



Optimization of Inspection for Low-Visibility Lighting System

(A collaborative project between GTAA, C-MORE
and Team Eagle)

Toronto Pearson Facts & Figures

- 85,000 people/day
- 4th largest entry point into North America
- Ability to handle more than 38 million per year
- 6666 low-visibility centerline lights

Project Scope

- Can GTAA optimize the low-visibility lighting system inspection program without materially reducing safety, reliability and compliance?
- Do we have any data?
- How to analyze the data?

Electrical Ops Pro (Team Eagle)





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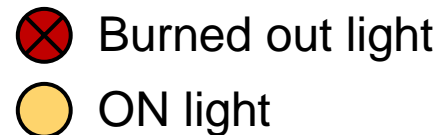
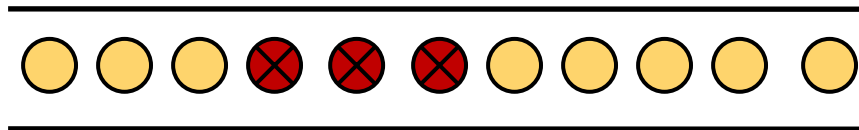
Neil Montgomery

William Luff

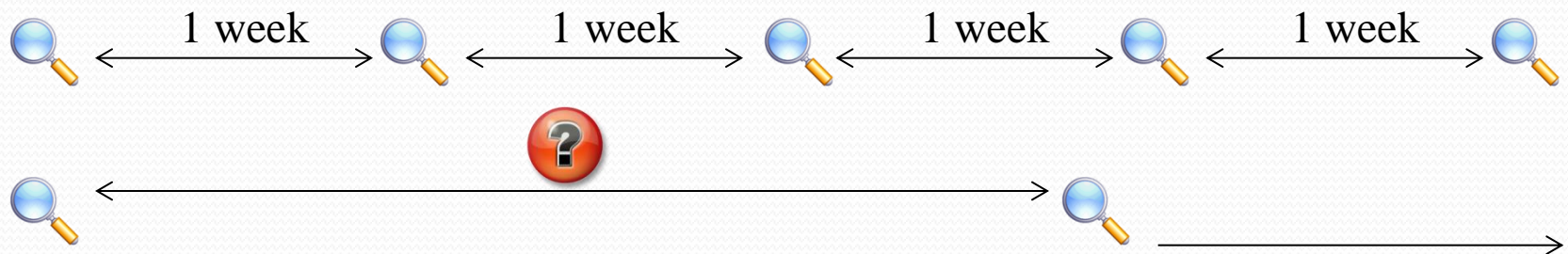
Operational Standards

The operational standards published by Transport Canada required the Canadian airports to:

- 1 Have less than 5% faulty centerline lights
- 2 Not to have more than 2 faulty centerline lights in a row

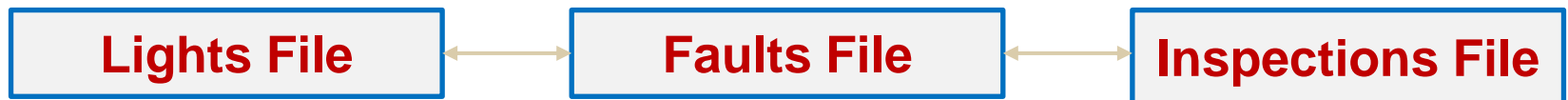


To **minimize** the total cost of inspection of centerline lights by **optimizing** their inspection interval while **complying** with the Transport Canada's regulations



Database Management System

The data in the Excel file are used to create and organize Lights file, Inspection file and Faults file.



Create Database

Database Challenges

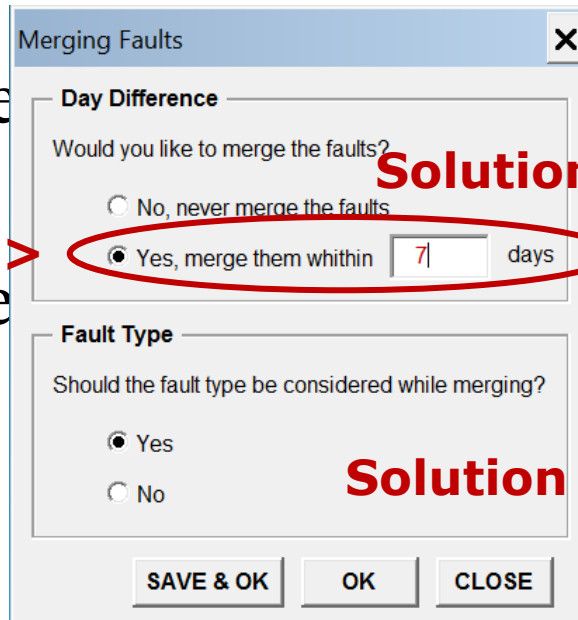
Repeated faults

- Unidentified

Solution >

- Incomplete before 2007

Solution >



Merging Faults

Day Difference

Would you like to merge the faults?

☐ No, never merge the faults

☒ Yes, merge them within days

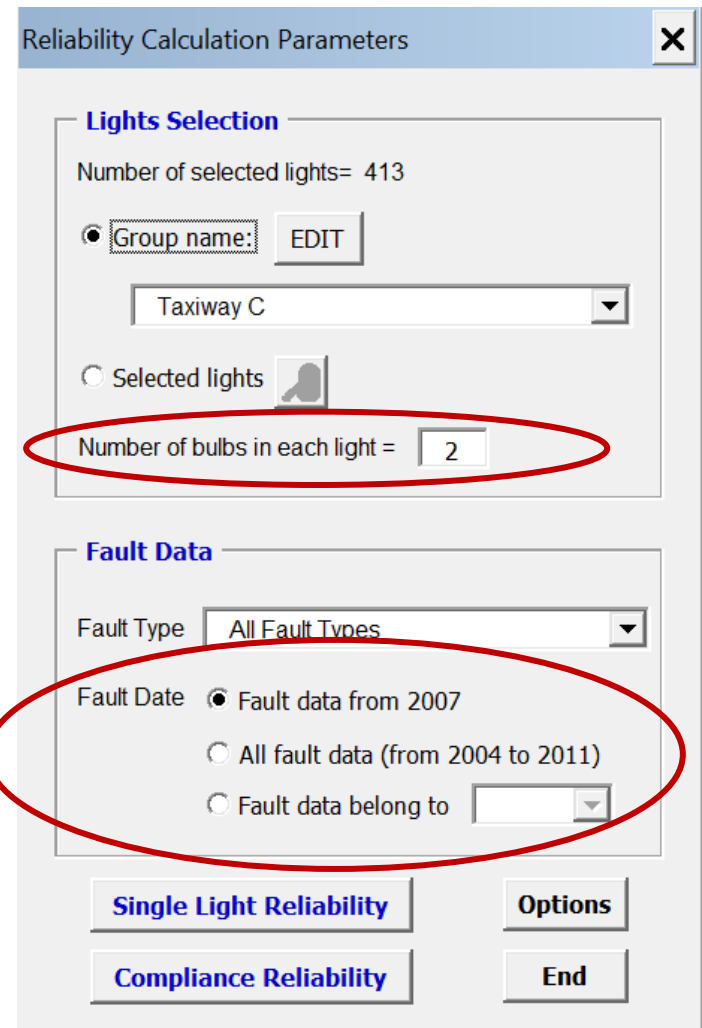
Fault Type

Should the fault type be considered while merging?

☒ Yes

☐ No

SAVE & OK OK CLOSE




Reliability Calculation Parameters

Lights Selection

Number of selected lights= 413

☒ Group name: EDIT

☐ Selected lights 

Number of bulbs in each light =

Fault Data

Fault Type

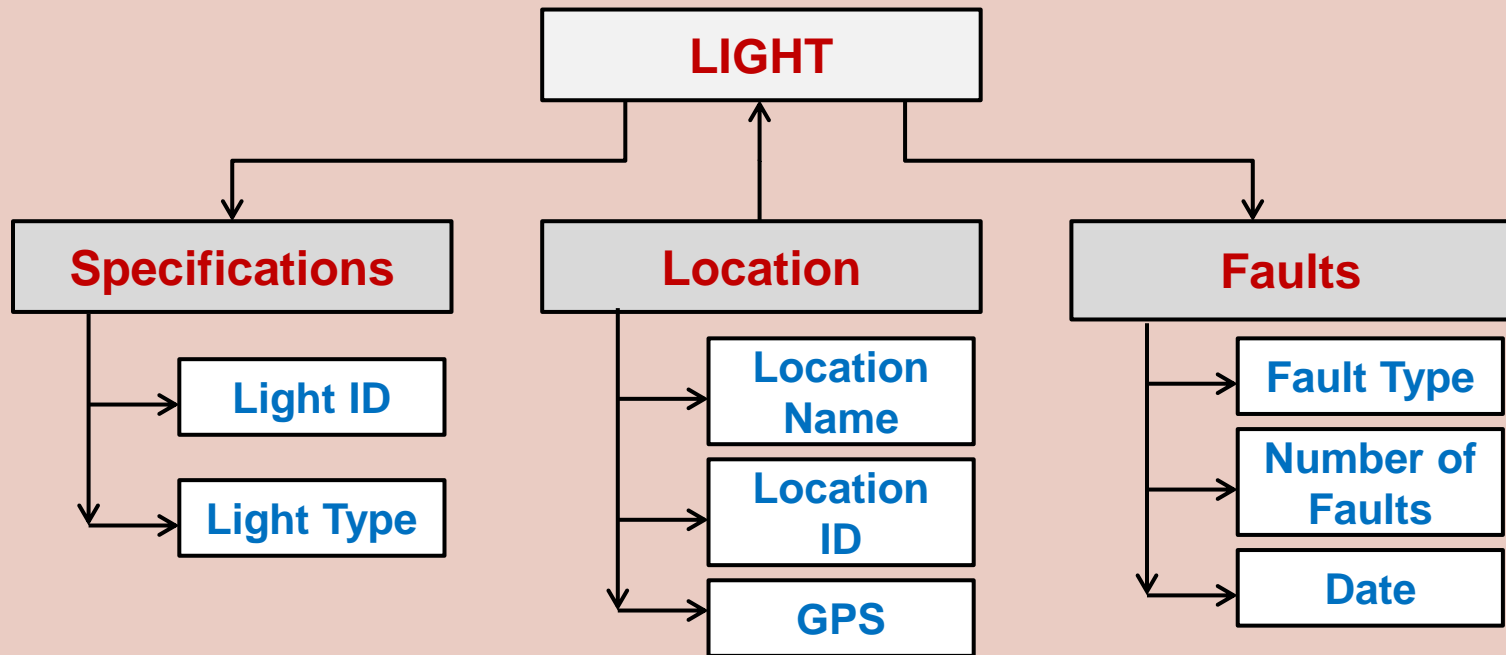
Fault Date ☒ Fault data from 2007

☐ All fault data (from 2004 to 2011)

☐ Fault data belong to

Single Light Reliability Compliance Reliability Options End

Lights



Example



Enter light ID

1234



Compliance Reliability

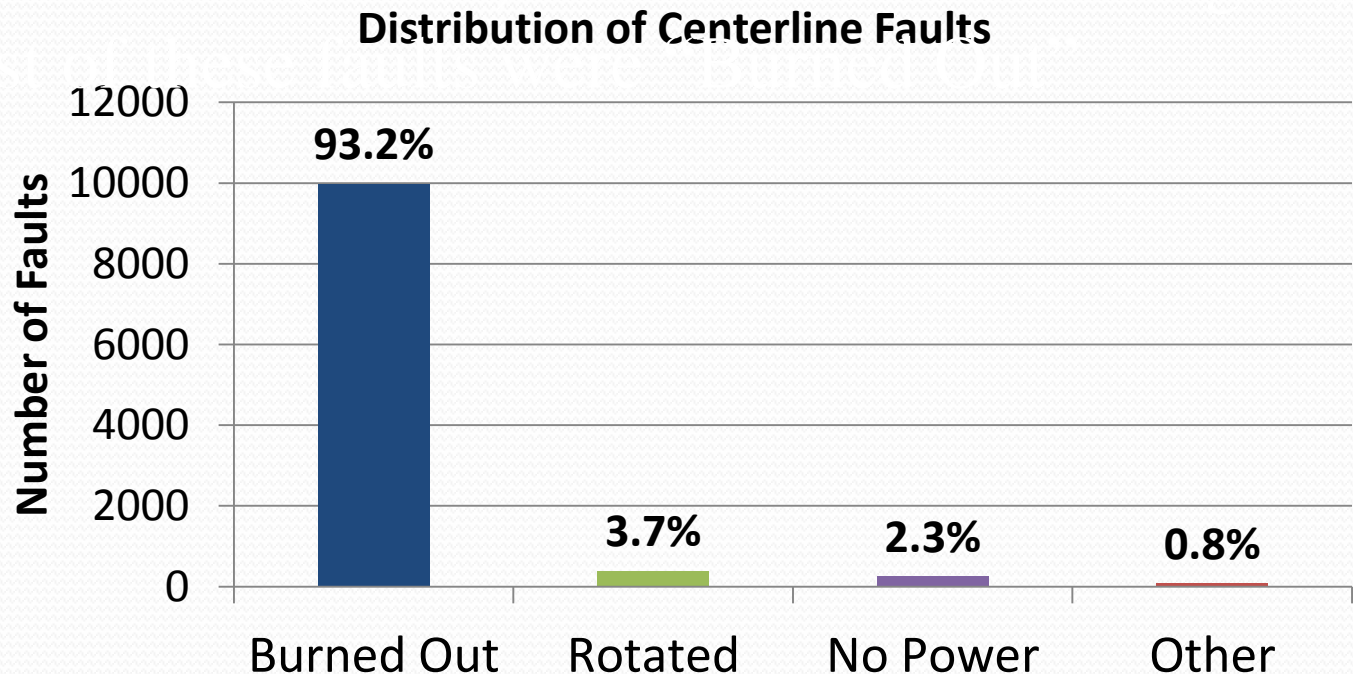
Definition: Compliance reliability of a group of lights is defined as the **yearly probability** of fulfilling the operational standards established by Transport Canada.

Note: Compliance reliability is a function of:

- ① Number of Lights
- ② Single Light Reliability
- ③ Operational Standards

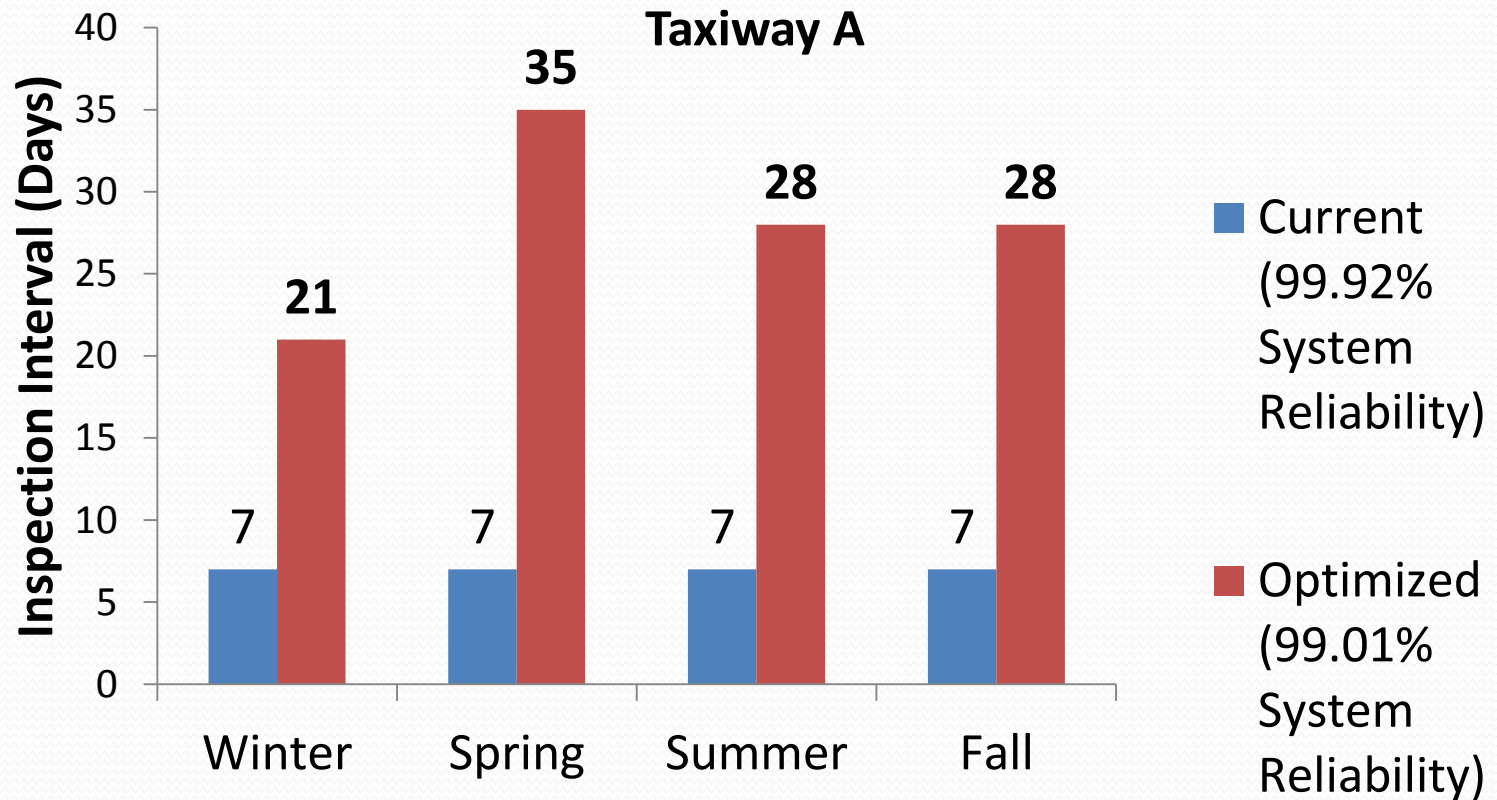
FAULT TYPES

Most faults (>90%) were of centerline lights, and most of these faults were “Burned Out”



OPTIMIZED INSPECTION INTERVAL

Minimum level of system reliability: 99%

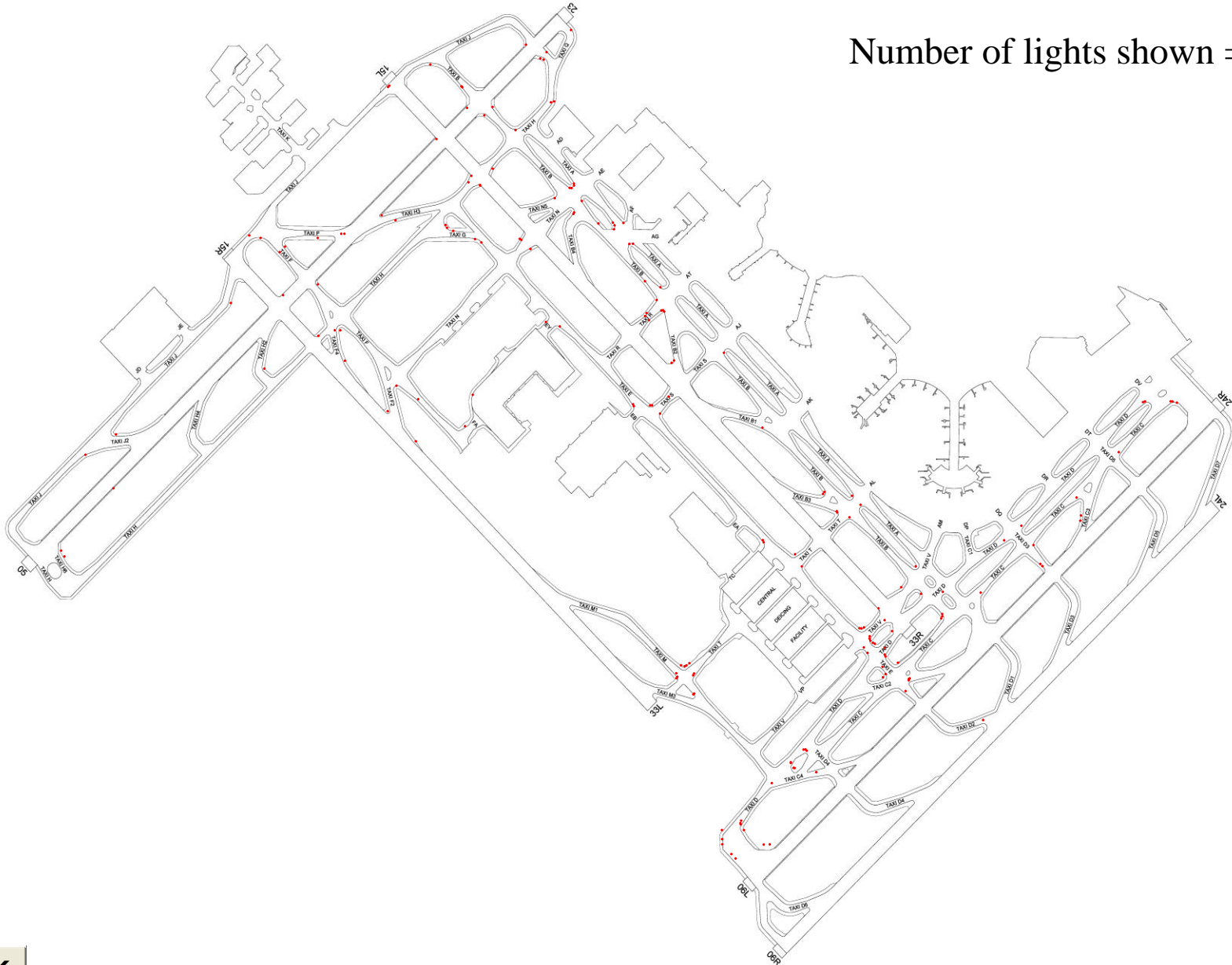


Toronto Airport Map

GO Analysis



Number of lights shown = **183**



BACK

Conclusion

- The inspection interval of low-visibility lights can be optimized to **save time and cost**
- The optimized inspection interval is **different** from a taxiway to another.
- In each specific taxiway the lights in **different locations** may have different levels of reliability.
- The project can be simply developed for other **airports**.

REFERENCES

1. Optimization of Inspection Interval for Centerline Lights at Pearson Airport, Presentation by Hossein Mohammadian at Canadian Airports Electrical Association (CANEW), St. John's, Newfoundland, Canada, September 25, 2012
2. Toronto Pearson Low Visibility Lighting Inspection, Presentation by Henry Oberholster at the International Maintenance Excellence Conference, Toronto, Ontario, Canada, November 21, 2012
3. Optimizing Airfield Lighting System Inspection Intervals: A Case Study at Toronto Pearson International Airport Paper

THANK YOU

QUESTIONS?

