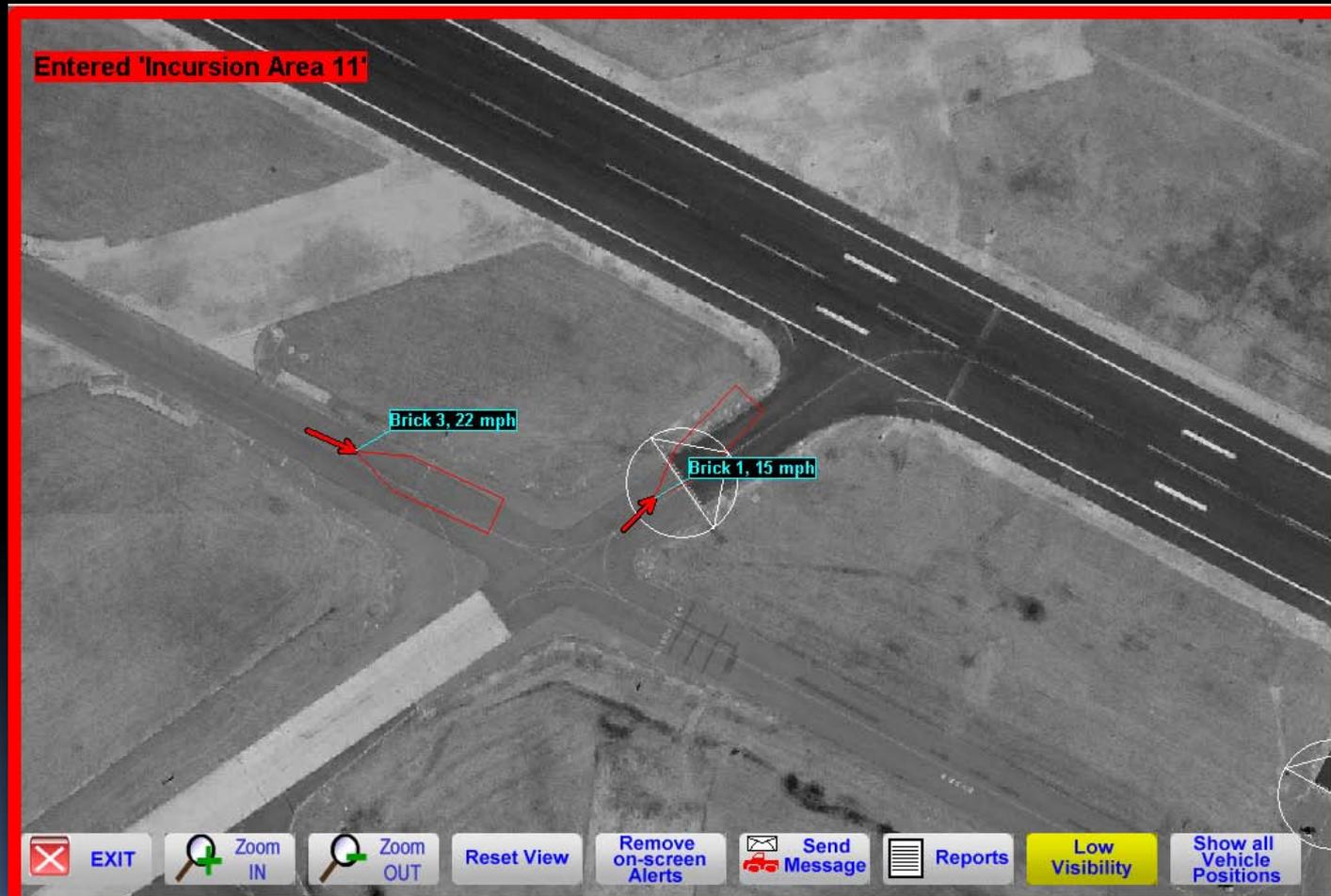
Airport Ground Vehicle Runway Incursion Warning System – Alerting Functionality

FAA Recommended Proximity Alert Trigger Distances

Speed	Proximity Alert Distance
0-10 mph	60 ft
20 mph	120 ft
30 mph	180 ft
40 mph	240 ft
50 mph	300 ft
60 mph	360 ft

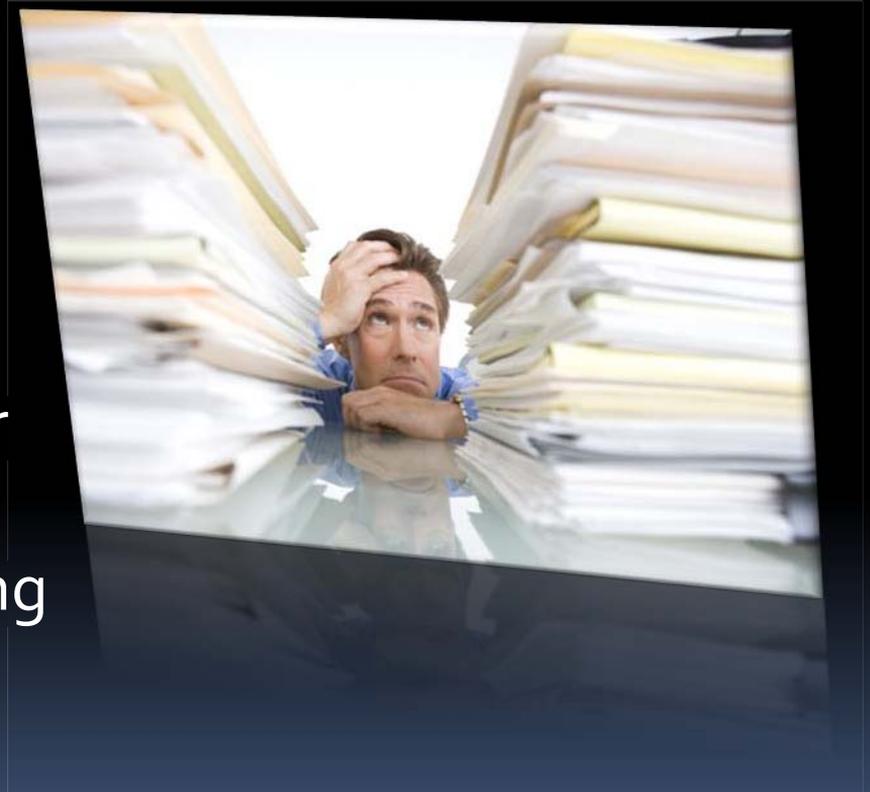


Situational Awareness in the Cabin of a Vehicle



Part 139 - Electronic Airfield Inspections and Work Orders

- FAA Part 139 Requirements
 - Airfield Self-Inspections
 - Lighting/Electrical Inspections
 - Discrepancy / Work Order Tracking
 - 12 Months Record Keeping
- Most airports today rely solely on paper



Part 139 - Electronic Airfield Inspections and Work Orders

- Electronic solutions to Part 139 Challenges
 - Make the paper form electronic
 - Word, Excel, PDF Editable Form
 - Create a database to track discrepancies
 - Develop a web-based tool
 - Utilize the power of GIS coupled with GPS



Part 139 - Electronic Airfield Inspections and Work Orders

- GPS/GIS as a Part 139 Solution
 - In the field and at the desk solution
 - Accuracy of discrepancy locations (GPS assist)
 - Situational awareness for the inspector/maintenance vehicle operator
 - Information sharing across Operations, Maintenance, ARFF, and other departments and stakeholders
 - **Ability to capture, record, and analyze Part 139 data geospatially**



Part 139 - Electronic Airfield Inspections Architecture



Part 139 - Electronic Airfield Inspections and Work Orders

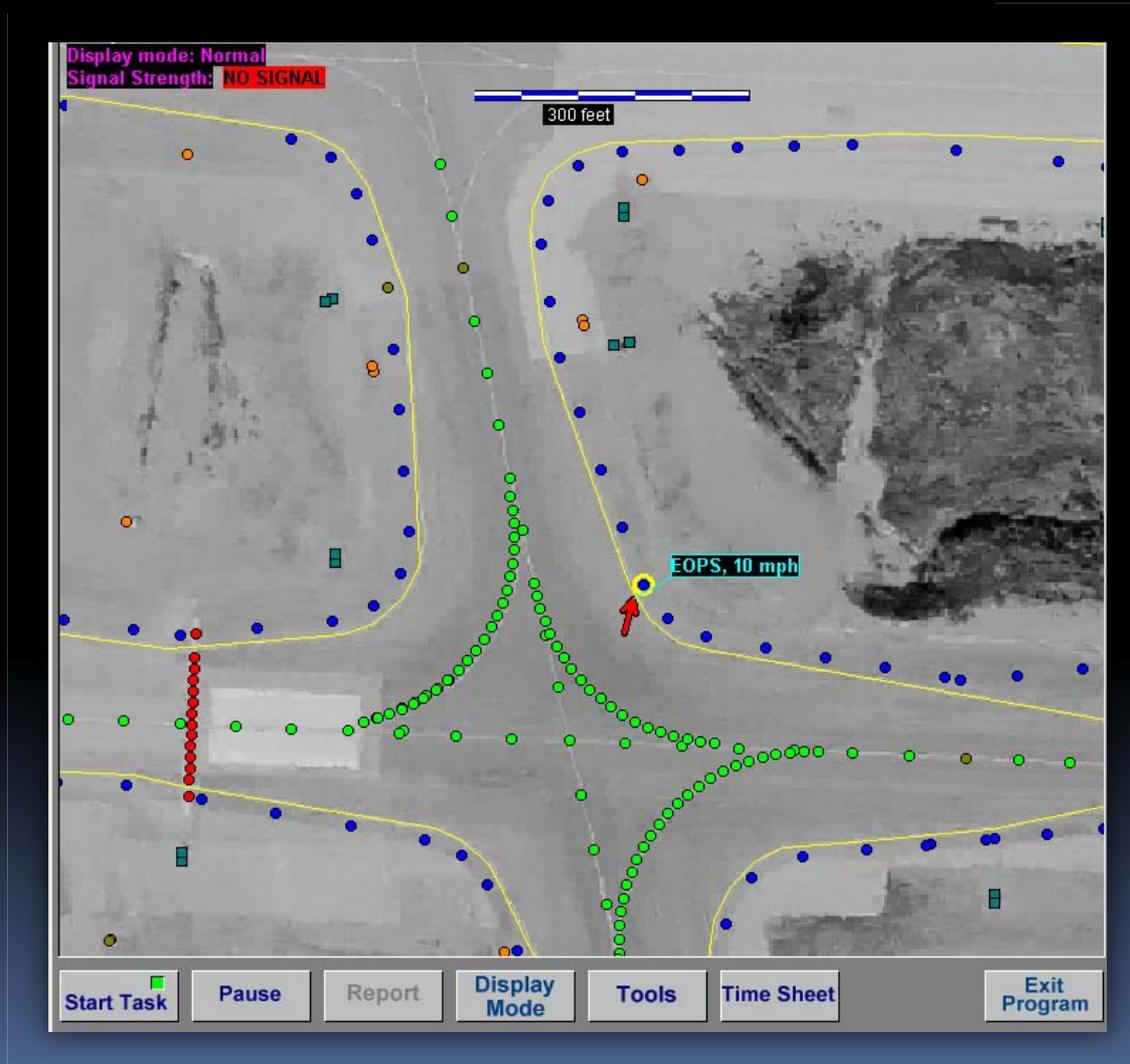
- Going paperless is a true paradigm changer for both airports and the FAA
 - Must bridge generational computer gap
 - Adapt new processes and procedures
 - Standardize data collection and reporting across airports nationwide



Part 139 - Electronic Airfield Inspections and Work Orders



Part 139 - Electronic Airfield Inspections and Work Orders



Electrical Inspections

Display mode: Normal

International Airport Authority Ottawa / Administration de l'aéroport international Ottawa

Wednesday, October 17, 07:42
Incursion Area's: 0
Current Discrepancies: 1
Vehicle Location: Runway 07-25

Light Identifier: RWY_07-25_022
Light Type: L850W
Color: White
Location: Runway 07-25

Selected Light (Yellow circle)
Repaired Light (Green circle)
Defective Light (Red circle)
Closest Sign (Cyan circle)

Stop Task Report Display Mode Tools Quick Report Exit Program



Electrical Inspections

Display mode: Normal

International Airport Authority Ottawa / Administration de l'aéroport international

Wednesday, October 17, 07:43
Incursion Area's: 0
Current Discrepancies: 1
Vehicle Location: Runway 07-25

Mark Discrepancy
Light Identifier: RWY_07-25_022
Fault Type: Burned
Inspection Notes: Replace bulb
 Clear Discrepancy
OK Cancel

Light Identifier: RWY_07-25_022
Light Type: LB50W
Color: White
Location: Runway 07-25

Selected Light (Yellow circle)
Defective Light (Red square)
Repaired Light (Green circle)
Closest Sign (Cyan circle)

Stop Task Report Display Mode Tools Quick Report Exit Program

Reset

Navigation buttons: Up, Down, Left, Right, Magnifying Glass (+), Magnifying Glass (-)



Electrical Inspections

The screenshot displays a software interface for airfield inspections. At the top, a header identifies the location as "SAN ANTONIO INTERNATIONAL AIRPORT" and the activity as "Airfield Inspection". A search bar contains "Taxiway N". A central window titled "Add Images" shows a list of attached images: "Taxiway Edge Light Close-up.JPG" and "Taxiway Edge Light.JPG". The main image area displays a photograph of a yellow taxiway edge light with a blue dome on a cracked asphalt surface. Navigation buttons include "Add", "Remove", "Close", "<< Previous", and "Next >>". A sidebar on the right lists discrepancy types: "14 CFR Part 139 Discrepancy", "139 Discrepancy", "Electrical Discrepancy", "Open Discrepancy", "Repaired Discrepancy", and "Accepted w Conditions". Below this are buttons for "Measure" and "Excursion Areas". At the bottom, there are buttons for "SEARCH", "Mark Discrepancy at Vehicle", "Exit Program", "Cancel", "Save", and a set of directional arrows (up, down, left, right) along with "Reset" and magnifying glass icons.



Electrical Inspections

AIROps

CONTACT MAINTENANCE SERVICES

Type of Inspection: CAT III/SMGCS Inspection

Generator Running? Yes No

Red Lights On? Yes No

Total:

Centerlines: 21 + -

Touch Down Zone:

Left: 3 + -

Right: 2 + -

Edge Lights: 2 + -

Cat III/SMGCS

Elevated Guard Lights: 0 + -

In Ground Guard Lights: 0 + -

SMGCS Area Clear? Yes No

Outage Limits

Centerline - 18 Touchdown Zone - 9 Edge Lights - 9

Back Save

Exit Program

PTAA
PIEDMONT TRIAD
AIRPORT AUTHORITY

Reset



Electrical Inspections

Current Discrepancies

Report Show Discrepancies with the following Status

Open
 Repaired
 Accepted w Conditions
 Rejected
 Closed
 All

Date	Location	Light Type	Fault Type	Discrepancy Status
2011/02/25	Runway 12R-30L	Runway Centerline	Not Working	Open
2011/02/24	Taxiway G	Taxiway Centerline	Damaged or Brok.	Closed
2011/02/24	Taxiway G	Taxiway Edge	Damaged or Brok.	Closed
2011/02/24	Terminal 2 Apron	Taxiway Edge	Not Working	Closed
2011/02/24	Taxiway Z	Windsock	Not Working	Closed
2011/02/24	Airfield	Sign Uni-Direction..	Not Working	Closed
2011/02/24	Runway 03-21	Runway Centerline	Not Working	Open
2011/02/24	Taxiway G	Taxiway Centerline	Not Working	Closed
2011/02/23	Taxiway H	Taxiway Edge	Not Working	Open
2011/02/23	Taxiway N	Taxiway Edge	Not Working	Open
2011/02/23	Taxiway RC	Taxiway Edge		Closed

Fault Type:
 Mark Repaired

Action Taken:
 Reopen Discrepancy

Notes:
 Accepted With Conditions

Rejected

Close Discrepancy



Electrical Inspections

The screenshot displays a software application window titled "Light Type: Runway Centerline (Unknown)". The main area shows a technical drawing of a runway with a grid of light points. A red dot on the grid is labeled "Not Working" with a green arrow pointing to it. A text box above the drawing indicates "Failure Date: 2011/02/25".

On the left side, there is a table with the following columns: "Inst", "Date", "Fault", "Action", and "Note". The "Date" column contains a list of dates from 2011/01/20 to 2011/02/20.

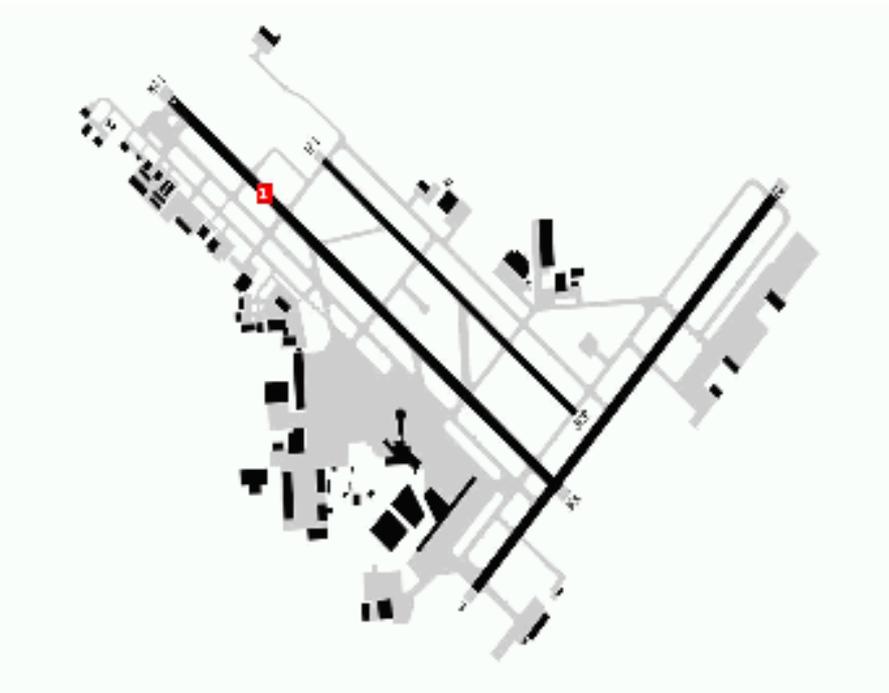
On the right side, there are control buttons: "Print", "Zoom" (with radio buttons for "In", "Normal", and "Out"), and "Close".



Electrical Inspections

Inspection Report

Done On:
2011/02/25



Details:

Map #	Location	Light Type	Fault Type	Comments	Repair User	Repair Date	Acc W Cond Date	Close User	Close Date
1	Runway 12R-30L	Runway Centerline	Not Working	CL out					

Printed On: Wednesday, October 17, 2012

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Electrical Inspections

ElectricalOps Pro - Summary Reports

Inspection Date (YYYY-MM-DD)	Inspe	Repaired	Open/Unresolved
2011-02-25 01:22 AM	E	0	1
2011-02-24 20:36 PM	E	0	0
2011-02-24 01:28 AM	E	0	1
2011-02-23 21:05 PM	E	0	4
2011-02-23 10:30 AM	E	13	13
2011-02-23 03:20 AM	E	0	9

Report Wizard - Fault Type

Filter By Fault Type

Select All Clear All

- Damaged or Broken
- Not Working
- Cable cut/broken
- Damage - post/pole
- Fixture Missing

Help << Back Next >> Cancel



Electrical Inspections



Summary Report

Problems - All
 Filtered By: Fault Type
 Grouped by: Fault Type
 Sorted by: Date

	Date	Location	Action Taken	Light Type	Status	Repair User	Repair Date	Acc W Cond Date	Close User	Close Date
Fault Type: Damaged or Broken										
1	23 Feb 2011	Runway 12R-30L	Relamp	Runway	Closed					
2	23 Feb 2011	Runway 12R-30L	Relamp	Runway	Closed					
3	23 Feb 2011	Runway 12R-30L	Relamp	Taxiway	Closed					
4	23 Feb 2011	Taxiway G	Relamp	Taxiway	Closed		23 Feb 2011			
5	23 Feb 2011	Runway 03-21	Relamp	Runway	Open					
6	23 Feb 2011	Runway 03-21	Relamp	Runway	Open					
7	23 Feb 2011	Runway 03-21	Relamp	Runway	Open					
8	23 Feb 2011	Runway 12R-30L	Relamp	Runway	Closed					
9	23 Feb 2011	Runway 12R-30L	Relamp	Runway	Closed					
10	23 Feb 2011	General Airfield	Relamp	Taxiway	Open					
11	23 Feb 2011	General Airfield	Relamp	Sign	Closed					
12	23 Feb 2011	Runway 12R-30L	Relamp	Runway	Repaired					
13	23 Feb 2011	Runway 12R-30L	Relamp	Runway	Repaired					
14	23 Feb 2011	Runway 12R-30L	Relamp	Runway	Repaired					
15	23 Feb 2011	Runway 12R-30L	Relamp	Runway	Repaired					
16	23 Feb 2011	Taxiway G	Relamp	Taxiway	Closed					
17	23 Feb 2011	Runway 12R-30L	Relamp	Taxiway	Repaired					
18	23 Feb 2011	General Airfield	Relamp	Sign	Closed					
19	24 Feb 2011	Taxiway G	Relamp	Taxiway	Closed					

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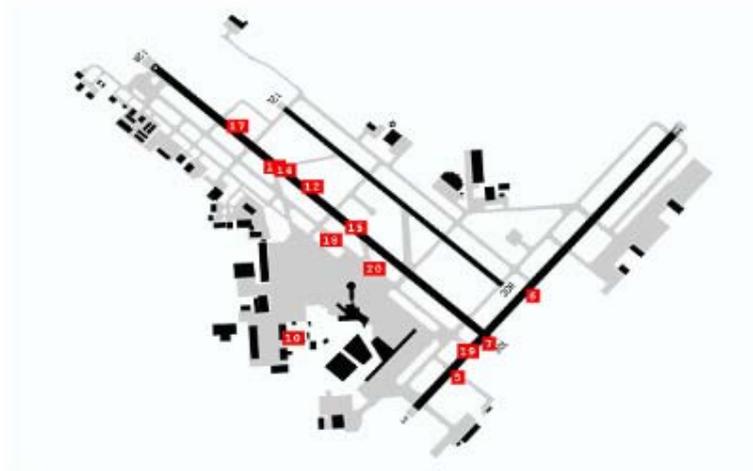
Electrical Inspections



Summary Report

Problems - All
Filtered By: Fault Type
Grouped by: Fault Type
Sorted by: Date

Date	Location	Action Taken	Light Type	Status	Repair User	Repair Date	Acc W Cond Date	Close User	Close Date
20	24 Feb 2011	Taxiway G	Relamp	Taxiway	Closed				



Print Date: Wednesday, October 17, 2012

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AVIATION LIGHTING COMMITTEE

Thank You!



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