



March 10, 2023

Sathya Silva
Investigator-In-Charge
National Transportation Safety Board
490 L'Enfant Plaza SW
Washington, DC 20594

Reference: FedEx Flight 1170, DCA22LA126

Dear Ms. Silva,

Per the National Transportation Safety Board (NTSB) rules, the Air Line Pilots Association, International (ALPA) submits the attached comments and conclusions concerning the incident of Federal Express flight 1170, a Boeing 757-236 aircraft. This incident occurred on June 8, 2022, during landing at Tulsa International Airport.

The following contains a synopsis of ALPA's analysis of the facts surrounding the event, based on the information obtained through the NTSB's investigation. ALPA's suggested Safety Recommendations are based upon these same facts.

History of flight

On June 8, 2022, at about 0415 Central Daylight Time (CDT), FedEx flight 1170, a B757-236, N949FD, landed at Tulsa International Airport (TUL), Tulsa, Oklahoma. The flight crew was in contact with air traffic control. Prior to landing the flight was cleared for and acknowledged the clearance to land on runway 18L. However, radar data indicated that the flight lined up for and subsequently landed on runway 18R. After landing, the airplane received and executed a taxi clearance to the ramp. The two flight crew members were the only occupants on board and were uninjured. The flight operated under Title 14 *Code of Federal Regulations* Part 121 as a cargo flight from Perot Field/Fort Worth Alliance Airport (AFW), Fort Worth, Texas to Tulsa International Airport (TUL), Tulsa, Oklahoma.

ANALYSIS

There was a breakdown in threat mitigation during flight operations on June 8, 2022, when FedEx flight 1170 landed on the wrong runway at TUL. This specific incident points to several opportunities for improvement.

Runway Awareness and Advisory System (RAAS)

RAAS is a software enhancement hosted within the Enhanced Ground Proximity Warning System (EGPWS) unit to provide aural advisories to assist flight crew awareness of airplane position during ground operations, approach to landing, and go-around. The airports in the RAAS airport database include details for every runway on the airport.

It is essential to understand the various limitations in the RAAS from a system design, human perception, and man-machine interface perspective. There are significant restrictions to the system, some of which are detailed below. (Source excerpts from 757 Aircraft Systems Manual FedEx Express, Warning Systems starting on page 833)

Advisories do not ensure that the aircraft will land on the identified runway, nor do they imply that the aircraft can or cannot be safely landed, stopped, or taken off, from a runway. They also do not ensure that the aircraft will, or can be, stopped before hold lines, the runway edges, or the runway end.

The absence of advisories does not necessarily imply that the aircraft is approaching a surface other than a runway. The flight crew is responsible for using other means available to ensure correct runway selection and the performance calculations are accurate for the conditions. In the approach environment to TUL, the system was designed to annunciate as follows: Sounds once each time the airplane:

- Approaches within approximately three nautical miles of a runway threshold, and
- Is within 20 degrees of the runway heading, and
- Is within approximately 200 feet plus one runway width of the runway extended centerline, and is between 750 feet and 300 feet AFE.

Note: This voice annunciation is delayed and sounds at 450 feet altitude if the voice annunciation would have sounded when the airplane was between 550 feet and 450 feet above field elevation. If the criteria above are not satisfied before the aircraft descends below 300 feet AFE, the advisory is canceled.

Significant aural and visual indications have been demonstrated to be ignored by the crew in high-workload environments as part of mitigating task saturation via load shedding. There is only so much cognitive bandwidth, and in high-stress situations, load shedding may occur. Of significance in this scenario is the volume of this alert; it is at a decibel level below other aural alerts. In this case, a runway announcement differed from the expected annunciation only in the “18 right” versus “18 left”. Additionally, the system does not annunciate differences in programmed airport and runway from actual airport and runway alignment. The RAAS does not interpret the crew’s intent and therefore cannot identify an error (the system does not interface with the FMS, MCP or crew tuned NAVAID data). Current flight crew training does not train crews to be alert or confirm the runway based on the RAAS callout. In this specific case, the PM was concerned about the low glide slope indication, and his attention

was drawn to the more critical Flight Path Management than the audible alert.

The RAAS system is an open-loop system based on a digital map and GPS location. The audible announcements are often in conflict with ATC and internal cockpit communications. Some of these internal communications are required call outs or mandatory ATC communications and take priority over the RAAS alert. During flight training in the simulators the RAAS is often intermittently turned off to allow the instructor to speak to the students without RAAS interruptions. The net effect is that this audible display can be perceived as a nuisance and ignored by the flight crew.

Flight Deck communication

Flight deck communication currently relies on limited noise cancellation with "on the ear" headphones worn with foam earplugs and crews speaking to each other in a loud voice. It is common to ask a crew member to repeat what was said during normal operation. Technology exists which would allow "over the ear" noise cancellation. Over the ear noise cancelling headsets are worn without foam earplugs and offer a hot mike feature allowing the crew to speak in a normal voice with limited background noise.

FedEx fatigue mitigation

FedEx has a robust fatigue mitigation plan. Additionally, the FedEx pilots, through their union, self-fund a fatigue mitigation safety program. Modeling and schedule analysis has come a long way. During the planning stage pairings are screened to identify and mitigate fatigue risk based on the proprietary modeling software to correct at risk pairings in the planning stage of bid pack development. Operating in the real-world environment results in constant changes to the model that are not readily apparent to the crew.

The flight crew had a report time of 1850 Pacific Daylight Time (PDT), 2050 CDT. The crew then flew from Ontario International Airport (ONT), Ontario, California to AFW. The flight arrived at AFW about 0030 CDT. After post flight duties both crew members proceeded to a company provided crew rest room. The First Officer stated that he was able to get about 30 minutes of rest before preparing for their next flight. The captain, however, had difficulty resting and was unable to get any sleep. Their next flight from AFW to TUL blocked out at approximately 0330 CDT.

Through the FedEx fatigue mitigation plan, and an internal ALPA modeling program, trip pairings are analyzed for the risk of fatigue. Trips that compute a fatigue risk above a predetermined threshold are flagged and are modified or removed from the bid list.

For the incident flight, the pairing was also analyzed and the rest period between the two flights impacts the fatigue analysis in a way that reduces the fatigue risk. It is scientifically

proven that such rest periods, even rather short ones, can reduce fatigue. Yet, this is with the assumption that rest can be obtained. In this case, especially with the captain, who was unable to get any rest, this assumption was not met. The captain stated he slept for about 5 hours (from 2000 EDT to 0100 EDT) in the evening of June 6 before their flight from Indianapolis International Airport (IND) Indianapolis, Indiana. He further stated he slept 5.5 to 6 hours (from 0700 PDT to 1300 PDT) on the morning of June 7 and woke up at around 1300 PDT (1500 CDT). At the time of the incident, the captain was awake for over 13 hours while only having rested for a maximum of 11 hours for the 2 days prior to the accident, with that sleep occurring during unusual rest times. This disruptive sleep cycle contributed to the fatigue of the captain. In the case of the FO, even if one crew member indicates they slept for a block of time there is currently limited opportunity to validate the quality of that rest days later.

Air Traffic Control

ATC functions to provide safe operation in the dynamic and threat dense environment around airports. This link in the safety chain was ineffective. This incident highlights questions on equipment, environment, and procedure for the ATC component. Air traffic controllers can be one link that catches and announces an error in flight operations. Ideally, in an aircraft approaching the wrong runway, ATC would detect this error and intervene promptly. In this case, a foggy window was cited as a challenge in determining which runway FDX 1170 was lined up on. The controller indicates backing up aircraft position with radar for the base turn but does not indicate that final position was verified visually or with radar. There was distraction by an American Airlines maintenance aircraft in the moments where the controller could have made an alignment determination visually or with radar. The tower is situated between the parallel runways. This perspective should provide the controller with enough information to determine improper alignment visually and alert the crew in a timely fashion.

Airport Surface Safety Systems

The airport and TUL Air Traffic Control (ATC) tower does not have runway safety technologies installed such as Airport Surface Detection Equipment Model X (ASDE-X) or Airport Surface Surveillance Capability (ASSC). These surface safety systems are capable of determining the position and identification of aircraft and vehicles on airport movement areas as well as aircraft flying on final approach corridors to each runway. System capability includes alerting ATC when unsafe conditions between aircraft / vehicles exist within runway safety areas, detect wrong surface landing alignment, aborted arrival / departures, and arriving aircraft position.

Currently, 35 airports have ADSE-X and 8 airports have ASSC installed in operational ATC towers. However, all of these 43 towers may not have the safety logic function installed that alert ATC when an unsafe condition exists. The FAA should develop National Airspace System (NAS) policy standardizing system requirements.

Specific to wrong surface landings, NAS policy standards should require the safety logic system alert ATC (visual no aural) when aircraft are aligned to land on a taxiway; when ATC issues a landing clearance to a runway but the aircraft is aligned to land on a different runway, similar to **FedEx Flight 1170**; when an ATC clearance is issued to a runway not compatible to aircraft characteristics (i.e. length, weight, general aviation use only).

ATC Policy Guidance for Airport Surface Safety Systems

FAA Air Traffic Organization (ATO) policy contained in Joint Order (JO) 7110.65 prescribes ATC procedures and phraseology for use by personnel providing air traffic control services. Controllers are required to be familiar with the provisions of this order that pertain to their operational responsibilities and to exercise their best judgment if they encounter situations not covered by JO 7110.65

The JO 7110.65 contains explicit guidance controllers must follow when safety logic system generates an unsafe warning alert. Of note, JO 7110.65 does not have guidance that a controller must issue missed approach / go-around instructions when an aircraft is aligned to a runway that a landing clearance was not issued and no threat exists (i.e., runway is clear of aircraft, vehicles, personnel). A safety Risk Management Analysis may be required to add explicit guidance to JO 7110.65 when an aircraft aligns to a wrong runway when there's no threat but runway/aircraft incompatibility exists.

FINDINGS AND SAFETY RECOMMENDATIONS

Findings

- No system component failures were causal to the incident.
- RAAS runway callouts are not as loud as other aural warnings.
- Current flight crew training does not train crews to be alert or confirm runway based on the RAAS callout.
- Due to sleep schedule, the captain was likely fatigued upon approach to TUL.
- ATC did not recognize the aircraft lined up to the wrong runway.
- TUL ATC tower did not have an airport surface safety system that would have alerted ATC aircraft was aligned to land on the wrong runway.

Safety Recommendations

ALPA recommends:

- **To Rockwell International**

- Improve RAAS to annunciate differences between programmed and executed airport and runway alignment. Provide RAAS callouts that are unique and are annunciated at a higher volume when the aircraft is lined up at a different airport and/or runway than programmed. If an interface cannot be developed that would identify a wrong runway error, perhaps consideration of a software change that will announce the actual runway identification (Approaching Rwy XX) just after the 500 foot AGL call so that the crew can then acknowledge the correct runway in the clear to land call rwy XX” while the signal is still in their short term memory.
 - Increase the volume of the current annunciations.
- **To FedEx and ALPA**
 - Jointly produce a clear and direct communication that illustrates how a typical pairing would be adversely affected by missed or degraded sleep opportunities.
 - Consider developing models available to crews for pairing that require rest during turn to meet fatigue modeling for pairing.
- **To FedEx**
 - Study the feasibility of adding interphone communication with active noise attenuation (noise cancelling headsets) with hot mike capability to improve communication and effectiveness of aural alerts.
- **To FAA**
 - Install surface safety systems capable of determining the position and identification of aircraft and vehicles on airport movement areas as well as aircraft flying on final approach corridors to each runway at airports with operational ATC towers.
 - Ensure the surface safety system includes safety logic alert algorithms to identify wrong surface landings that includes alignment to taxiways, alignment to runways that ATC has not issued a landing clearance, and alignment to runways that are not compatible with aircraft landing characteristics (i.e., length, weight).

ALPA appreciates the opportunity to participate in this investigation and hopes that the attached Findings and Safety Recommendations will help as the NTSB concludes this investigation.



Norm Maxim
ALPA party coordinator