The FAA and the airlines are working to transfer LOSA principles from the flight deck to the maintenance shop and to the ramp.

Moving to Maintenance

BY LINDA WERFELMAN

Principles inherent in the line operations safety audit (LOSA) program — typically used on the flight line — can be applied to aviation maintenance and ramp operations to identify conditions that might lead to an incident or accident, a U.S. Federal Aviation Administration (FAA) report says.

"The hazards that threaten the safety of flight deck operations are not unique to that environment," said the report, issued in September by the FAA Office of Aerospace Medicine.[1] "Similar problems are present during maintenance and ramp operations."

LOSA traditionally has been used to gather safety data during routine airline operations. The program had its roots in a Delta Air Lines effort to assess the operational effects of a three-day crew resource management (CRM) training course.

"Analysts soon realized that existing data collection methods did not assemble adequate information regarding flight crew adherence to standard operating procedures and environmental influences on flight crew performance," the report said.

In 1994, Delta and the Human Factors Research Project of the University of Texas at Austin formed a partnership, with a goal of developing "a line audit methodology utilizing jump-seat observations on regularly scheduled flights." The first audits looked primarily at CRM.

LOSA programs expanded to other airlines and gradually evolved to focus on threat and error management.

LOSA is seen as a way of helping ramp and maintenance workers identify threats and errors in their work environment before they lead to an accident.

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"Monitoring routine operations, the cornerstone of the LOSA process, addresses an important aspect of safety auditing, namely, that risks and human error can never be completely eliminated," the report said. "Recognizing correct and incorrect actions to manage these risks and errors before they manifest into larger incidents/accidents makes LOSA a truly proactive — rather than a reactive — strategy, as well as a workable predictive way of risk mitigation."

Typically, the LOSA process works like this: Observers record threats to safety, along with specific information about how the threats were addressed, what errors were generated, how those errors were managed and how the actions that were observed could be associated with incidents and accidents. The resulting data are analyzed to help determine organizational strengths and weaknesses, and countermeasures are developed to address the threats and errors.

$5 Billion in Losses

Only recently have LOSA programs begun to be modified to include maintenance and ramp activities.

The report cited Flight Safety Foundation information published in 2007 that said the industry was losing an estimated $5 billion annually because of ramp damage to aircraft.[2]

"Additional methods of reducing damage and injuries are imperative," the FAA report said, adding that LOSA "holds promise as a means of reducing the incidents and accidents in ramp and maintenance operations because LOSA enables ramp and maintenance workers to identify and develop methods to address threats and errors before they lead to an incident or accident."

Even before the current effort to introduce LOSA into maintenance and ground operations, several air carriers had implemented programs similar to LOSA to reduce maintenance errors and damage to aircraft on the ground, the report said.

For example, the report cited Continental Airlines, which determined that, of 447 problems identified in 2008 by the carrier's flight operations LOSA, 29 percent involved ground safety issues. The industry average is 16 percent, the report said.

Continental responded by beginning several new programs aimed at improving ground safety, including Ramp-LOSA (R-LOSA). In a subsequent review of safety performance from 2006 through 2009, the airline compared data for two stations and found a dramatic improvement at both; nevertheless, improvements at Station No. 1, where R-LOSA was implemented in 2007, surpassed those at Station No. 2, where R-LOSA was not used, the report said. The difference "can potentially be attributed to the effectiveness of R-LOSA," the report said, noting that Station No. 1's initial safety performance also was better than that of Station No. 2.

Ground safety performance was based on the total number of occurrences that were considered ground damage mishaps, the mishap rate per 10,000 departures and the cost of the mishaps. The mishaps also were divided between "attributable" mishaps — those that result from human error and are "charged back" to the department or vendor deemed responsible — and non-attributable mishaps, such as foreign object damage, for which costs cannot be recovered.

Both stations recorded what the report called a "dramatic decrease" in the number of ground damage mishaps between 2006 and 2009. Attributable mishaps decreased by 73 percent for Station No. 1 and 58 percent for Station No. 2, while non-attributable mistakes declined 85 percent for Station No. 1 and 67 percent for Station No. 2.

The ground damage mishap rate also decreased at both stations. At Station No. 1, the rate of attributable mishaps decreased 61 percent, while non-attributable mishaps declined to zero, the report said. At Station No. 2, the attributable mishap rate decreased 43 percent and the rate of non-attributable mishaps decreased 45 percent.

The cost of ground damage decreased at both stations between 2006 and 2009, although

the cost of attributable mishaps at Station No. 1 increased slightly in 2008, the report said.

Over the same time period, information gathered through Maintenance-LOSA (M-LOSA) led to the time-saving revision of certain aircraft system deactivation procedures, the report said.

"M-LOSA findings help make deactivation procedures more workable, efficient and safer," the report said.

"As an example, [Boeing] 767 leading edge device deactivation and reactivation procedures used to take three hours to properly lock out and tag out without individual sign-offs. An M-LOSA auditor identified this inefficiency, which was then addressed by Tech Publications by rewriting their deactivation/reactivation procedures. Previously, the lockout and tag-out process involved unnecessary deactivation of some systems following a 37-page procedure. … The new work card is two pages long, with clearly defined steps. Now, with individual sign-offs, this modified process takes between 30 and 45 minutes to complete."

The report said the new procedures also have helped prevent confusion related to interruptions and shift changes.

Line Painting

At Delta, data from the Ramp Operations Safety Audit (ROSA) was credited with persuading the Atlanta Airport Authority to repaint clearance lines at the international concourse, the report said.

Previous requests from Delta officials to repaint the lines had been ignored, "until Delta presented the results of a … ROSA audit," the report said. "The ROSA data illustrated serious problems caused by the missing clearance lines. Following repainting, ground equipment operators have consistently obeyed the rule of parking outside the clearance lines when airplanes are not at the gate. … Consequently, parking violation-induced ground equipment damage and occurrence of FOD [foreign object debris] on the ramp have decreased."

Qantas Safety Audits

Qantas Airways adapted its LOSA methodology for use on the surface, conducting its first ground operational safety audit (GOSA) in 2008. Auditors

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focused on how ramp teams functioned during aircraft turnarounds and provided additional data on "threats, errors and undesirable operational states that threatened the operational safety of ground operations," the report said.

The program allowed the airline's ramp managers to collect data on the strengths and weaknesses of their operation, and helped them evaluate the effectiveness of training and the quality of their procedures, including "processes undertaken by staff that result in work shortcuts, injury or risk to other staff," the report said.

Industry Task Force

A more comprehensive effort — a collaboration between the Air Transport Association Maintenance and Ramp Human Factors Task Force and researchers from the FAA and Saint Louis University — began late in 2008.

The group's efforts generated M-LOSA and R-LOSA forms, training documents and a structure for collecting and storing data, and then tested the paperwork and processes at ramp, line maintenance and base maintenance facilities across the United States.

The goal was to develop "a practical, customizable and scalable methodology," which was delivered to the industry in the form of a tool kit, available online at <https://hfskyway.faa.gov/HFSkyway/LOSAHome.aspx >.

"The development of R-LOSA and M-LOSA will build upon existing knowledge regarding safety across high-consequence industries," the report said. "In particular, the impact of observation of normal behaviors in the aircraft maintenance and ramp operations will help qualify and quantify the efforts made by aircraft mechanics and ramp agents to prevent or reduce incidents and accidents."

Notes

1. Ma, Jiao; Pedigo, Mark; Blackwell, Lauren; Gildea, Kevin; Holcomb, Kali; Hackworth, Carla; Hiles, John J. *The Line Operations Safety Audit Program: Transitioning From Flight Operations to Maintenance and Ramp Operations*. DOT/FAA/AM-11/15. September 2011.
2. Lacagnina, Mark. "Defusing the Ramp." *AeroSafety World* Volume 2 (May 2007): 20–24.