

BY RICK DARBY

Turnaround Story

Risk also lurks *between* flights.

Ground operations accidents and incidents were dominated by one causal factor — failure to comply with clearances — according to a study conducted by the Australian Transport Safety Bureau (ATSB) of occurrences at Australian airports, 1998–2008.^{1,2} The occurrences occurred most frequently on taxiways, at the gate and during pushback.

Ground operations accidents and incidents — called “occurrences” by the ATSB — are rarely spectacular enough to make headlines in the popular press. Nevertheless, they represent a risk significant enough that Flight Safety Foundation targeted them in its Ground Accident Prevention program. Based on data from the International Air Transport Association, the Foundation estimates the injury rate at nine per 1,000 departures. According to the *Boeing Statistical Summary of Commercial Jet Aviation Accidents (ASW, 8/10, p. 48)*, two accidents claimed the lives of ground workers in 2009: On May 19, at Miami, a cargo loader fell from a ladder to the ramp; on Dec. 21, a deicer fell from the bucket to the ramp.

“Ground operations are potentially one of the most dangerous areas of aircraft operation,” the report says. “They include any services necessary to manage an aircraft’s arrival and departure from an airport. Commercial aviation generally operates on small profit

margins, and short aircraft turnaround times are critical for airline efficiency. ... In some circumstances, ground operations do not go as planned or as required, resulting in safety occurrences which are the focus of this report.”

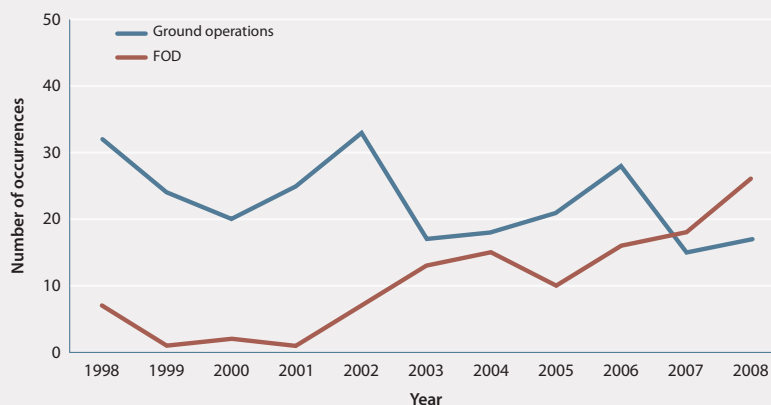
The number of ground operations workers involved in airliner turnaround is usually larger than that of crewmembers for the flight. Their various tasks must be performed according to clear rules and guidelines to avoid conflicting with aircraft, including moving aircraft other than those being serviced.

Of the 398 ground occurrences reported in the study period, about 71

percent were associated with ground operations and the rest with foreign object debris (FOD), the report says. FOD occurrences increased notably during the study period (Figure 1). Ground operations occurrences trended slightly down, with peaks in 2002 and 2006; the report has no explanation for the increases in those years.

During the study period, there were 282 ground operations occurrences. Those on a taxiway, at the gate or during pushback accounted for 34 percent, 28 percent and 26 percent of the total, respectively, for a combined 88 percent of occurrences.

Occurrences, Australian Airports, 1998–2008



FOD = foreign object debris

Note: Airports are those serving high-capacity aircraft.

Source: Australian Transport Safety Bureau

Figure 1

Six types of ground operations occurrences represented about 75 percent of the total. “Failure to comply with a clearance,” at 28 percent of the total, was most common type, representing more than double the next highest type, “collision or contact with an aircraft by a vehicle,” 13 percent of the total.

More than three-quarters of the ground operations occurrences had no “consequential events,” the report says. About 20 percent of the total ground operations occurrences were related to ground crew collision with a stationary aircraft, and about 2 percent involved aircraft collision with an object on the ground. Fewer than 1 percent

required passenger disembarkation.

The report analyzes the categories of occurrences according to whether they took place on taxiways, at or approaching the gate, or during pushback (Figure 2).

“About 77 percent of taxiway occurrences involved a deviation by vehicles from a surface movement

controller clearance (not a runway incursion),” the report says (Figure 3). Such failures, the report says, included using an incorrect taxiway; failing to stop at a taxiway holding point; failing to stay on the surface-movement control frequency; and failing to seek a clearance.

“The occurrences where vehicles nearly collided with aircraft involved a range of vehicles, including cars belonging to the Australian Customs and Border Protection Service, catering trucks, tugs and fuel trucks,” the report says.

Near collisions between aircraft on the ground were “infrequent, but potentially serious,” the report says, adding that “separation standards apply to aircraft in the air, but there are no specific separation standards on taxiways — much the same as cars on the road.”

In those near collisions, “some aircraft were taxiing at a high groundspeed, in one case estimated to be 30 kt; there are no speed limits for taxiing aircraft.”

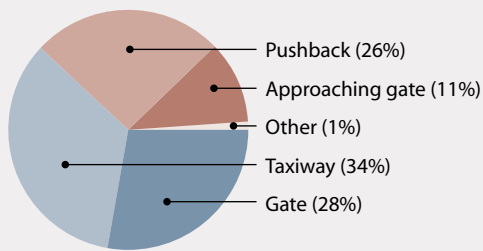
Gate occurrences, the second-most-frequent type of ground operations occurrences, were analyzed according to three subcategories: approaching the gate, at the gate and pushback.

The most commonly reported subcategory of approach-to-gate occurrences was “near-collision with aircraft by vehicle” (Figure 4). “These occurrences required immediate braking action by the flight crew or vehicle driver in order to avoid a collision,” the report says. “Occasionally, cabin crew were injured during these events, as they were out of their seats preparing for arrival; the act of sudden braking threw them off balance.”

The second-most commonly reported occurrence in the approach-to-gate subcategory was “ground equipment/obstacle clearance.” Generally, this meant a vehicle operating outside its prescribed clearance area as an aircraft approached the gate.

Occurrences at the gate most often involved actual collision or contact — rather than near-collision — by a vehicle and an aircraft (Figure 5). The report says that this subcategory was probably under-reported, because the ATSB only learns of accidents and incidents while an

Ground Operations Occurrence Types, Australian Airports, 1998–2008

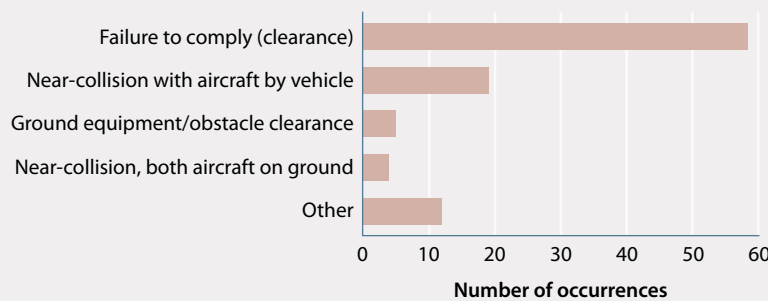


Note: Airports are those serving high-capacity aircraft.

Source: Australian Transport Safety Bureau

Figure 2

Taxiway Occurrences, Australian Airports, 1998–2008



Note: Airports are those serving high-capacity aircraft. Occurrences in the “Other” category involved a vehicle that was parked in the instrument landing system critical area when weather was below minimums; vehicles on perimeter roads operating contrary to traffic lights used to stop vehicles when aircraft land (two occurrences); and a large aircraft making a 180-degree turn, damaging lighting and pavement.

Source: Australian Transport Safety Bureau

Figure 3

aircraft is being prepared for takeoff or before disembarkation of passengers and crewmembers.

“Damage occurred in 45 percent of reported occurrences where the aircraft was at the gate,” the report says. “Most of the damage came from vehicles, but three occurrences involved ground equipment collisions and [another] involved an aircraft rolling and striking a terminal wall.”

Among vehicles colliding with aircraft at the gate, the most common were cargo or container loaders; mobile stairs; and catering trucks (Table 1, p. 52). Of collisions at the gate, “about 50 percent occurred as the vehicle or object was being driven up to, or away from, a door,” the report says. “Approximately 23 percent of vehicle or object collisions involved contact with a wing, horizontal stabilizer or engine. ...

“It is interesting to note that airlines using predominantly hand-push vehicles for loading and unloading of luggage and passengers appear to have fewer ground operations occurrences involving damage. Use of motorized vehicles around aircraft cannot be totally eliminated, as pallet container and catering trucks must continue to lift heavy items into the cargo hold of an aircraft.”

Pushback occurrences, the third-most frequently reported category in ground operations, were identified as those occurring during the time between connection of a tug or PPU and the time an aircraft taxis under its own power. “Commonly, pushback might involve up to four ground personnel, including a tug or PPU driver, a dispatcher and possible observers,” the report says.

Pushback involves a strict sequence. “This includes connecting the push unit [tug], releasing the aircraft brakes, pushing the aircraft back onto the taxiway and disconnecting the push unit,” the

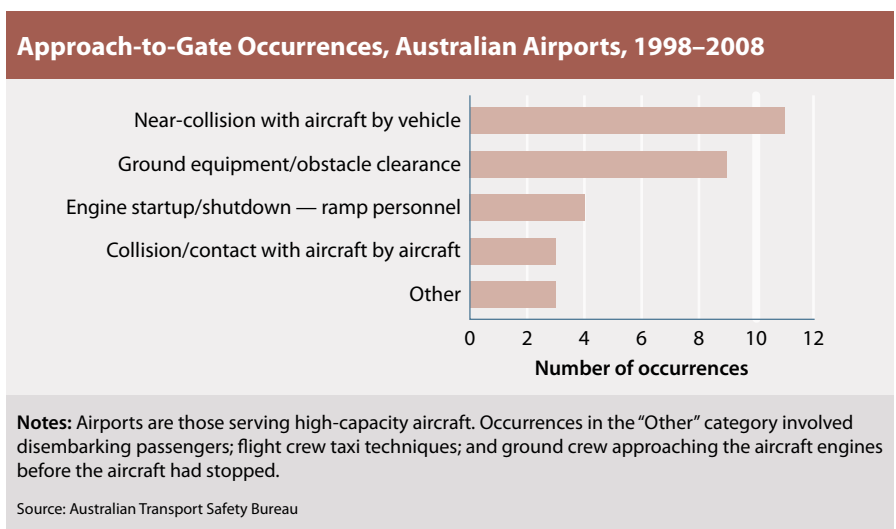


Figure 4

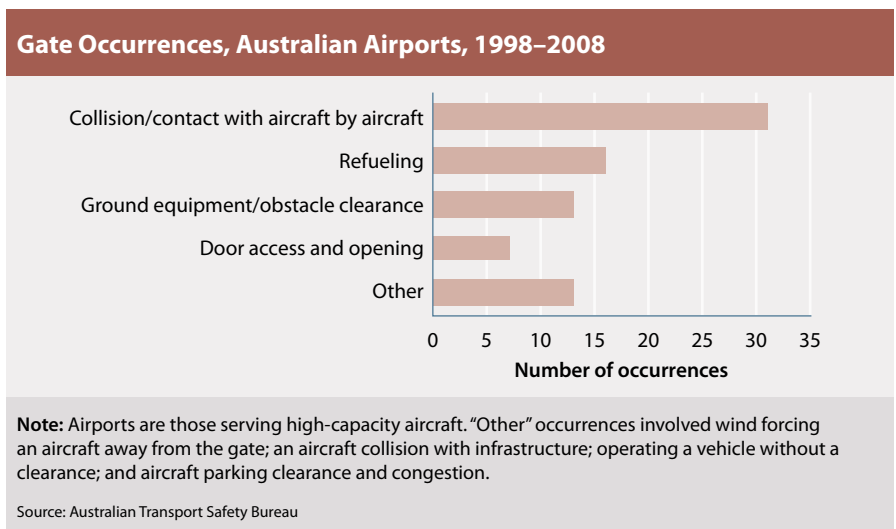


Figure 5

report says. “A clear line of communication is required at all times between flight and ground crew. With PPU [power push units] and tug towbar pushes, a large amount of energy is exerted on the aircraft nose or main landing gear to provide enough inertia to move the aircraft. Sometimes these components fail, and this poses a significant risk to the tug unit and driver, as the driver is usually positioned under the aircraft.”

Four subcategories dominated, in total accounting for about 80 percent of pushback occurrences: tug or PPU connection and breakage; failure to comply

with pushback clearance procedures; inadvertent aircraft door opening; and collision with aircraft by a vehicle (Figure 6, p. 52).

Occurrences involving tug or PPU connections and breakages consisted of events such as pushback begun with the airbridge still connected; pushback begun without inserting the aircraft steering lockout pin; premature disconnection, resulting in the aircraft rolling forward or backward; and using an incorrectly configured tug for the aircraft, causing the tug roof to strike the aircraft fuselage.

FOD occurrences, which increased from seven in 1998 to 26 in 2008 — a 271 percent jump — were “most frequently reported during the busiest hours of operation at most airports in Australia, between 7 a.m. and 7 p.m.,” the report says.

“FOD comes from many sources. Material sometimes falls from aircraft, maintenance vehicles and aircraft

handling equipment onto runways, taxiways and the airport aprons [ramps]. In the case of aircraft, the physical stresses exerted during takeoff and landing place high loads and vibrations on tires, engines (reverse thrust) and landing gear components, which can cause poorly secured components to loosen and separate.”

The most common form of FOD reported — about 25 percent of the FOD occurrences — was aircraft components, the report says.

“In terms of high-capacity aircraft, components making up the engine reverse-thrust assemblies were most commonly reported and included blocker doors, door assembly pins and bolts, bushes, and plates,” the report says. “Less commonly reported FOD items from aircraft were landing gear doors, de-laminated material from flaps and control surfaces, struts and landing lights. Most of these components were found on the runway strip rather than on or near taxiways and airport aprons.”

Tools or equipment accounted for about 19 percent of FOD occurrences. “The reports showed [that] a variety

of tools and equipment were found on runway strips, taxiways and aprons, including screwdrivers, a 15-L [4-gal] can of paint, spanners and wrenches, a torch [flashlight], wire, a headset and rags.”

About 11 percent of reported FOD occurrences damaged airframes, wheels or engines. Four FOD occurrences occurred during takeoff, with one resulting in engine ingestion of the FOD and a return to the gate, and three tire blowouts entailing a rejected takeoff and return to the gate.

“FOD occurrences leading to aircraft damage occurred not only on the runway strip, but on taxiways and the aerodrome gate,” the report says. “Nine of the 116 occurrences ... occurred on the aerodrome apron and 12 occurred on taxiways. Examples of foreign objects found on aprons and taxiways included a box, paper and plastic sheets, which are all capable of being ingested into an engine.”

Notes

1. ATSB. *Ground Operations Occurrences at Australian Airports 1998 to 2008*. ATSB Transport Safety Report, Aviation Research and Analysis AR-2009-042. June 2010. Available via the Internet at <www.atsb.gov.au/media/1529837/ar2009042.pdf>.
2. The data are for airports that accommodate high-capacity aircraft, those with a maximum payload greater than 4,200 kg (9,259 lb) or more than 38 seats.

Occurrences are divided between *ground operations occurrences* and *foreign object debris (FOD)*. Ground operations occurrences are defined as “operations involving aircraft handling, and operations on the airport apron and taxiways, as well as movements around the aerodrome.”

FOD occurrences are defined as “any object found in an inappropriate location that — as a result of being in that location — can damage equipment or injure crew, passengers or airport personnel.”

Vehicle Types Causing Damage, Australian Airports, 1998–2008

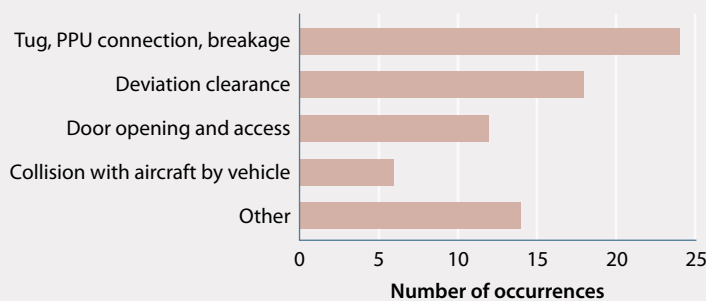
Vehicle Causing Damage	Number	Percent
Cargo or container loader	8	24.2
Mobile stairs	8	24.2
Catering truck	4	12.1
Airbridge	3	9.1
Passenger lifter	3	9.1
Belt loader	3	9.1
Tug	2	6.1
Baggage trolley	1	1.3
Fuel truck	1	1.3
Total	33	100.0

Note: Airports are those serving high-capacity aircraft.

Source: Australian Transport Safety Bureau

Table 1

Pushback Occurrences, Australian Airports, 1998–2008



PPU = power push unit

Note: Airports are those serving high-capacity aircraft. “Other” occurrences included near aircraft-aircraft collisions; near vehicle-aircraft collisions, where pushback was stopped to avoid a collision; flight crew monitoring lapses, including making sure the aircraft dispatcher was disconnected before starting to taxi; and ground crewmembers being close to an operating aircraft engine.

Source: Australian Transport Safety Bureau

Figure 6