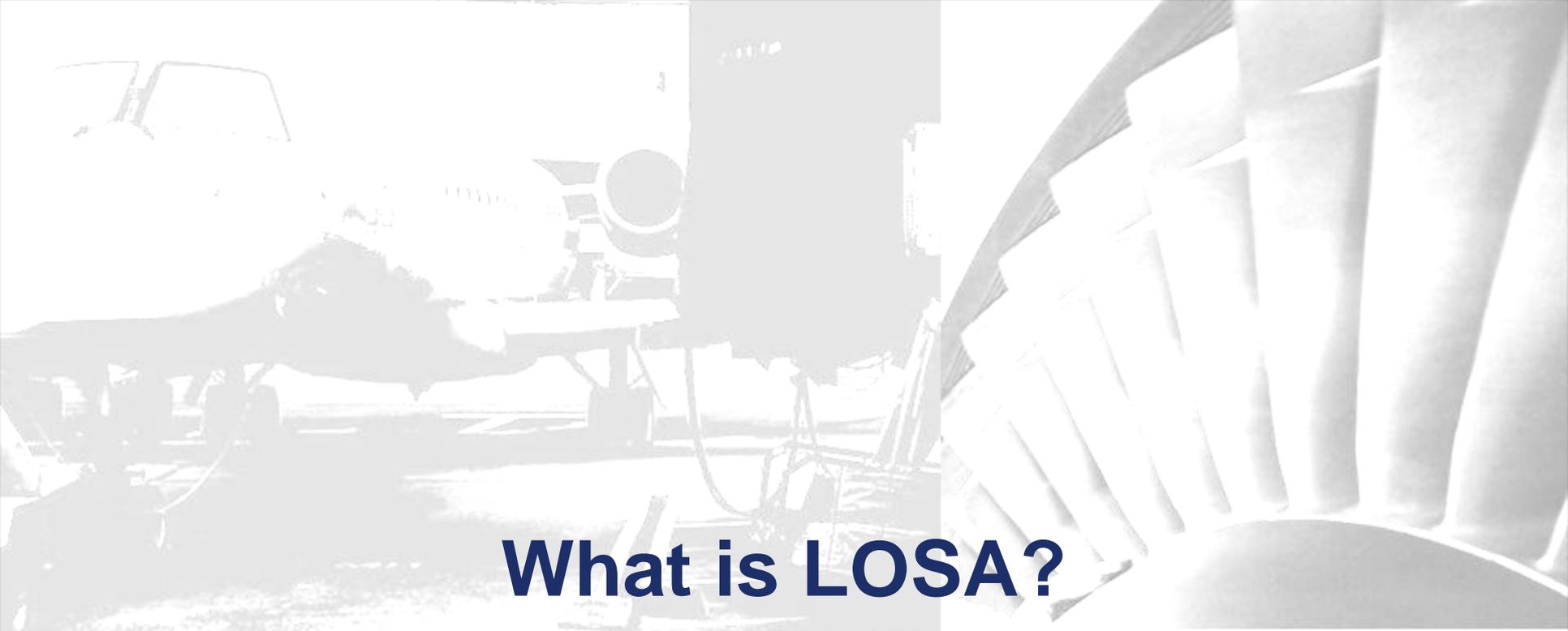


# Considerations for Implementing Maintenance Line Operations Safety Assessment (M-LOSA)

# Agenda

- Who is involved?
- What is LOSA?
- Why LOSA?
- Status Report and LOSA Products
- Steps to Implement LOSA
- Questions/Discussion?



# What is LOSA?



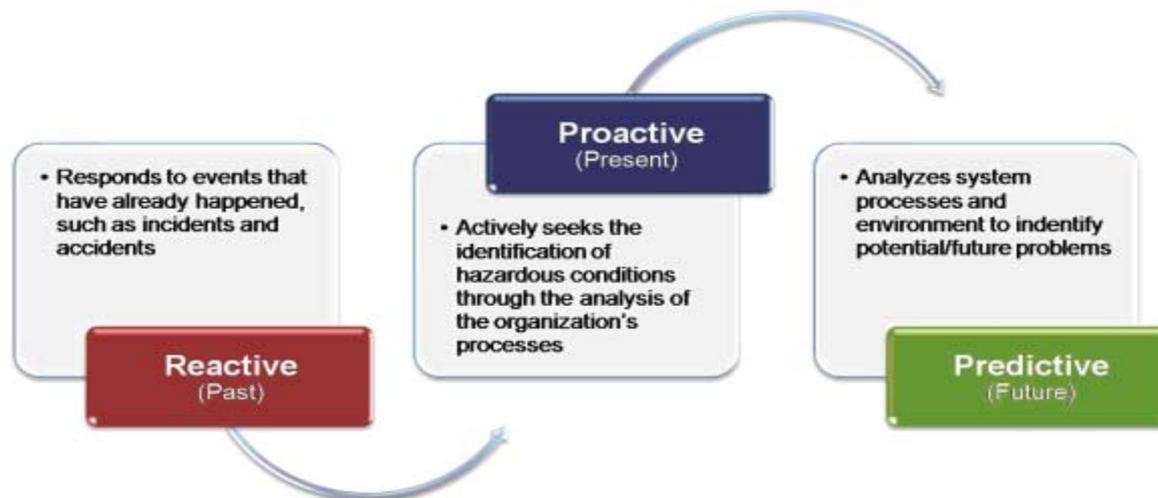
# LOSA is.....

- Line Operations Safety Assessment



# How does LOSA relate to SMS?

- Focus is on Safety Risk Management (observing the system during normal operations)
- It is a predictive hazard identification system
- Foundation is based on Threat and Error Management (TEM)
- Supports the continuous improvement philosophy



# Reactive Hazard Identification

- Investigation of accidents and incidents.
- Boeing Maintenance Error Decision Aid (MEDA) for line maintenance and heavy maintenance.
- Boeing MEDA Workshops for back shop maintenance.
- Boeing Ramp Error Decision Aid (REDA)

# Proactive Hazard Identification

- Mandatory and voluntary reporting systems, safety assessment, and surveys
- Quality Assurance Audits
- Internal hazard reporting systems
- Safety surveys

# Predictive Hazard Identification

- Confidential reporting systems, flight data analysis, and normal operations monitoring.
- Digital Flight Data Recorder (DFDR) Analysis
- Line Operations Safety Assessment (LOSA)
  - Flight
  - Maintenance
  - Ramp

# Intent of LOSA Observations

- Observe day-to-day work behaviors during normal operations
- Discover procedural and systemic threats and errors
- Reduce injuries & equipment/aircraft damage
- Generate baseline data, implement new changes, and generate follow-up data to assess effectiveness



**Trusted &  
Trained  
Observers**



**Peer-to-Peer  
Observations**



**Management &  
Labor Agreement**



**Inform  
Workforce**

**LOSA  
Characteristics**



**Non-punitive**



**Targeted  
Enhancements**



**Secure &  
Private**



**Systematic  
Observations**



**Volunteers**



# Why LOSA?

→ **Safety Issues**

→ **Cost Issues**

# Maintenance-Related Accidents

→ Maintenance system failures, due to errors and/or violations, can affect safety of flight:

1. **Primary Cause** of an accident. Accident is due to the maintenance/inspection failure. Accident is not in any way due to flight crew action.
2. **Contributing Factor** to an accident. Accident chain begins with a maintenance/inspection failure that is incorrectly handled by the flight crew, ultimately ending up as an accident (Primary Cause is pilot error).

# Accident: Maintenance is Primary Cause

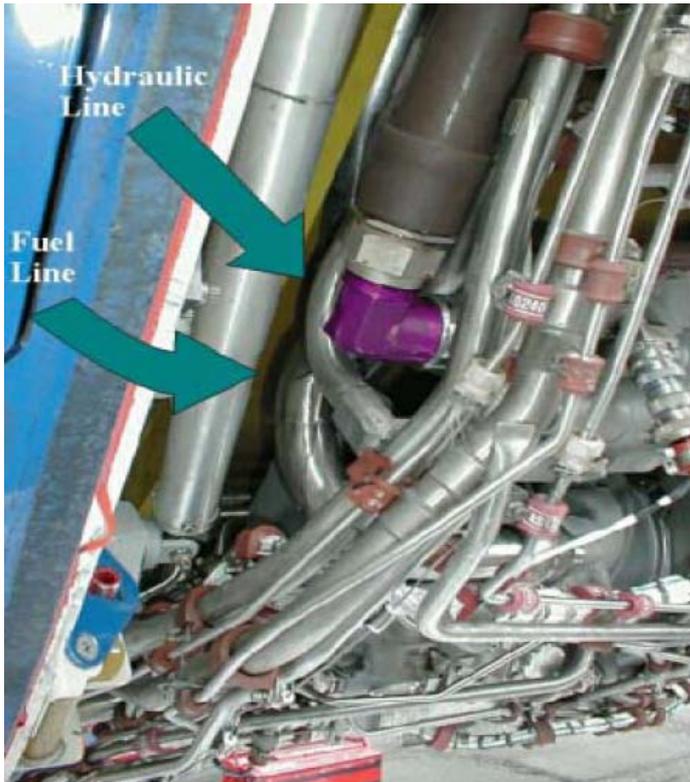
Toronto, Canada crossing the Atlantic Ocean, 2001  
Airbus A330  
Engine fuel leak



North Atlantic



# Accident: Maintenance is Primary Cause (cont'd)



Right Engine Pipe Contact



Fuel Pipe Crack and Scratches

*\*Photo courtesy of Aviation Accidents Prevention and Investigations Department, Government of Portugal*

# Maintenance as a Primary Cause

Data provided in a recent Advance-Notice of Proposed Amendment No xx/2007 from EASA\* .

<u>Primary Cause of HF-Related Accidents</u>	<u># of Accidents</u>	<u>% of Total</u>
Design	135	3%
Production	101	2
<b>Operations (flight crew related)</b>	<b>3038</b>	<b>58</b>
Maintenance	416	8
ATM	66	1
Dispatch	18	0
Loading	129	2
TOTAL HF-Related Accidents	3903	75
Non-HF-Related Accidents	1320	25
TOTAL	5223	100

\*Data obtained from EASA Safety Analysis & Research. It is based on airliner accidents only, covering the period 1990 to January 2006. Only reports where causal factors have been positively identified are included in the analysis.

# Accident: Maintenance as a Contributing Factor

Lima, Peru 1996

757-200

Tape left on static ports



# Why LOSA?

→ Safety Issues

→ Cost Issues



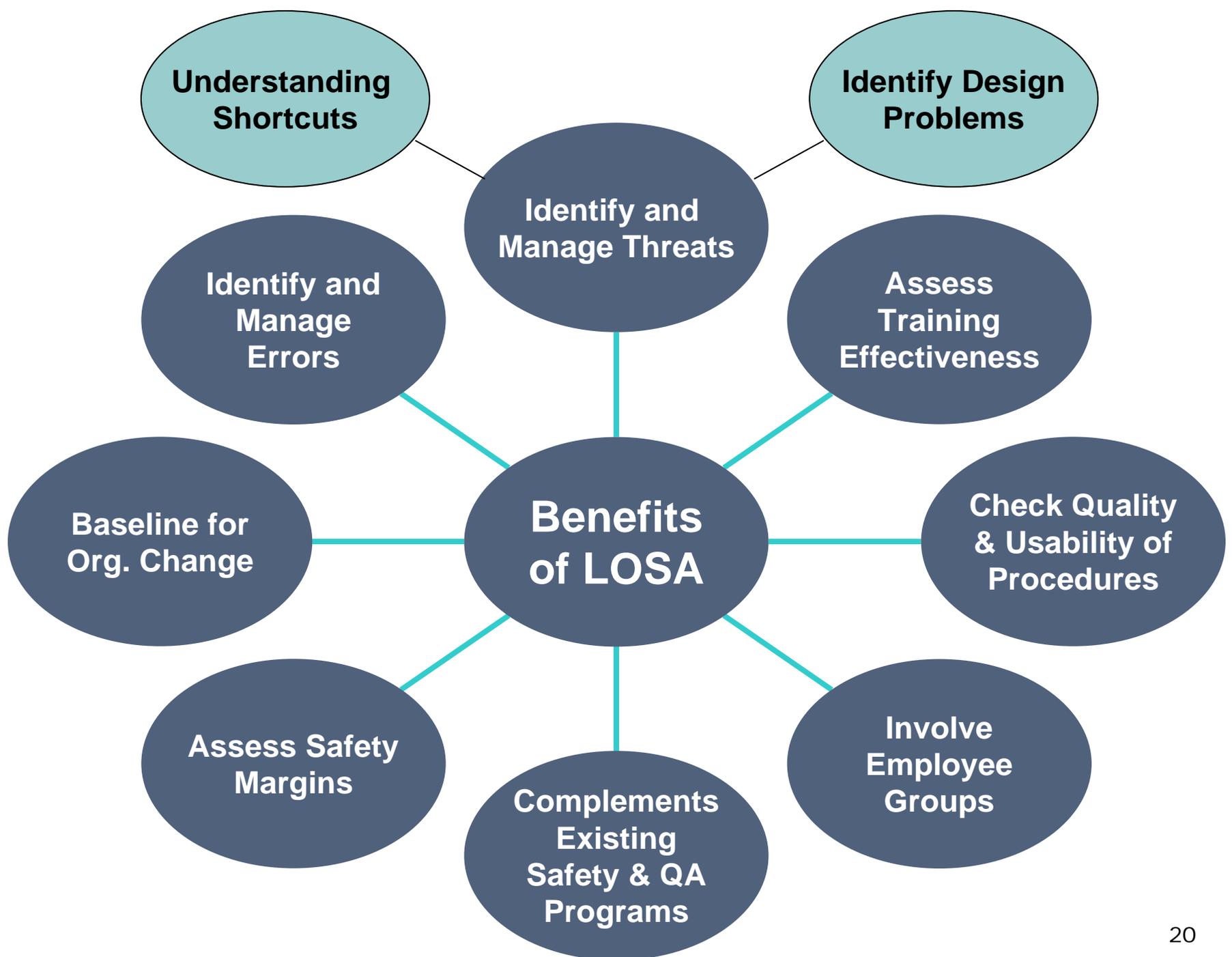
# Safety Costs of Maintenance Events

- International Air Transport Association (IATA) Safety Reports
  - **Safety Report 2003—Found that in 26% of the accidents a maintenance-caused event started the accident chain.**
  - **Safety Report 2006—40%**
  - **Safety Report 2007—20%**
  - **Safety Report 2008—15%**
- Note: IATA did not distinguish between maintenance as a Primary Cause vs. a Contributing Factor.

# Costs of Maintenance Error

## Maintenance error caused...

- 20% to 30% of in-flight shutdowns (IFSDs) at a cost of US \$500,000 per IFSD
- 50% of flight delays due to engine problems at an average cost of US \$9,000 per hour
- 50% of flight cancellations due to engine problems at an average cost of US \$66,000 per cancellation





**Status Report and Success Stories...**

# Status Report: LOSA Progress

→ **Support Materials are ready**

Available on the LOSA website: [www.MRLOSA.com](http://www.MRLOSA.com)

→ **Active users of Mx LOSA**

COAIR/United

→ **Considering LOSA and had Initial Briefing**

Alaska Airlines

FedEx

Delta Air Lines

UPS

Garuda Airlines

Jet Blue Airlines

American Airlines

Garuda Indonesia

China Airlines

EVA Airways

Qantas

Korean Air

Etihad Airways

Gulf Air

# Maintenance Success Stories

→ M-LOSA findings help to make deactivation procedures more workable, efficient, and safer.



→ Before: Leading edge device de/reactivation procedures took three hours to properly tag out without individual sign-offs.

→ After: With sign-offs, this modified process takes between thirty and forty-five minutes to complete.

# LOSA Products

Forms

The image shows two overlapping paper forms for Line Operations Safety Audit (LOSA) observations. The top form is titled 'Maintenance LOSA Observation Form' and includes sections for 'Observation' (with a green header), 'Observer Information', and 'Maintenance LOSA Demographics'. The bottom form is also titled 'Maintenance LOSA Observation Form' and includes sections for 'Observer Information', 'Maintenance Conditions', 'Observation Details', and 'Maintenance LOSA Demographics'. Both forms contain various fields for recording observation details, including aircraft type, task description, and observer information.

Database Software

The image shows a screenshot of a database software interface for LOSA observations. The window title is 'LOSA Observations'. The interface includes a menu bar, a toolbar, and a main data grid. The data grid has columns for 'Observation ID', 'Date', 'Time', 'Aircraft', 'Task', 'Observer', and 'Status'. There are also several buttons and checkboxes for filtering and sorting the data. The interface is designed for data entry and management.

Ready to use

The image shows training materials for Line Operations Safety Audit (LOSA) Mx Operations - Line. It includes a slide with the title 'Line Operations Safety Audit (LOSA): Mx Operations - Line' and the Federal Aviation Administration logo. Below the slide is a training card with the text 'Please take a few minutes for observation' and 'Plane'. The card also features a photograph of an aircraft on the tarmac. The Federal Aviation Administration logo is visible in the bottom right corner of the training card.

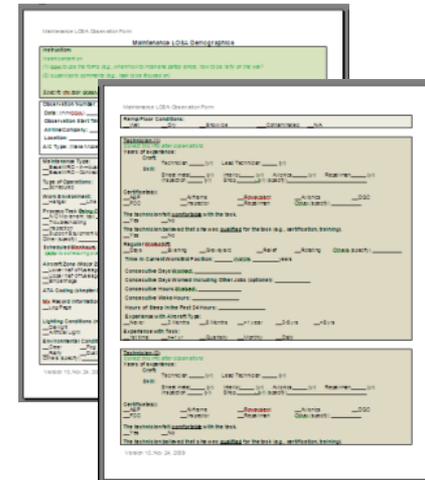
Training



# LOSA Forms



- Developed by reviewing and aggregating procedures from flight deck LOSA (or similar programs) and related M-LOSA & R-LOSA references.
- Refined during extensive taskforce discussions & beta testing.



Line Operations Safety  
Audit (LOSA): Mx  
Operations – Line



Federal Aviation  
Administration

**Training**

Training

Please take a few minutes for  
observation

→ Plane control

→ Control tower communication and no



Federal Aviation  
Administration

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# LOSA Training



- LOSA Awareness
- LOSA Procedures
- Scenario-based Practice
- Database Familiarization

Line Operations Safety Audit (LOSA): Mx Operations – Line

*Training Scenarios*

**Federal Aviation Administration**

*Please take a few minutes to code this observation*

→ **Plane contacts jet bridge**

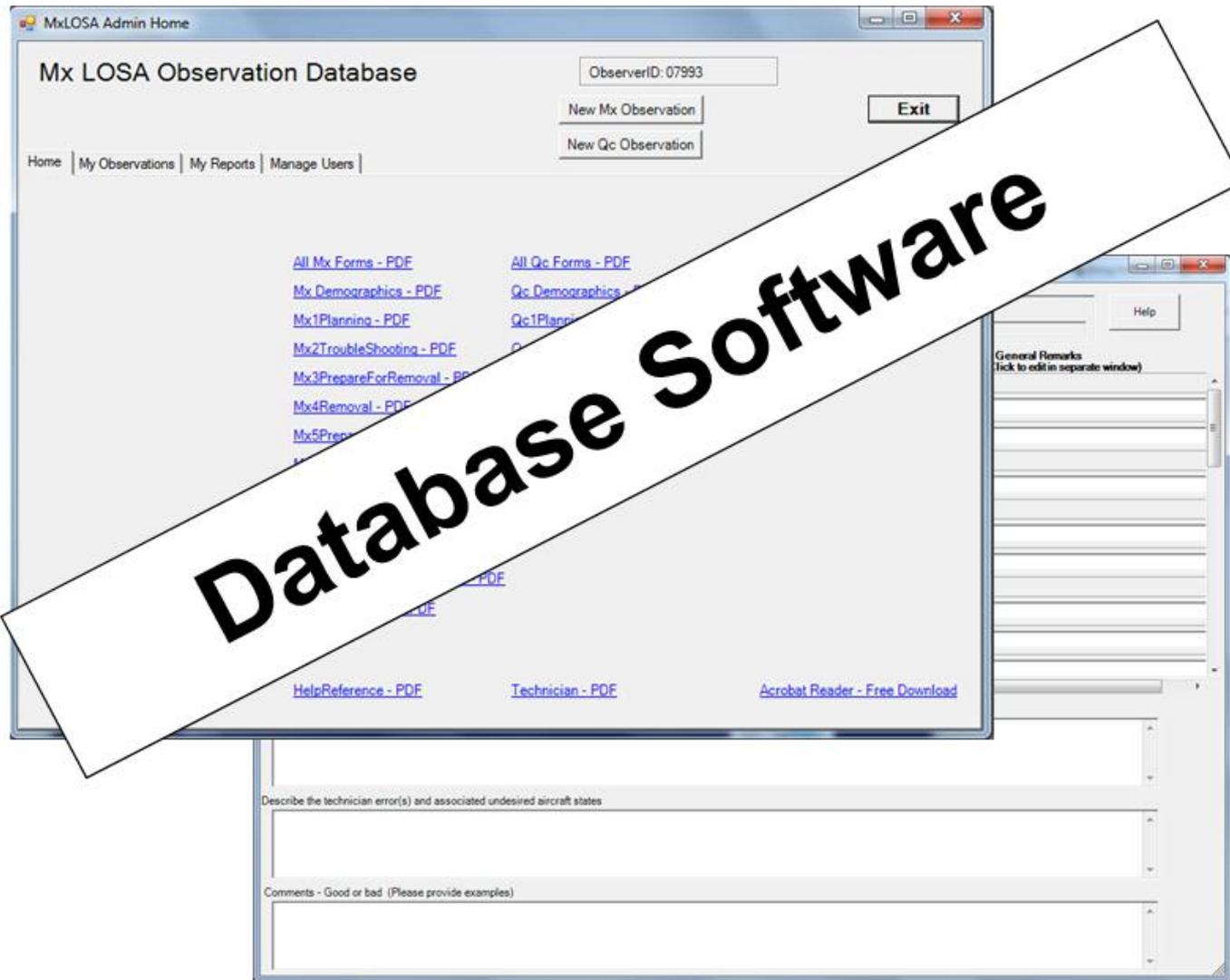
→ Contributing factors: Lack of communication and no lighted wands



**Federal Aviation Administration**

107

The image shows a slide from a training presentation. The top part has a dark blue background with white text. The bottom part has a white background with black text and a photograph. The photograph shows a white aircraft on a tarmac with a jet bridge. The slide includes the FAA logo and the number 107.



# Maintenance LOSA Database Software

- Records information about the observation
- No identifying information
- Analysis and report generation
- Data exportable to Excel and other statistical software
- Should have local analyst for best results
- No “data-sharing” necessary

The screenshot displays the 'Demographics' tab of the software. It features a top navigation bar with buttons for 'New', 'Exit', 'Current Observation', 'Observation Type', 'Airport', and 'Help'. Below this, there are several sections of data entry fields, including 'Observation Type', 'Airline Country', 'Maintenance Type', 'Type of Operation', 'Process/Task Being Observed', 'Scheduled Hours', and 'ATA Coding'. Each section contains various checkboxes and dropdown menus for detailed data collection.

The screenshot displays the 'Mx Troubleshooting' tab of the software. It features a table with columns for 'Safety Risk' and '#Threats'. The table contains several rows of data, including 'Safety', 'Personnel', 'Tools and Equipment', and 'Research and Preparation'. Below the table, there are text input fields for 'Describe the threat(s)', 'Describe the technician action(s)', and 'Comments'.

	Safety Risk	#Threats	General Remarks
<b>Safety</b>			
1. Meets, conditions, and warnings reviewed	Safe	0	000 Threats
2. Meets, conditions, and warnings followed	Safe	0	000 Threats
<b>Personnel</b>			
3. Required personnel available	Did not Ct	0	000 Threats
<b>Tools and Equipment</b>			
4. Tools available	Safe	0	000 Threats
5. Access equipment available	Is This	0	000 Threats
<b>Research and Preparation</b>			
6. Fault history reviewed	Safe	0	000 Threats
7. Production expectation/leadtime clear	Safe	0	000 Threats
8. Production expectation/leadtime reasonable	Safe	0	000 Threats



<b>Line Operations Safety Assessments</b>
<a href="#">Home</a>
<a href="#">Introduction</a>
<a href="#">History</a>
<a href="#">LOSA Characteristics</a>
<a href="#">Benefits of LOSA</a>
<a href="#">Management and Labor</a>
<a href="#">Marketing</a>
<a href="#">MX Training</a>
<a href="#">Ramp Training</a>
<a href="#">Forms and Software</a>
<a href="#">Publications</a>
<a href="#">Contact</a>
<a href="#">FAQ</a>

## Home

### Welcome to the Line Operations Safety Assessment Website

Enhancing maintenance and ramp safety through voluntary, peer-to-peer observations under strict non-jeopardy conditions.

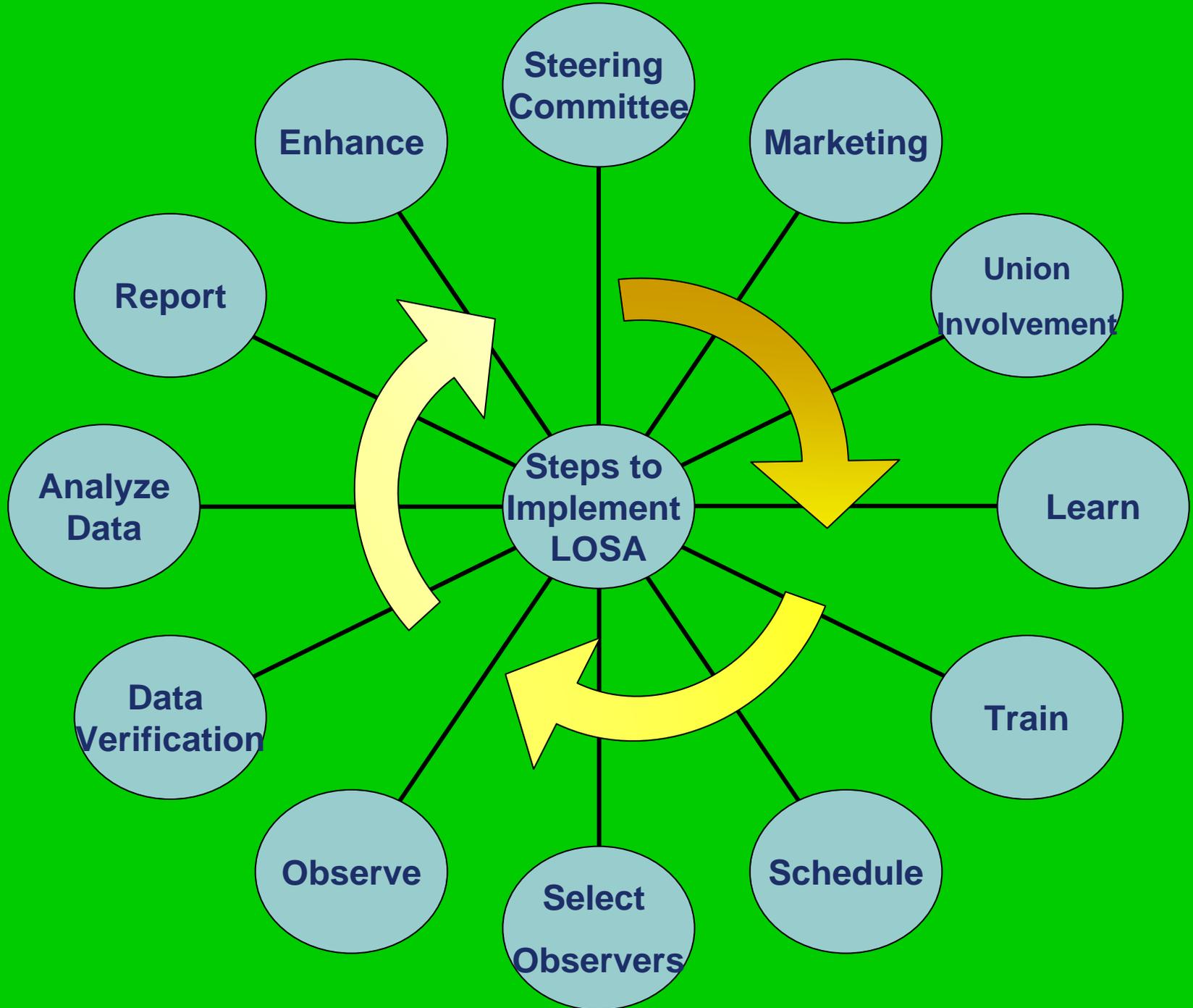


### Improving Safety in a Complex Environment





# Steps to Implement LOSA



# Strategies to Insure Trust and Respect

- Promote LOSA
- Emphasize that LOSA is not for disciplinary purposes and that the forms do not include any personal information.
- Select credible, respected observers.
- Ask crew if it is OK to do the LOSA observation.
- Communicate the LOSA results in a timely manner.
- Use the information—create action plans, implement changes, and evaluate results.

# Key Reminders

- Ensure Buy-in
- Fundamentals are critical
- Communication to everyone is critical
- Available Training
- Consistency is essential
- One false step with discipline is significant
- Start small/target areas for improvement



# Conclusion

- The following products are available for implementing LOSA at airlines...
  - Marketing materials (posters & brochures)
  - Implementation Guideline
  - Observation forms
  - Database software
  - Training
- LOSA is a predictive hazard identification system for your SMS that can:
  - Reduce your costs,
  - Improve safety, and
  - Improve efficiency



**Questions/Comments?**



This concludes the  
introduction to  
Line Operation Safety  
Assessment.

Visit the LOSA website: [www.MRLOSA.com](http://www.MRLOSA.com)

Acknowledgements: ATA/FAA Maintenance and Ramp Human Factors Committee