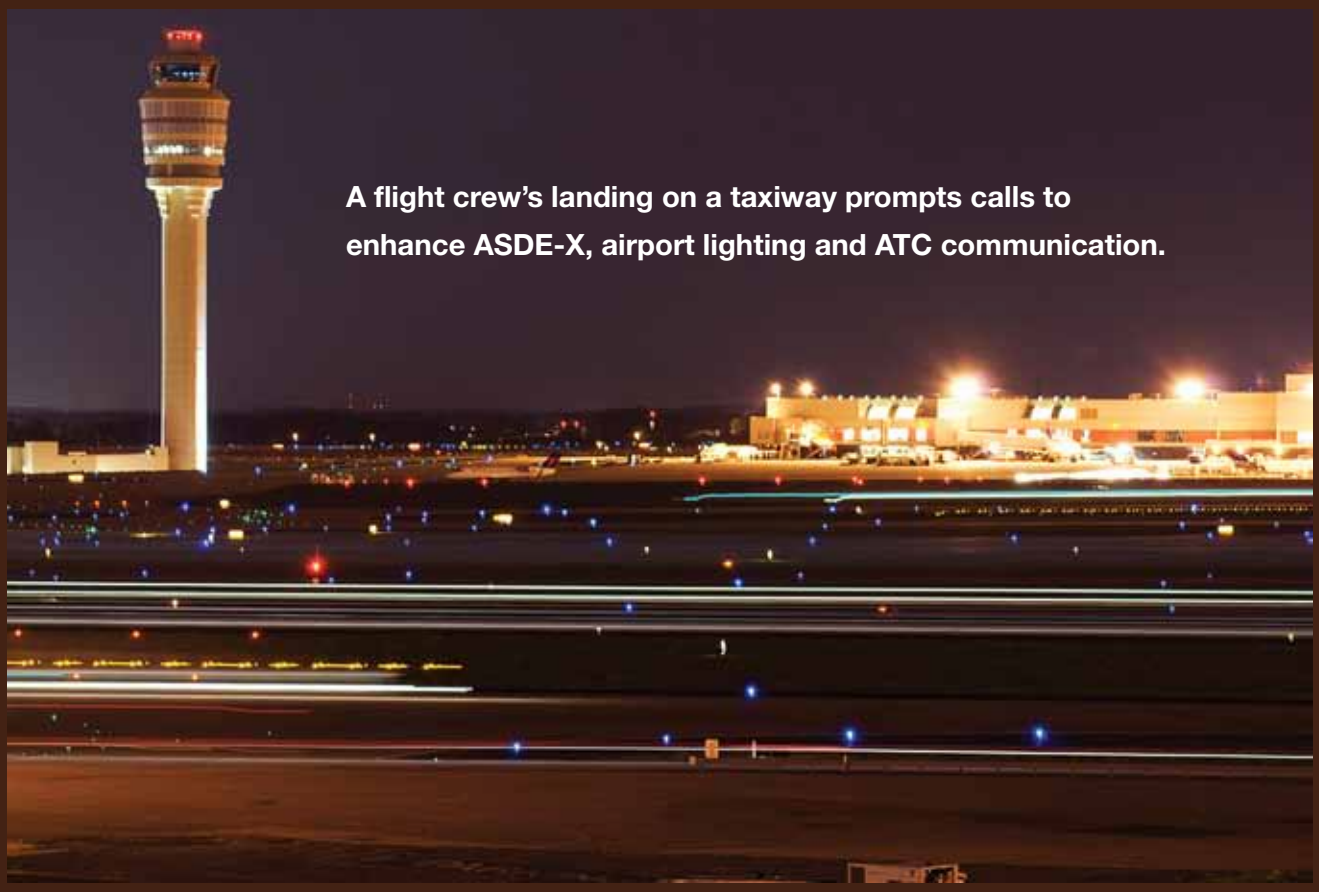


A flight crew's landing on a taxiway prompts calls to enhance ASDE-X, airport lighting and ATC communication.

BY WAYNE ROSENKRANS

New proposals to augment airport surface detection equipment, model X (ASDE-X), and tighten airfield lighting practices have lengthened the list of safety recommendations inspired by a nighttime taxiway-landing incident. The landing involved a Boeing 767-300ER at Hartsfield-Jackson Atlanta International Airport (ATL), recalls the U.S. National Transportation Safety Board (NTSB). No injuries or aircraft damage occurred at 0605 local time on Oct. 19, 2009, when the Delta Air Lines flight being handled as a medical emergency — and initially cleared to land on Runway 27L — was cleared by air traffic control (ATC) to land on Runway 27R, a runway usually assigned for departures.

One minute and 40 seconds after accepting the side-step approach, the flight crew landed on Taxiway M, 200 ft (61 m) north of and parallel to the runway. The weather for the airport, reported at 0552, included calm winds and clear sky with visibility of 10 mi (16 km).

Having explained in October 2010 the human factors of pilot fatigue and the incapacitation of one of the three pilots on this flight (*ASW,* 12/10–1/11, p. 59), the NTSB turned in its March 2011 safety recommendation letter to the potential for airport infrastructure and ATC to exacerbate or mitigate a flight crew's errors and misperceptions. The safety recommendation letter emphasizes "non-causal aspects of this incident that present opportunities to improve ATC detection of potential taxiway landings and management of taxiway light settings."

The probable cause of this incident, which occurred after a 9.5-hour flight from Rio de Janeiro, Brazil, to Atlanta, was: "The flight crew's failure to identify the correct landing surface due to fatigue. Contributing to the cause of the incident were the flight crew's decision to accept a late runway change; the unavailability of the approach light system and the instrument landing system [ILS] for the runway of intended landing; and the combination of numerous taxiway signs and intermixing of light technologies on the taxiway."

The captain and first officer had been based at this airport for five years and eight years, respectively, and told

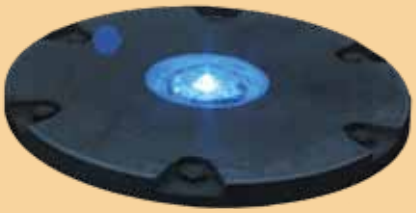
Omoo at en.wikipedia

Blue Edge Lights

NTSB investigators that they had difficulty recalling more than one previous experience of landing on Runway 27R. The captain said that in assessing risks after one pilot had become incapacitated, he had wanted to have available to the crew all possible "aids and resources from inside and outside the cockpit."

When the aircraft was on the ILS Runway 27L approach near the final approach fix, the local controller offered the side-step to the closer Runway 27R. "[The captain, intending to expedite the gate arrival,] said they had the parameters, and since they were an emergency, he decided to accept it and asked the first officer to set up the approach for 27R," the NTSB said. "[He] said he looked up and saw the edge lights, 'locked in' on the precision approach path indicator [PAPI] lights because he did not have the glide slope [or flight director], and followed them in. … [He said,] 'I glanced at the centerline lights for alignment information. I continued to focus on the PAPI until short final, at which point I looked ahead, aligned the aircraft and started to flare.' … He said when the main wheels touched down and he was in reverse [thrust], he realized the edge lights were blue, not white, and at that point 'it was too late [to go around].'" The captain said that he had not requested that ATC turn on the approach lights for Runway 27R because he believed that he already had identified that runway.

Multiple visual cues could have misguided the captain to align with Taxiway M instead of Runway 27R while on final approach, however, the NTSB said. "These cues included numerous taxiway signs along the sides of Taxiway M which, from the air, appeared to be white and could be perceived as runway edge lights. In addition, the blue light-emitting diode (LED) lights used on the eastern end of Taxiway M [Figure 1, p. 44] were perceived to be brighter than the adjacent incandescent lights on the airfield, and the alternating yellow and green lights in the ILS critical area [of Taxiway M] provided the appearance of a runway centerline.



"Observations made from the flight deck during [four post-incident 767 approaches flown to recreate the appearance of relevant airfield lighting] indicated that when the lights were set to the same levels as were encountered by the incident crew, from about DEPOT intersection [the final approach fix for ILS Runway 27L], the Runway 27R centerline lights were not identifiable and the Taxiway M centerline lights were more prominent. When established on final, the taxiway signs were more visible than Runway 27R edge lights. At about 500 ft above ground level, the runway centerline lights were barely visible and it appeared that some lights may have been out. The color of the blue taxiway edge lights became distinguishable at about 500 ft above ground level while on approach."

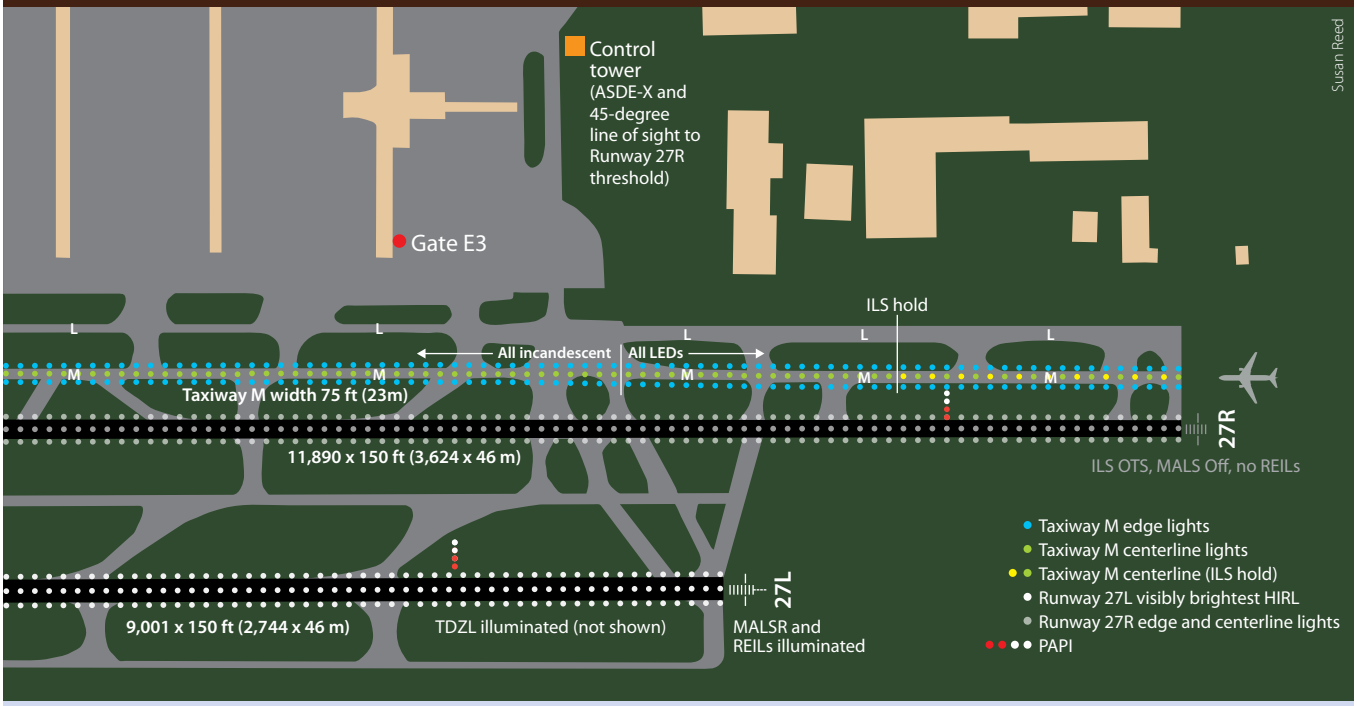
Observations by flight test lighting-evaluation participants were recorded, including: "Taxiway signs are very enticing to the eye. … At about 2,500 ft, the runway [27R] is virtually invisible and green lights being seen are the taxiway lights. … When 1 DME [1.0 nm (1.8 km) slant range on distance measuring equipment] from DEPOT, the taxiway appeared to be the runway."

Airfield Lighting Practices

The incident local controller told investigators that ATL airfield lighting presets periodically were re-selected according to time of day and visibility criteria, and that "[ATC] never changed the intensity of the lights unless a pilot requested it."

The investigation revealed that local controllers' ability to operate taxiway and runway lights from the touch-screen panel in the tower and the airport's lighting-intensity preset options did not conform to FAA standards and/or guidance. Among unrecognized

Context of Inadvertent Night Visual Landing on ATL Taxiway M



ASDE-X = airport surface detection equipment, model X; ATL = Hartsfield-Jackson Atlanta International Airport; HIRL = high-intensity runway lights; ILS = instrument landing system; LEDs = light-emitting diodes; MALS = medium-intensity approach lighting system; MALSR = MALS with runway alignment indicator lights; OTS = out of service; PAPI = precision approach path indicator; REILs = runway end identifier lights; TDZL = touchdown zone lights

Note: The flight crew conducted the ILS Runway 27L approach with a side-step maneuver to Runway 27R but landed on Taxiway M. The maneuver began from the altitude of 2,800 ft at the final approach fix about 5.4 nm (10 km) from the 27L threshold.

Source: U.S. National Transportation Safety Board

Figure 1

problems, the system did not provide controllers with accurate intensity information for all preset lighting, and controllers were unaware of these discrepancies, the NTSB said.

"The edge and centerline lights for Runway 27R were set to step 1 [the correct minimum intensity, as the FAA specifies during nighttime visibility of more than 5 mi (8 km)] at the time of the incident, the edge lights for Taxiway M were set to the maximum settings [that is, step 3 on the east and west ends and step 5 in the mid-section instead of the FAA-specified step 1 for all edge lights], and Taxiway M centerline lights were set to step 2 [instead of the FAA-specified step 1 for the east and west ends and step 3 for the mid-section]."[1,2]

An airport maintenance supervisor noted that management had directed that the nighttime appearance of the north and south sides of the airport be uniform, and also had increased the centerline preset for Taxiway M to step 2 "to compensate for the difference in the output level of the LED and the incandescent lighting," the NTSB said.

Notably, one observer in the tower during the lighting-evaluation flight also saw this, saying, "The taxiway edge lights for the entire airport were much brighter than the runway lights, which made it a challenge in identifying the runway lights among the taxiway lights."

The NTSB's latest safety recommendations call for advisory circular (AC) revisions clarifying that airport operators should inform air traffic managers of such changes. The NTSB also proposed amending FAA Order 7210.3, "Facility Operation and Administration," to direct that "at airports with air traffic control towers equipped with airport lighting control panels that do not provide direct indication of airport lighting intensities, the air traffic manager annually reviews and compares, with the airport operator, the preset selection settings configured in the tower lighting control system to verify that they comply with FAA requirements."

FAA officials in 2009 told the NTSB that a forthcoming AC restricting mixing of LED and incandescent lighting was not prompted by a safety concern but rather by "pilot perception of the

lights being different [in brightness and color]" and pilots' preference for consistent lights on the same movement surface although "LEDs only appear brighter in clear visibility due to chromaticity and saturated color." New limitations on mixing light source technologies were addressed with the September 2010 release of AC 150/5340-30E, "Design and Installation Details for Airport Visual Aids."

ATC Surveillance

The latest recommendations also propose that the FAA study and, if feasible, enhance ASDE-X (*ASW*, 9/08, p. 46). The NTSB already has obtained a preliminary technical review by the manufacturer. "Sensis [Corp.] found that software modifications could possibly enable ASDE-X to detect a potential taxiway landing at ATL at a distance of up to 0.75 m [1.2 km] from the runway threshold and 15 seconds from touchdown and provide an alert to controllers," the agency said. "A more thorough evaluation of the system should be conducted to determine whether ASDE-X logic can be modified systemwide to detect … improper operations such as landings on taxiways."

Despite good prevailing visibility during the incident, the controller and supervisor who were observing the arrival did not recognize the widebody passenger jet's misalignment because of the 45-degree viewing angle from the tower to the threshold of Runway 27R and the east end of Taxiway M, and the airplane lights intermittently blending with city lights. The controller told investigators that the distance between this runway and taxiway was a factor.

"He also stated that, as [the aircraft] approached Runway 27R for landing, he checked the ASDE-X display and saw that the system's safety logic bars were raised, which indicated to him that the aircraft was lined up to land on Runway 27R," the NTSB said. "In addition, no alerts were being emitted by the ASDE-X, which indicated to the controller that the runway was clear of other traffic and that it was safe to land. … The ASDE-X's verification of the aircraft's position relative to the runway, combined with the visual uncertainty, provided a false confidence that the aircraft was lined up for Runway 27R."

Human Factors

Lack of information from ATC to the crew about some of the risk factors involved in landing on Runway 27R was cited by the NTSB and by a written submission by the Air Line Pilots Association, International (ALPA).

The flight crewmembers, who had briefed the other approaches that they had been assigned or that they had expected, lacked sufficient time to brief the approach to Runway 27R. They were "not aware that the approach light system [which was turned off to accommodate airport construction] and the ILS [which normally was not turned on except when rare arrivals were at or outside the outer marker] were not available to aid in identifying that runway," the NTSB said. After this incident, ATL tower management implemented a standard operating procedure for local controllers to notify flight crews about the status of the approach light system and ILS.

During interactions with the local controller, however, the incident flight crew did not advise ATC that the airfield lighting was a problem or express any reluctance to side-step from Runway 27L, although this runway had the advantages of a full complement of approach and runway lighting, including runway end identifier lights and touchdown zone lighting, and a functioning ILS already set up as the backup to visual navigation.

"At approximately 0603, the local controller asked [the flight crew,] 'Do you have Runway 27R in sight, and would you like to land on it?" the NTSB said. "[The crew] responded, '27R is in sight and we would love to land on it.'" The controller told investigators that he offered the side-step because "the aircraft had a medical emergency on board and Runway 27R would eliminate excessive taxi time because it is closer to the ramp area." Only a few side-steps were conducted per day, and medical emergencies were a common reason.

ALPA's interpretation of the incident also cited failures to communicate about the difficulties actually occurring. "While air traffic controllers at ATL were trying to provide assistance to the inbound emergency aircraft, their actions created more workload for the flight crew," ALPA said. "Controllers should be aware of the briefings that have to take place with each runway change." The pilot union also recommended that the FAA's ATC policy order instruct controllers to "provide pilots during last-minute runway changes … any NOTAMs [notices to airmen] relevant to that runway (e.g., lighting and navaid [navigation aid] out of service)."

Notes

1. The FAA's only exceptions to standard settings for airfield lighting are situations in which an ATC facility directive has specified other settings or times to meet local conditions, a pilot has requested different settings, or a controller deems different settings to be necessary and those settings are not contrary to pilot request.
2. On a three-step system, the intensity is 100, 30 or 10 percent of the maximum 6.6 amps. On a five-step system, the intensity options are 100, 80, 60, 40 and 20 percent of the maximum 6.6 amps.