



# A Study of Airfield Lighting Maintenance Management

---

DAVID A BURGESS, PHD, PE, ACE  
RDM INTERNATIONAL, INC.

IESALC TECHNOLOGY MEETING  
DETROIT, MI  
OCTOBER 16-22, 2022

# Topics

---

- ✈ Observations
- ✈ Research
- ✈ Results
- ✈ Conclusions
- ✈ Recommendations

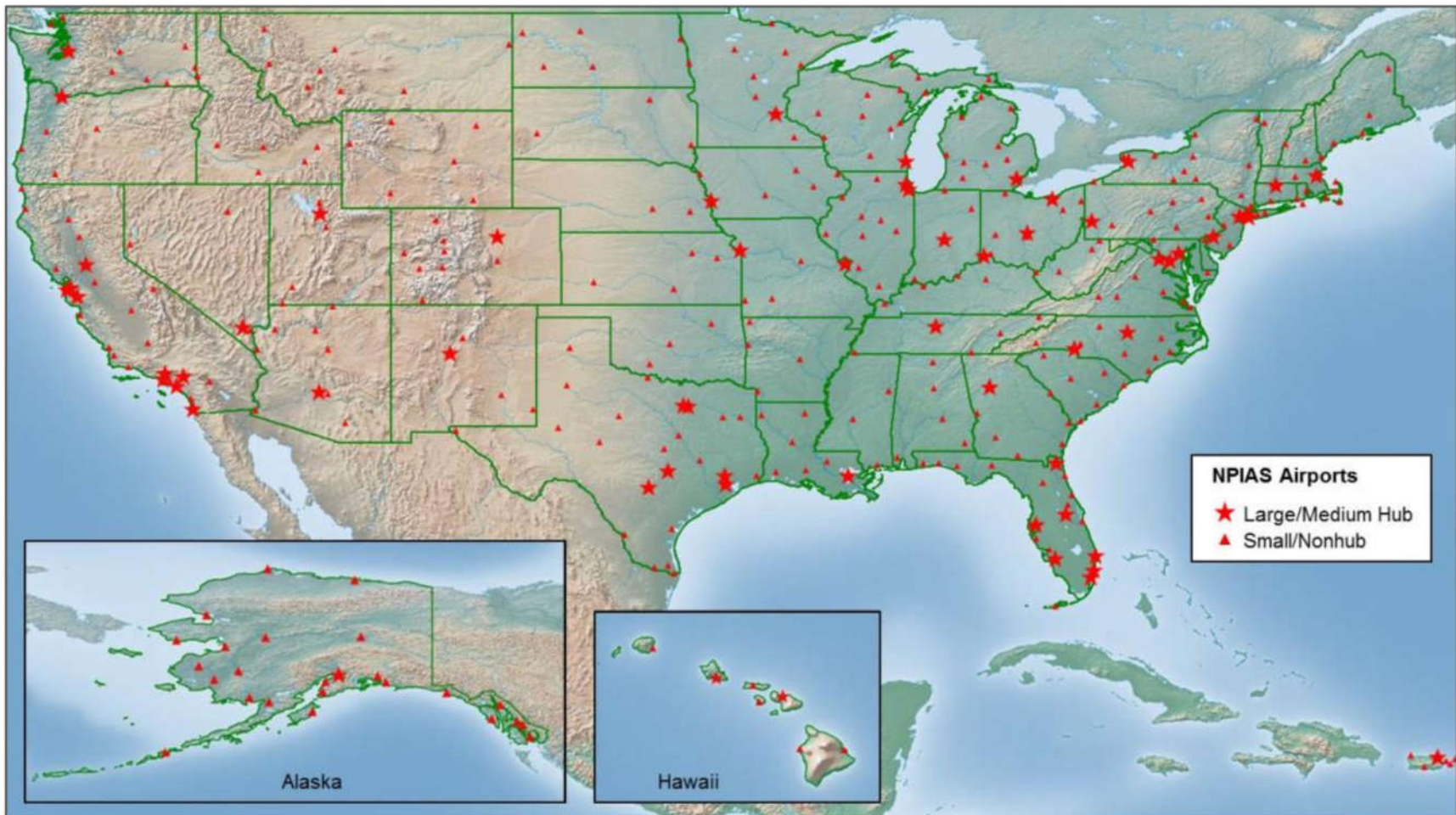


# Observations

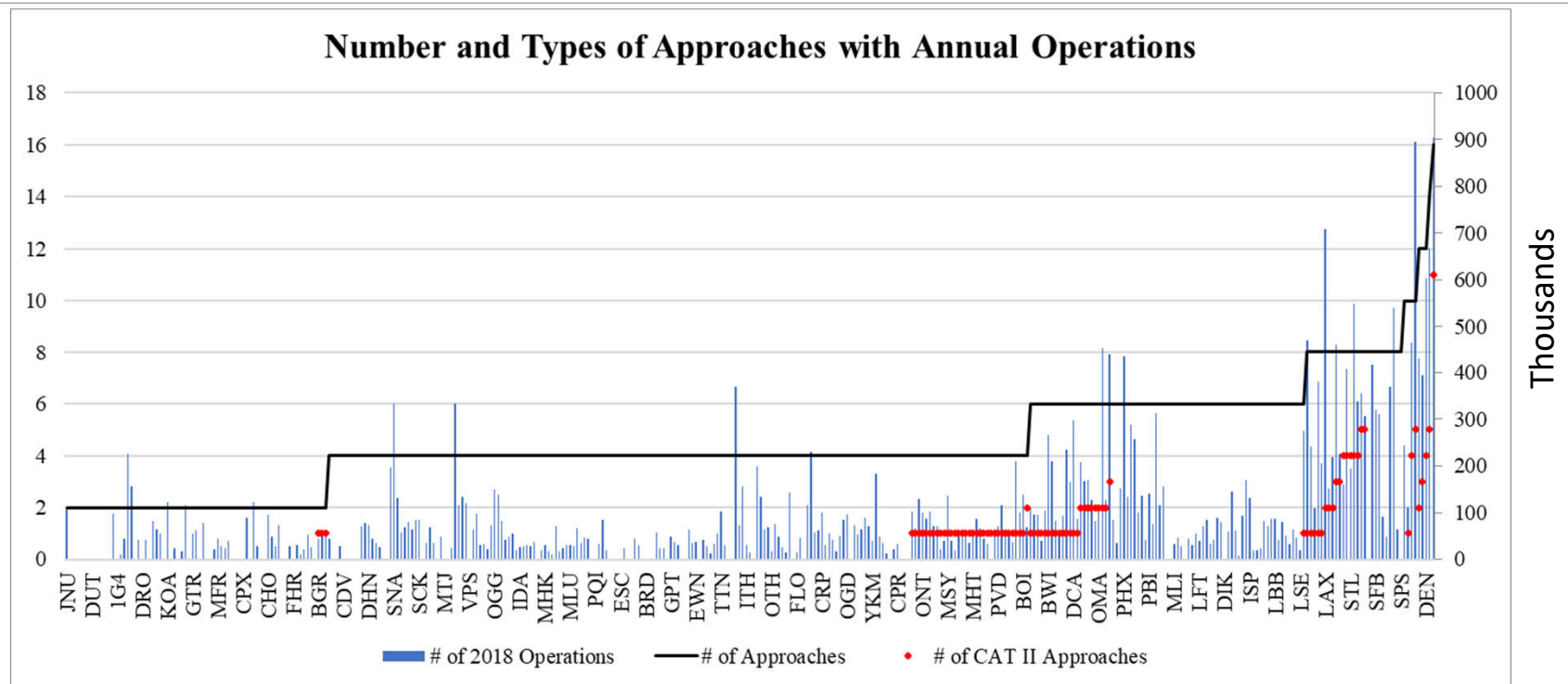
---

1. Airport Characteristics Vary Widely

## Observations - Locations of US Commercial Service Airports



# Observations – Airport Characteristics



380 U.S. Primary Commercial Service Airports


# Observations

---

1. Airport Characteristics Vary Widely
2. Maintenance Staff Training and Work Experience at Different Airports Vary Widely
3. OJT is the Primary Airfield Lighting Maintenance Training Method
4. Sharing of Lessons Learned is Difficult

# Observations – Staff Qualifications & Responsibility

---

| Airport Size   | Personnel Performing AFL Maintenance             |
|--|--|
| <div>Small</div> <div></div> <div>Large</div> | Operations Staff & Firefighters                  |
|  | Non-Electrician Facility Maintenance Staff       |
|  | Multi-Tasked Electricians (Airside and Landside) |
|  | Dedicated AFL Electricians                       |

# Training and Experience

---

- ✈ Hiring Staff with Previous AFL Experience is Uncommon
- ✈ OJT is the Primary Training Method
- ✈ Supplemental Training Sources
  - Manufacturer Seminars and Videos
  - Internet (Alaska DOT, ANTN Digicast)
  - AAAE Airport Certified Employee – Airfield Lighting
- ✈ Sharing of Lessons Learned, Where to Ask Questions
  - Old Yahoo Group?





# Questions

---

- What practices are common to all airfield lighting maintenance management programs?
- What airport factors influence maintenance decisions?
- How do we measure successful maintenance?
  - Do you have any Key Performance Indicators (KPI's)?

# Maintenance Program

---

## ✈ Policies & Procedures

- Task Descriptions / Frequencies
  - Maintenance Strategies
- Key Processes  
(e.g. work order processing, requesting funds)
- Goals / Performance Indicators

## ✈ Staff

- Hiring Qualifications
- Number
- Training
- Work Shifts

## ✈ Tools & Equipment

- Standard and Specialized Tools
- CMMS

## ✈ Facilities & Vehicles

- Lighting Vault
- Shop Equipment
- Storage Areas

## ✈ Spare Parts Kept on Hand

# Research Method

---

- Data Collected Using Telephone Interviews
- Electricians, Shop Supervisors, Maintenance Managers, Airport Directors
- Ground Theory Data Analysis



# Results – Program Similarities

---

## ✈ Goals

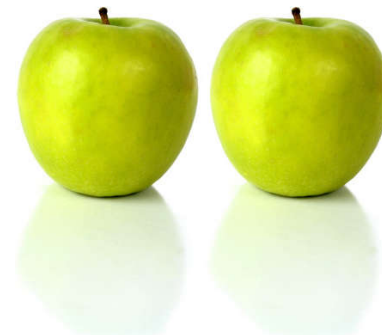
- Safety
- Part 139 Compliance

## ✈ Equipment

- 5kV Constant Current Equipment

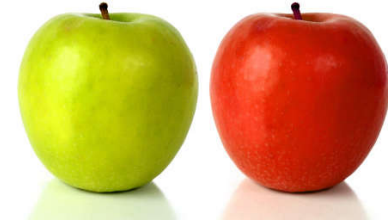
## ✈ Available Guidance and Training Programs

- Advisory Circulars
- OJT, AAAE/ACE, Manufacturers, Internet



# Results – Program Differences

---



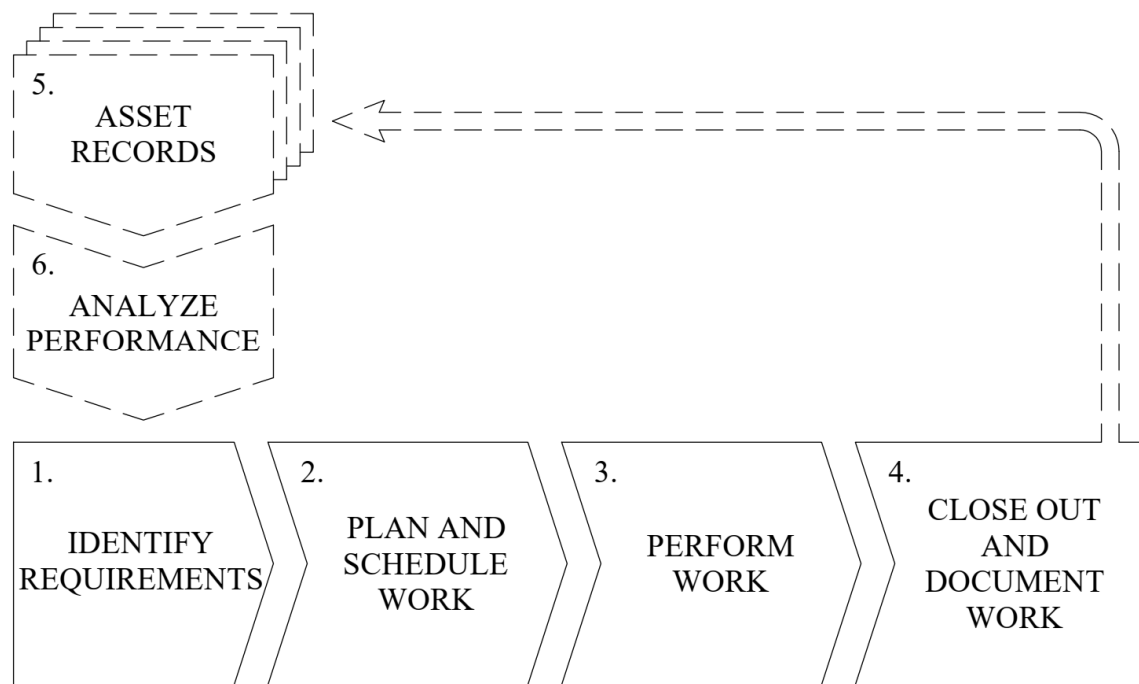
## LARGER AIRPORTS

- ✈ More Trained/Qualified Staff
- ✈ More Preventive Maintenance
- ✈ CMMS (Computerized Maintenance Management Systems)
- ✈ Funds Available for Most Needs
- ✈ Asset Management Programs
  - Focus on Business Risk and Life-Cycle Cost

## SMALLER AIRPORTS

- ✈ Multi-Tasked Maintenance Staff
  - Less time for maintenance
  - Usually, No Qualified Persons (per AC)
- ✈ Limited Specialized Equipment
- ✈ More Corrective Maintenance
- ✈ Funds Available for Safety and Part 139 Needs

# Results – Core Workflow Diagram



## Common Maintenance Databases

- Work Order Log
- Asset Inventory
  - incl. GIS Location
- Asset Condition
- Parts Inventory

# Results – Maintenance Strategies

---

## CORRECTIVE MAINTENANCE

- Reactive Maintenance – Emergency
- Reactive Maintenance – Scheduled
- Run-to-Failure



## PREVENTIVE MAINTENANCE

- Operator-Based Maintenance
- Time-Based Inspections
- Time-Based Maintenance
- Condition-Based Maintenance
- Reliability-Centered Maintenance
- Predictive Maintenance

# Results – Factors Affecting Airfield Lighting Maintenance

---

## Access

- Traffic, Weather

## Budget

- Availability, Approval

## Condition

- Age, Wear & Tear

## Design

- Quantity, Technology, Diversity

## Environment

- Meteorological, Geological

## Impetus

- Legacy, Bottom-Up, Top-Down

## Regulations

- Part 139, Advisory Circulars

## Staff

- Size, Skills, Experience

[Reasons why do you do maintenance the way you do?](#)



# Conclusions

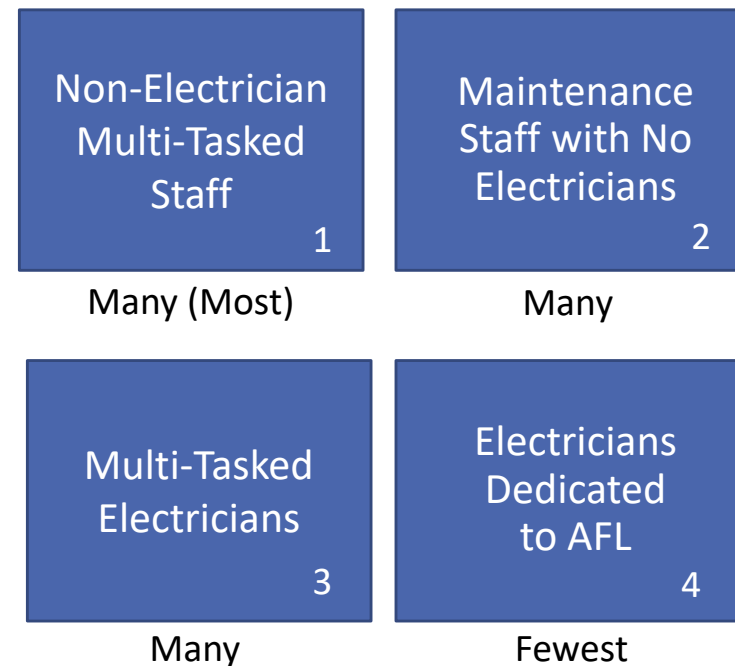
---

1. No one program works for all airports
2. Lacking Suitable Training and Guidance for Non-Electrician Maintainers
3. Lacking Guidance for Developing and Justifying a Maintenance Program
4. Lacking Industry Performance Indicators
  - i. Quantitative measurements of maintenance success
  - ii. Data that can support the value of program improvements
5. There is a common interest in learning how others are doing it.

# Recommendations

---

1. Recognize Four Categories
2. Technical Training for All Categories
3. Management Training for All Categories
  - a. Consider Business Risk and Life-Cycle Cost in Decisions
  - b. Create Processes to Continuously Improve
  - c. Common Performance Indicators and Benchmarks
  - d. Outsourcing Work When Not Qualified
  - e. Encourage Involvement in Design
4. User Group Involvement



# Additional – Airport Cooperative Research Program

---

## ✈ ACRP 09-22 *Guidance for Small Airports on Safe Maintenance of Airfield Electrical Systems*

- Problem - Many small airports do not have the resources to train airfield lighting maintenance staff. Staff may be unknowingly exposed to safety hazards.
- Anticipated Actions
  - Management decision-making tools
  - Standard practices
  - Guidance for Out-Sourcing
  - On-the-Job Training Tools





# Questions?

[dburgess@rdmintlinc.com](mailto:dburgess@rdmintlinc.com)