Updated tools, free from IATA, help airlines get a grip on inadvertent slide deployments.

SLIP *of the* WRIST

BY WAYNE ROSENKRANS

Cabin safety specialists seeking resources to reduce the risk of inadvertent slide deployments have a difficult task. Working against them is a perception that the cause is obvious: Someone opens an airplane door without conducting the standard operating procedure (SOP) for disarming the mechanism, such as a girt bar, that deploys the slide for an emergency evacuation. Casual observers may assume, too, that other events simply involve undetected or uncorrected door/slide equipment problems. The reality is more complex.

"The financial resources required to conduct more training or to run awareness campaigns are often a bottleneck," says Martin Maurino, manager, safety analysis, Safety, Operations and Infrastructure at the International Air Transport

Association (IATA). "This is why IATA provides cost-analysis tools in the *Cabin Operations Safety Toolkit* to help managers determine and present to senior management a plan that shows a return on investment and the long-term savings."[1]

The best strategy so far has been for airlines to select from a variety of recommended solutions. "There is no 'one size fits all' solution," Maurino said. "Strategies to help improve this problem revolve mostly around proper use of on-board technology that already exists and is under-utilized, as well as robust SOPs and enhanced training to raise cabin crew awareness of threats and also show them how to apply proper counter-strategies to mitigate the risk of [inadvertent] slide deployment. In terms of personal safety, cabin crew must be aware of

the physical harm that can come from opening an armed door, as much to themselves [as] to people outside the aircraft. The costs and operational impacts of a slide deployment are significant, and this hurts the airline's bottom line, which in turn hurts the crews themselves during financially difficult times."

Real World Examples

Environmental conditions distracted a cabin crew in an example of one of the most common types of reported events. "[The Airbus A320] was parked … for an indefinite weather delay [and] was getting very warm," a March 2001 incident report said. "The auxiliary power unit and no. 1 high-pressure bleed valve were inoperative. The flight attendant asked the captain if [the cabin crew] could open the rear … door to get some relief. The flight attendant opened door [but had forgotten] to disarm the door, causing the slide to deploy. The aircraft was taxied back to the gate."[2]

Recycling a door — that is, reopening and reclosing it because of an incorrect arming indication — has led to some events. "An inadvertent slide deployment by our … flight attendant on door 1L [happened] just prior to pushback," said a first officer's voluntary report in April 2002. "The jetway had already been removed from the aircraft, and the gate agent had already left. … Prior to pushback and engine start, the [electronic centralized aircraft monitor] showed that the 1L door was not armed. The captain made a brief public address announcement and said only '1L.' … The captain and [I were] on the flight interphone, the captain [selected] one chime and there was a brief discussion about trying to cycle [the door] again. At that point, we could hear the 1L door unlock and begin to open. The [Position C] flight attendant said, 'Wait, it's still armed,' just as the slide [deployed]. We were running late because of a last-minute aircraft swap; the crew coming off [had] said that [door] 1L was difficult to arm. … Later that evening [at another airport], the other crew said that they had written … up [the problem] and that maintenance … was going to re-rig the door on the overnight [stop] so they wouldn't take a delay. Perhaps if maintenance had

performed a more thorough fix when [the problem] was first reported, it would have reduced the chances of this slide deployment."[3]

In another event, an Airbus A300 captain incorrectly opened a door in August 2006. The captain's report said, "[I] went to the main crew entry door to arm the door for departure. [I] closed the door … armed the door [and] stored the safety pin. [I] tested the arming tone. It checked [OK]. [I] checked the two overhead door indicators. Both were red [indicating failure to arm]. I failed to reverse my sequence and attempted to recycle the door with the door handle. Upon lifting the door handle, slide activation [began] as designed except that the stairs were still in position. The door blew open, but the slide did not activate [fully, it] just partially separated from the door container. … The slide was unable to be safetied [that is, secured with a pin to prevent inflation]. Maintenance ended up having to deploy the slide to be able to remove and replace the unit."[4]

Credible Sources

A core team comprising representatives from 12 airlines and Airbus began in 2004 to develop the *Toolkit* material under IATA's coordination. Most representatives were cabin safety managers, heads of cabin crew training, flight crew

Unlike this maintenance check, an inadvertent slide deployment can cause injury with almost no warning.

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safety managers/directors and specialists from equipment manufacturers. "Another 20 airlines and Boeing [Commercial Airplanes representatives] then reviewed the material and provided feedback prior to finalizing the *Toolkit,*" Maurino said. The project advanced soon after the team settled on methods for consistently determining what data from proprietary airline operations reports show about how these events have occurred. IATA's Cabin Safety Task Force in early 2007 published the third revision of *Toolkit* modules dedicated to this issue, refining the guidance.

A follow-up report on the initiative — based on 210 air safety reports to IATA's Safety Trend Evaluation Analysis and Data Exchange System (STEADES) from Jan. 1, 2003, through Dec. 31, 2005 — found that cabin crewmembers caused 47 percent of inadvertent slide deployments and that events in 2005 mainly involved widebody aircraft; 70 percent of events disrupted operations; and during the three-year period, the number decreased.[5] IATA members soon realized that no airline suffers this problem alone.

"Many of the [member] airlines were surprised to find that others echoed the same problems/causes they experienced in terms of slide deployments … regardless of the region of the operator," Maurino said. "Those with success stories shared their expertise, and others applied it."

Data Clarify Causes

Member airlines provided proprietary occurrence data, case studies, cost breakdowns, SOPs and training material to the task force on a confidential basis. "All was de-identified by IATA," Maurino said. Boeing and Airbus also briefed the task force on their respective design philosophies, defense mechanisms and technology to prevent inadvertent slide deployments.

"The IATA Safety Department analyzed data to evaluate the rates of deployment by fleet and also conducted statistical analysis on incidents," he said. Sector data — number of events divided by number of sectors flown by those carriers — were used to study events by fleets. IATA staff, working with the task force and the Line Operations Safety Audit (LOSA) Collaborative at the University of Texas at Austin, U.S., also developed a version of the threat-and-error management (TEM) method for cabin operations. "The task force itself looked at case studies and conducted detailed analysis of events using the TEM framework … to identify recurrent contributing factors and develop prevention strategies," Maurino said.

Toolkit Highlights

The *Toolkit's* modules begin with a review of normal door operation using IATA best practices as SOPs, while acknowledging that elements of existing airline SOPs may have to supersede module elements. One module, illustrated with close-up color photographs of type-specific door and slide controls, focuses on items that the task force calls "advantages" and "drawbacks" — characteristics that might cause problems if not well understood — of several door designs.

Best practices for normal situations include:

- Cross-checking the arming/disarming of the opposite door by walking across the cabin for a close-up visual check;

- Using the interphone to confirm arming to the purser(s) — sometimes called in-charge cabin crew or in-flight service managers;

- Assigning the purser to centrally cross-check arming status with on-board technology such as a flight attendant panel;

- Assigning the flight crew to centrally cross-check door status from the electronic centralized aircraft monitor on the flight deck;

Correct use of aircraft-specific technology — such as the interface elements for this Airbus A380 door — is one of the basic defenses.

Wayne Rosenkrans

- Providing SOPs that help ensure that doors are not armed or disarmed without an explicit order from the flight crew or purser;

- Assigning two cabin crewmembers — an operator and a checker — to conduct any internal door–opening SOP; and,

- Reinforcing by training that, because of the risk of being ejected from the airplane to the ground, a crewmember must not attempt to keep closed any armed door that has been opened.

The *Toolkit* provides additional guidance for "specific situations" — those generating threats and requiring extra vigilance — because they disturb routines and make human errors more likely. These include ferry, delivery or positioning flights without passengers; return to the departure gate; refueling with passengers aboard the airplane; malfunction of a door; in-flight reassignment of cabin crew stations; and reopening of a door.

Also covered are human factors risks and mitigations for fatigue; mixed-fleet duty, leading to confusion and negative transference of skills; distractions and time pressure; deviation from SOPs and nonpunitive reporting as a countermeasure; multi-tasking; environmental conditions, such as frozen condensation causing a stuck girt bar; and the human-machine interface. Other modules provide case studies; explain the reduction of risk when doors automatically are disarmed whenever they are opened from the outside; and offer current advice for SOP developers, checklist/placard/memory aid designers and cabin safety instructors.

Early STEADES Trends

The 2006 STEADES report was the first to begin quantifying possible effects of this initiative, according to Maurino, but the task force looks forward to perhaps a 50 percent reduction in events by the end of 2010. "When adding up all the cases of inadvertent slide deployments caused by cabin crew (including pursers), a downward trend (from 63 percent of all deployments in 2003 to 47 percent in 2005) was noted," the report said. "Cabin crew distraction, time pressure and multi-tasking/workload were among the main contributing factors on the rise in 2005. … Ground crew were second to cabin crew … [with] a slight increase in the number of these events." Maintenance personnel ranked third in causing inadvertent slide deployments.

For 2004 and 2005, IATA researchers analyzed the last two years of cabin crew–related inadvertent slide deployments by phase of flight. About half of the events occurred during the arrival phase — taxi-in and parking at the gate — making it predominant. About one-fourth of the events happened during the departure phase — boarding, pushback or taxi-out. The remainder occurred during other phases.

The majority of events in 2004–2005 were linked to specific situations. "Despite a decrease, these remain significant," the report said. "In 2005, the main [specific] situation … was reopening of cabin doors. There was a noticeable increase in this factor from 28 percent … in 2004 to 66 percent in 2005. … Reassignment of cabin crew stations in flight … is often linked to [confused] door responsibility among cabin crew and the absence of a briefing to clarify which crewmember is responsible for which door after stations are switched." The task force also recommended that pursers be the focus of a specialized training emphasis.

Each iteration of the *Toolkit* has received positive feedback — such as the letter from the CEO of a large airline that said the airline "had problems with [inadvertent] slide deployments and applied the *Toolkit* with great results," Maurino said.

Some airlines plan to update their prevention strategies based on ongoing monitoring to better link the initiative to measurable results. "The [*Toolkit's*] third revision … allows airlines to conduct line observations to monitor how SOPs are being implemented and how effective training is, and to correct these if necessary," Maurino said. "We are in constant contact with IATA members, and they often come to us, share their successes and ask for guidance if needed. We keep track of these interactions."

The free *Toolkit* material can be downloaded from <www.iata.org/whatwedo/cabin_safety/toolkit>. ●

Notes

1. International Air Transport Association (IATA). *Cabin Operations Safety Toolkit: Inadvertent Slide Deployment Prevention.* Third revision, 2007. Other elements of the *Toolkit* cover turbulence management; cabin safety management systems; and a cabin safety quality system.

2. U.S. Federal Aviation Administration (FAA). Aviation Safety Information Analysis and Sharing (ASIAS). Accident and Incident Database (AID) report no. 20010330009209C, March 30, 2001.

3. U.S. National Aeronautics and Space Administration (NASA) Aviation Safety Reporting System (ASRS). Report no. 543627, April 2002.

4. NASA ASRS. Report no. 707177, August 2006.

5. IATA. *STEADES Safety Trends Analysis.* "Monitor and Cross-Check: Inadvertent Slide Deployments, 2003–2005." Issue 1, 2006. STEADES is IATA's Safety Trend Evaluation Analysis and Data Exchange System.