



Communicating From the Pushback-tractor Seat Helps Prevent Serious Injuries

Accident investigations, working groups and surveys have recommended methods of increasing worker safety during pushback operations. Airlines and ramp-service contractors have adopted engineering solutions and many changes based on awareness of human factors.

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FSF Editorial Staff

Aircraft pushback accidents involving injuries have occurred relatively infrequently in recent years, but robust preventive measures are required because injuries typically have been severe, international specialists said. Implementing changes to prevent injuries and fatalities among airport workers who conduct pushback operations has been difficult in some countries.

Pushback-accident prevention worldwide is still over-reliant on worker behavior, said Geoff Dell, dean, College of Fellows, Safety Institute of Australia.¹ In early 2004, he informally surveyed 24 major airlines that had participated in his earlier pushback-safety research; the 1994 report was published by Flight Safety Foundation.² The 2004 responses, with few exceptions, suggested that pushback accidents have “markedly diminished” but some apron personnel have not benefited from current safety knowledge, he said.

“Despite the apparent downturn in accident numbers, overall I would have to say that the aviation industry has been only partially successful in reducing the risk of pushback-runover accidents,” Dell said. “In principle, the need to protect ramp personnel from the kinetic energy of the moving aircraft and the pushback tractor still exists. The 1994 study findings are just as valid today.”

Among the 1994 study’s recommendations were: use cordless headsets; use towbarless tractors; place the lead agent (also called the dispatcher, crew chief or headset operator) on the tractor as the driver (one-person pushback); delay engine



starts until after pushback; and improve training and supervision for pushback operations. Dell attributed the partial success to several factors.

“Only in the United States and Scandinavia has anything approaching a shift to one-person pushbacks been achieved,” Dell said. “In most parts of the globe — including Australia — pushbacks are conducted predominantly by personnel walking beside the aircraft nose; the penetration of towbarless tractors into the market has been limited. Cordless-headset technology did not gain acceptance by airlines, principally because of concerns about frequency congestion/interference,

etc. The industry culture in many parts of the world continues to support the notion that a licensed maintenance technician must be available to react to emergencies during pushback and engine start, despite there being no hard evidence.”

Faulty risk perception also has slowed the adoption of changes in pushback operations in some countries, he said.

“Individual companies and pushback operators perceive the risk as very low,” Dell said. “When viewed in the context of a single workplace, statistically the risk of a serious accident is very low. It is only when you consider industrywide data or global data that the risk climbs to a level that is sufficient to generate concern.”

Economic pressures on the world’s airlines, combined with the work of occupational safety and health authorities, have increased attention given to preventing pushback injuries, however, he said.

In New Zealand, studies and accident investigations during the 1990s led to broad recognition of hazards to lead agents who walk alongside the airplane during pushback, and to acceptance of procedures for wide-body airplanes in which pushback operations were directed from a seat on the tractor, said Norman Hogwood, principal of AeroGround Safety Services.³

“There was more difficulty ensuring clearance for narrow-body airplanes because of a more limited view from the tractor,” Hogwood said. “Some people still believe that it is necessary to walk alongside the airplane nose gear during pushback, but ideally the communication during pushback should be coming from the lead agent on the tractor. In my travels around the world, I have seen fewer people walking next to the airplane — by far — compared with a few years ago.”

Australian research on pushback safety in the early 1990s and a proprietary study in 2000⁴ have supported most of the recommendations of Dell’s report, said Ulrich (Ollie) Ojczyk, principal of Safety Always in Australia.⁵

“We conducted a two-week study of the pushback operation to identify any need for change to improve the safety of personnel without lowering any operational standards,” Ojczyk said of the 2000 study. “All comments were put into the safety-case matrix and evaluated with the end result being a consensus of all persons in the group. The findings from one live trial [i.e., trial during normal airline operations] recommended that the pushback procedure should be changed to have the lead agent seated next to the driver. Further trials were conducted with the Boeing 767, Boeing 737, Airbus A320 and BAE Systems Bae 146. The report said that pushback operations were no less safe when the leads were encapsulated with the drivers within the pushback tractors, but we decided that it was far more efficient, and far safer still, to do a single-person pushback. The primary recommendation was to get people out of harm’s way.”

In the United States, safety enhancements to pushback operations have echoed these conclusions, and have been augmented by applying current knowledge of human factors to training.

“Lead agents who ‘walk the headset’ outside the pushback tractor have a tendency to get hurt because they can be placed at risk by the aircraft nose gear,” said Gerry McGill, regional manager, outstations safety and regulatory compliance, Operations, Continental Airlines. McGill is chairman of the Safety Committee and chairman of the Human Factors Subcommittee of the Air Transport Association of America (ATA).⁶

“For the majority of pushback operations, most U.S. airlines use towbars and conventional tractors because towbarless tractors take up more room in the confined space at the gate and because of cost,” McGill said.

In some airports, major U.S. airlines have adopted large towbarless tractors to move aircraft around airports because they are relatively fast and efficient; smaller towbarless tractors are

used for pushback operations of many regional aircraft and are used by many fixed-base operators, McGill said. “For example, we have picked elite teams that do 110 towbarless moves a night at one airport, towing aircraft to the main hangar or prepositioning them to other gates for international flights,” he said.

For regional aircraft, most major U.S. airlines also conduct single-person pushbacks with specially designed heavy-duty tugs that are used to move baggage carts at other times.

A 2004 ATA survey of member airlines found that the majority conduct pushback operations with a lead agent-driver and two wingwalkers, McGill said. The exceptions include airlines that have implemented procedures for the use of one wingwalker or no wingwalkers. The lead agent is in charge of coordinating all gate operations and performs most ground-flight deck communication. Creation of this position has reduced safety occurrences, he said.

“The lead typically is an interviewed position [i.e., requires selection by an interview process rather than by seniority or ability to quickly perform turnarounds],” McGill said. “Training is extensive because the lead functions as the ‘captain of the gate.’ Wingwalkers use hand signals primarily to provide guidance to the lead agents, letting them know when the area behind the aircraft is clear, ensure that other vehicles have stopped moving so that the aircraft can come out of the gate, and stop any other vehicles observed coming toward the moving aircraft.”

Typical initial training of a lead agent includes how to communicate effectively with operators of all vehicles parked at the gate. Annual recurrent training also is required.

“This system involves more selective hiring processes and more intense training than the industry had in the past,” McGill said.

Moving the lead agents to tractors began to become popular around 1995 among major U.S. airlines, he said, based on trials of various methods and joint work by industry work groups and ground service equipment (GSE) manufacturers.

Cordless headsets have not been used widely by major U.S. airlines, he said. Instead, most have adopted a system that uses a spring-loaded reel with a retractable coiled cord or a resilient coiled cord equipped with strain-relief hooks to connect the tractor to the aircraft interphone panel. For communication during pushback operations, the lead agent-driver plugs the headset into a jack on the tractor. The reel lets out cord and maintains a taut cord that does not drag on the ground, which has been a tripping/snagging hazard. The coiled cord performs similarly.

“This procedure enhances safety because the lead agent-driver is in continual, immediate contact with the flight crew on the aircraft,” he said. “So if something happens, this person immediately will take necessary actions. If the lead agent is *not* the tractor driver, he/she must use hand signals, so communication

from the flight deck to the driver will be delayed, and potential miscommunication between the lead agent and driver will be ever-present, especially during emergencies.”

Many U.S. airlines also have taken steps to standardize pushback-related interphone communication between the lead agent and flight crew, and precautions if hand signals are required.

“Ideally, the lead has exact words that must be spoken to the flight crew, and exact replies from the flight crew are required so that there is no confusion,” McGill said. “Causes of confusion may include background voices. If an aircraft interphone fails, our procedures require that the lead and the captain have a face-to-face conversation on the flight deck to make that sure hand signals are correct and understood.”

Under typical U.S. pushback procedures, engine starts are conducted during pushback — with exceptions — so that the tractor remains attached if the engine-start procedures fail, and interphone communication normally continues until terminated by the flight crew.

“A 45-mile-per-hour [72-kilometer-per-hour] wind from the back of an aircraft, combined with icy conditions on the ramp, could push forward the aircraft and twist the towbar, however,” McGill said. “In winter, the aircraft parking brake must be on and engines must be started after disconnect from the tractor. Both the lead and the aircraft captain have authority to delay engine start until the pushback has been completed.”

In the late 1990s, an ATA study of pushback-accident/incident data showed that no significant difference existed in the safety performance of maintenance technicians compared with ramp personnel. Most U.S. airlines currently use lead agents for pushback operations; a few others are in the process of changing from the use of maintenance technicians for all pushback operations to using lead agents, he said.

ATA committees currently are working to standardize apron markings and ramp-service procedures, including pushback operations, among all member airlines, their codeshare/alliance partners and contractors, he said.

“Currently, if contractors are handling our aircraft at an outstation, their crews must be current in all of our airline’s procedures and technical differences,” McGill said. “For the past two years, ATA has been working on documents to standardize clearance distances, GSE positions and ramp procedures for the same type of aircraft.”

Extending to airside operations knowledge of aviation human factors also has been a major ATA effort during the past year.

“Any error already has been made, so we first want to look for threats that can be identified before we have an error — such as a pushback crew being overtired,” McGill said. “In the beginning stages, we are training leads in threat-and-error management — such as fewer than two wingwalkers, snowy conditions, late aircraft arrival, low visibility, high traffic congestion and other aircraft movements — to focus their safety decisions and actions. We also have developed a line operations safety audit for airside safety, in which employees are trained to do anonymous observations of apron operations.”

Recent engineering advances include efforts to introduce safety-zone scanners for automatic identification of aircraft, remotely controlled towbarless tractors and marshalling wands that wirelessly transmit warnings to the driver from the wingwalker(s).

“If a wingwalker sees a threat and only can cross wands to signal the driver to stop, the driver may be looking at that moment toward the other side of the aircraft or talking with the pilot,” McGill said. “With signaling wands, the wingwalker crosses the wands and presses a button that activates an audible alarm and flashing light on the tractor.”

Equipment maintenance contributes significantly to preventing pushback injuries.

“Maintenance of towbars is very important,” McGill said. “Crews must prevent the use of a bent towbar or an unsafe towbar shear bolt. They typically inspect tow bars on specific days for any bending or malfunction of wheel-lockdown mechanisms; check shear bolt clearances [which indicate prior stress on the shear bolt] and replace the shear bolt at specified intervals of several months regardless of the apparent condition. In one accident, contract ramp-service personnel installed a regular bolt into a towbar instead of the correct shear bolt. The driver overturned [oversteered] and, instead of the shear bolt shearing to prevent aircraft damage, the tow bar went up into the nose-gear doors and damaged a nose-gear hydraulic valve. We then required that all shear bolts have a red mark that can be seen readily by ground crewmembers.”



Aircraft pushbacks conducted by one lead agent-driver with a towbarless tractor are among methods preferred by ground-safety specialists.

ATA airlines also have been working on an agreement for standardization of ramp-crew training and licensing that will include pushback operations and hand signals, McGill said.

“One critical change for us has been that we do not just sign off individuals for pushbacks, they must be signed off on specific tractors and aircraft types,” McGill said. “As recently as two years ago, individuals were signed off to operate categories of GSE; now authorization is required for specific models of GSE because of the variations in control layout and operation.”

Another significant trend to affect pushback operations in recent years has been the introduction of a large number of regional aircraft by major U.S. airlines — which has meant that lead agents may push back a Boeing 757, then an Embraer regional jet is the next arrival at that gate, McGill said.

“Typical lead agents are qualified to handle almost all the aircraft types, which requires a lot of differences training, and every gate agent is cross-trained to do every job on that gate,” he said. “In today’s airline economic environment, it has to be that way.”♦

Notes

1. Dell, Geoff. E-mail communication with Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 12, 2004. Flight Safety Foundation, Alexandria, Virginia, U.S.
2. Dell. “Pushback Accidents Reviewed to Identify Causes and Prevention.” *Airport Operations* Volume 20 (May–August 1994).
3. Hogwood, Norman. Telephone interview by Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 7, 2004. Hogwood is a past general chairman of the International Air Transport Section of the U.S. National Safety Council, a retired ground-safety investigator for Air New Zealand and a founder of the Australasian Aviation Ground Safety Council.
4. AEA Technology – Aviation. “Ansett Australia: Aircraft Pushback Safety Assessment.” <www.aeat.co.uk> Accessed May 7, 2004. The Internet site said, “In 2000, AEA Technology was asked to conduct an independent safety study of Ansett [Australia] aircraft pushbacks with a view to recommending whether they could be amended to reduce the number of walking parties associated with the pushback. AEA Technology initially conducted a hazard and operability study (HAZOP) to identify the key hazards associated with aircraft pushbacks and then visited eight Australian airports to perform safety assessments associated with real working environments. Recommendations were made for each airport and, where appropriate, after a trial period Ansett Australia implemented revised pushback procedures without the need of a wingwalker and with the headset engineer located in the pushback tug.”
5. Ojczyk, Ulrich (Ollie). Telephone interview by Rosenkrans, Wayne, and e-mail communication. Alexandria, Virginia, U.S. May 7, 2004. Flight Safety Foundation, Alexandria, Virginia, U.S. Ojczyk is a former manager of ground safety for Ansett Australia and a founder of the Australasian Aviation Ground Safety Council.
6. McGill, Gerry. Telephone interview by Rosenkrans, Wayne. Alexandria, Virginia, U.S. May 6, 2004. Flight Safety Foundation, Alexandria, Virginia, U.S.

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Airport Operations

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