Aviation Investigation Final Report

Location:	Tulsa, Oklahoma	**Incident Number:**	DCA22LA126
Date & Time:	June 8, 2022, 04:15 Local	**Registration:**	N949FD
Aircraft:	Boeing 757-236	**Aircraft Damage:**	None
Defining Event:	Wrong surface or wrong airport	**Injuries:**	2 None
Flight Conducted Under:	Part 121: Air carrier - Non-scheduled		

Analysis

As the Federal Express (FedEx) flight 1170 flight crew approached the Tulsa International Airport (TUL), they mis-identified runway 18R as runway 18L and continued their approach and landing on runway 18R. After touchdown and hearing the “3000 feet remaining” call from the automated runway awareness and advisory system (RAAS), the captain recognized they had landed on the incorrect runway, applied heavy braking and was able to exit the runway at the final taxiway.

Figure 1. Final approach screenshot illustrating flight alignment with runway 18R.

Available Cues

As the flight was in visual meteorological conditions, there were available visual cues external to the airplane, to distinguish the runways from one another in their lighting, configurations, and the surrounding environments. These differences were all salient visual cues that should have enabled the flight crew to distinguish one runway from the other in visual meteorological conditions.

The flight deck provided both pilots with a primary flight display (PFD) and navigation display (ND), while only the captain had a heads up display (HUD) to aid in monitoring the progress of the flight. The first officer (FO) told investigators that the electronic glideslope on the PFDs and HUD which was set for 18L looked “normal” however he was concerned about their alignment with the visual glideslope (18R precision approach path indicator (PAPI)). The FO failed to realize that ultimately the airplane was showing “low” on the visual glideslope because of the parallel runways’ displaced thresholds.

Cognitive Phenomena

The flightdeck visual cues that were perceived by the flight crew were 1) the horizontal situation indicator (HSI) deviation bar being off to the left on the FO’s PFD; and 2) the captain’s HUD localizer being off to the left. It was FedEx policy to back up all approaches with the instrument landing system (ILS), however the flight crew appeared to discount the information their instruments were providing in favor of the view they had of the runway and understanding of their circumstances. The flight crew focused on their flightpath and decent rate for the runway they had already visually acquired, and the multiple visual cues that they were misaligned were not recognized.

Once they took manual control of the airplane and adjusted to the desired precision approach path, the flight crew proceeded with the landing without engaging in further confirming acts. This behavior is consistent with the psychological phenomenon of plan continuation bias which is the unwillingness to deviate from a previously determined course of action, despite the arrival of circumstances precipitating the need for a change. Once a plan is committed to, it becomes increasingly difficult for stimuli or changing conditions to be recognized.

Plan continuation bias is exacerbated by fatigue. In this incident, the flight crew was working within the window of circadian low and under circadian disruption. While the captain, who was the pilot flying, stated that he was not fatigued during the incident flight, he had been awake for more than 15 hours prior to the incident occurring and was likely experiencing fatigue due to chronic and acute sleep debt due to limited sleep in the days preceding the incident.

The flight crews lack of recognition of their error was likely affected by fatigue, plan continuation bias, and their inability to perceive and efficiently integrate available information.

Operator Fatigue Risk Management

When creating flight schedules FedEx determines the potential risk for fatigue for each pairing by using the Karolinska Sleepiness Scale (KSS) on a 1-9 scaled rating. In evaluating the pairings FedEx also collaborates with the Airline Pilots Association (ALPA) who uses SAFTE-FAST which incorporates both the KSS and the Psychomotor Vigilance Test (PVT) on a scale of 1-100% (100% being peak wakefulness). The resulting scores are then compared.

A KSS score of 7 or higher, or a SAFTE-FAST score of 70% or lower, typically indicated the pairing was of high risk and needed further review. The FedEx assessment of the incident flight pairing was a KSS of 6.39 and the score was established using the assumption that the flight crew would nap during their hub-turns. The ALPA assessment of the pairing was a 76.0% SAFTE-FAST score which also incorporates the nap assumption.

FedEx did not publish KSS pairing scores, nor did they provide the scores (including the 30-minute nap assumption) to the flight crew. FedEx crews were expected to nap on a hub turn but were not told that a nap is expected or why that expectation exists. When asked why they adopted this policy, FedEx fatigue risk management program (FRMP) manager expressed concern over overburdening flight crews with additional information.

The manager stated that FedEx feels that notifying flight crews of the pairing fatigue score, and what assumptions are factored into the obtaining of that score, is unnecessary and that FedEx's current training program effectively addresses flight crew expectations and what fatigue mitigations are available. In this incident, the captain chose to abandon his nap attempt during the hub turn when he was unable to fall asleep. After about 30 minutes he decided to prepare for the next phase of his schedule. In failing to obtain a nap during the hub-turn, the captain unwittingly increased his fatigue score from within limits to high risk (7.4) on the KSS.

Air Traffic Control (ATC)

ATC awareness of the traffic approaching the airport provides an additional barrier to trap and correct errors, such as aircraft misalignment during landing. The tower controller's failure to monitor the flight throughout the duration of its progress resulted in a missed opportunity to notify the crew and correct the misalignment before landing. Expectation bias occurs when a person hears or sees something or behaves in a way based on what he or she expects rather than what is actually occurring. Past experience or repetition can exacerbate this issue.

In this incident, the controller had a reasonable expectation that the flight — a late night/early morning operation recurrent to TUL — would approach and land on the assigned runway. Consequently, she directed her attention away from the flight to other tasks. Because she was not monitoring the flight, she was unable to confirm its alignment on the correct runway nor was she able to provide corrective action to prevent the wrong surface event.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be:

The flight crew's misidentification of the intended landing runway. Contributing to the incident were (1) the flight crew's failure to perceive and correctly interpret visual and auditory indicators – including electronic guidance – that they were approaching the incorrect runway which was likely the result of a degradation in cognitive function brought on by working within their window of circadian low, increased workload, and fatigue, and (2) the air traffic controller's failure to monitor the arriving flight after issuing a landing clearance.

Findings

Personnel issues	Fatigue due to work schedule - Flight crew
Personnel issues	Expectation/assumption - Flight crew
Personnel issues	Identification/recognition - Flight crew
Personnel issues	CRM/MRM techniques - Flight crew
Personnel issues	Task monitoring/vigilance - ATC personnel
Organizational issues	Adequacy of policy/proc - Operator

Factual Information

History of Flight

Approach	Wrong surface or wrong airport (Defining event)

The incident flight crew began the day's pairing in Ontario, California with a report time of 1850 Pacific daylight time (2050 Central daylight time (CDT)). Their first flight of the evening was from Ontario International Airport, Ontario, California to Fort Worth Alliance Airport (AFW), Fort Worth, Texas. The flight arrived at AFW about 0030 CDT. After postflight procedures each crewmember procured a crew rest room. According to the first officer, he was able to get about 30 minutes of rest prior to preparing for the next flight, which was the incident flight. The captain reported that he attempted to obtain rest, however, he "couldn't get to sleep." However, the captain added that he would not have flown fatigued, and he did not feel tired on the incident flight.

The crew reconvened in the preflight briefing room, where they reviewed notices to air mission (NOTAMs) and the weather. Then, they proceeded to the airplane where they conducted preflight checks. About 0330, the flight pushed back from the parking position, taxied out to the runway, and departed AFW for the less than one-hour flight to TUL. The captain was the pilot flying and the first officer was the pilot monitoring. The flight climbed to an enroute altitude of flight level 310 at 0349 and began their descent 2 minutes later.

The first officer stated that at the start of the descent, he obtained the current TUL weather and performance data for the landing. He then proceeded to set up the frequencies for the ILS. Additionally, they created a waypoint about 30 miles from the airport as they wanted to be at 11,000 feet (ft) at that waypoint. The captain briefed the anticipated visual approach, backed up by the ILS, and landing to runway 18L, which included the frequency for the ILS, the Vref speed of 123 knots, and the approach lights for runway 18L.

He also briefed that they would not use the autobrakes, as he wanted to "roll long" as the parking location was at the south end of runway 18L. The flight was transferred from the Federal Aviation Administration (FAA) Air Route Traffic Control Center to the FAA TUL approach controller about 10,000 ft and were issued a heading of 360°, which routed the flight west of the airport. According to the flight crew, the flight was in instrument meteorological conditions at the time.

The flight was given a further descent and then exited the base of the clouds. The first officer reported that when the flight exited the clouds, he could not see the runway but did visually acquire the TUL airport beacon and said it "looked like a normal downwind." The captain

reported that after exiting the clouds he could see the lights for runway 8/26 and that they were “normal.”

The flight crew extended the centerline for runway 18L in their flight management system, which displayed the extended centerline on their ND in the cockpit. Additionally, the first officer verified that the frequency for the ILS 18L was correct and, when the captain requested, extended the flaps to one. The approach controller asked, and the crew verified that they had the airport in sight.

The flight was cleared for the visual approach to runway 18L and cleared to land runway 18L. The captain commanded the autopilot to start the turn to the right and the first officer set 2,400 ft into the altitude preselector, the altitude for the final approach fix as published on the ILS 18L approach chart. During the turn to final about 0410, the captain stated they disengaged the autopilot, extended the flaps to 5, and subsequently configured the airplane for landing which included extending flaps to 30, lowering the landing gear, and conducting the before landing checklist.

According to the FO, while on final approach, the aircraft appeared low visually and he brought that to the captain’s attention. He further explained that the glideslope appeared to be “normal” however, the PAPI lights indicated they were below the runway’s glidepath. Additionally, he stated that the deviation bar on his HSI was deflected to the left; however, during the incident flight he did not bring that to the captain’s awareness.

The captain adjusted the descent rate of the airplane to place the airplane on the visual glideslope as indicated by the PAPI. About a 2.8 mile final and about 800 feet above ground level, the RAAS callout “Approaching 18R” was recorded on the CVR, however this occurred simultaneously with communications in the cockpit and neither crew member acknowledged or recalled this call out.

The captain stated that initially the HUD was showing “slightly off to the left.” However, he transitioned visually to what the PAPI lights were indicating for his vertical alignment with the runway and was more focused on that. The flight touched down about 0413 on runway 18R and the RAAS subsequently announced there was 3,000 ft of runway remaining.

The captain stated during a post incident interview, that he applied the brakes and “came on them harder initially because he was confused.” After slowing the airplane, the captain asked the FO “are we on the correct runway?” and then stated, “we landed on the right [hand] runway.” After informing the controller that they had landed on runway 18R, the controller provided taxi instructions to the ramp.

Pilot Information

Certificate:	Airline transport	**Age:**	57,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	
Instructor Rating(s):	Airplane multi-engine	**Toxicology Performed:**	
Medical Certification:	Class 1	**Last FAA Medical Exam:**	May 24, 2022
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 5, 2022
Flight Time:	5544 hours (Total, all aircraft), 1632 hours (Total, this make and model)		

Co-pilot Information

Certificate:	Airline transport	**Age:**	50,Male
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	5-point
Instrument Rating(s):		**Second Pilot Present:**	
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:	Class 1	**Last FAA Medical Exam:**	May 24, 2022
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	November 10, 2021
Flight Time:	2217 hours (Total, all aircraft), 1478 hours (Total, this make and model)		

The incident flight crew consisted of a captain and first officer. Both crewmembers stated that this pairing was the first time they had flown with each other.

Captain:

The captain was 57-years-old and held an Airline Transport Pilot (ATP) certificate with a rating for airplane single-engine land and multiengine-land, and type ratings on the A310, B-707, B-720, B-757, B-767 which included limitations of B-757, B-767, A-310 Circling approach – visual meteorological conditions (VMC) Only, and English Proficient. He held an FAA first-class medical certificate dated January 27, 2022, with limitation of must wear corrective lenses. At the time of the incident, he was based at Memphis International Airport (MEM), Memphis, Tennessee.

The captain held over 10,000 hours of total flight experience, 790 of which were as a captain in the B757. During the interview with the captain, he stated that he had flown into TUL “at least a hundred times” and the most recent was about two weeks prior to the incident.

The captain's account of his sleep in the 72 hours preceding the incident starts the evening of June 5, therefore it is unknown at what time he awoke that morning. He obtained approximately seven hours of sleep, followed by a six-hour period of wakefulness, a two-hour nap, another six-hour period of wakefulness, and a final four-and-a-half-hour period of rest prior to the 0225 crew show on June 7. Following that flight, he slept for approximately five hours. The captain did not have another period of rest before the incident flight. He was awake for approximately 15 hours and 30 minutes prior to the incident occurring.

First Officer:

The FO was 50-years-old and held an ATP certificate with a rating for multi-engine land, single-engine land, rotorcraft-helicopter, instrument helicopter, instrument powered-lift, powered-lift, and type ratings in the A-320, B-757, B-767, with limitations of English Proficient and A-320, B-757, B-767 Circling approach – visual meteorological conditions (VMC) Only . He held an FAA first-class medical certificate dated May 24, 2022, with no medical restrictions. At the time of the incident, he was based at MEM.

The FO held about 4,500 hours of total flight time, 739 of which was as a first officer in the B757. The first officer stated during his interview that it was his second time operating into TUL since his employment began with FedEx 2 years earlier.

The FO's account of his sleep in the 72 hours preceding the incident starts the evening of June 5, therefore it is unknown at what time he awoke that morning. The longest period of rest was the evening of June 5 to the morning of June 6 where the FO recorded approximately nine hours of sleep. This was followed by a period of wakefulness for approximately 12 hours. A four-hour nap followed and was prior to the 0225 crew show time on June 7. After that flight, the FO recorded another seven hours of sleep, interrupted by a lunch break. The next crew show time was approximately three hours later. Following that flight, the FO took a short, ½ hour nap before the last crew show at 0226 for the incident flight. He was awake for approximately 12 hours since his last prolonged period of rest, and three hours since his nap, prior to the incident occurring.

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N949FD
Model/Series:	757-236	**Aircraft Category:**	Airplane
Year of Manufacture:	1991	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	25060
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	Continuous airworthiness	**Certified Max Gross Wt.:**	230000 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:		**Engine Manufacturer:**	Rolls Royce
ELT:	Installed, not activated	**Engine Model/Series:**	RB211-535E4
Registered Owner:	FedEx Express	**Rated Power:**	40100 Lbs thrust
Operator:	Federal Express Corporation	**Operating Certificate(s) Held:**	Flag carrier (121), Supplemental
Operator Does Business As:	FedEx Express	**Operator Designator Code:**	FDEA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KTUL	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	03:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Few / 4300 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 5500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	40°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	2986 inches Hg	**Temperature/Dew Point:**	-5°C / -5.6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Fort Worth, TX (AFW)	**Type of Flight Plan Filed:**	IFR
Destination:	Tulsa, OK	**Type of Clearance:**	IFR
Departure Time:	18:34 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Tulsa International Airport TUL	**Runway Surface Type:**	Concrete
Airport Elevation:	678 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	18R	**IFR Approach:**	Visual
Runway Length/Width:	6101 ft / 150 ft	**VFR Approach/Landing:**	

Tulsa International Airport was located about 5 miles northeast of Tulsa, Oklahoma, with a field elevation of 677.5 ft above mean sea level (msl). The airport was owned by the City of Tulsa and was serviced by an FAA ATC tower that was in operation 24-hours a day. The ATC tower was in operation at the time of the incident. Approach radar services were provided by Tulsa Approach control.

At the time of the incident, TUL, had three paved runway surfaces designated as 18L/36R, 18R/36L, and 8/26. The intended landing runway 18L was 10,000 ft long and 150 ft wide, with precision instrument markings. It had high-intensity edge lights, centerline lights, a 4-light PAPI on the left side of the runway, and medium intensity approach lighting system (MALSR) approach lights. The actual landing runway 18R was 6,101 ft long and 150 ft wide with precision instrument markings and a 600-foot displaced threshold. It had high-intensity edge lights, a 4-light PAPI located on the left side of the runway, and runway end identifier lights.

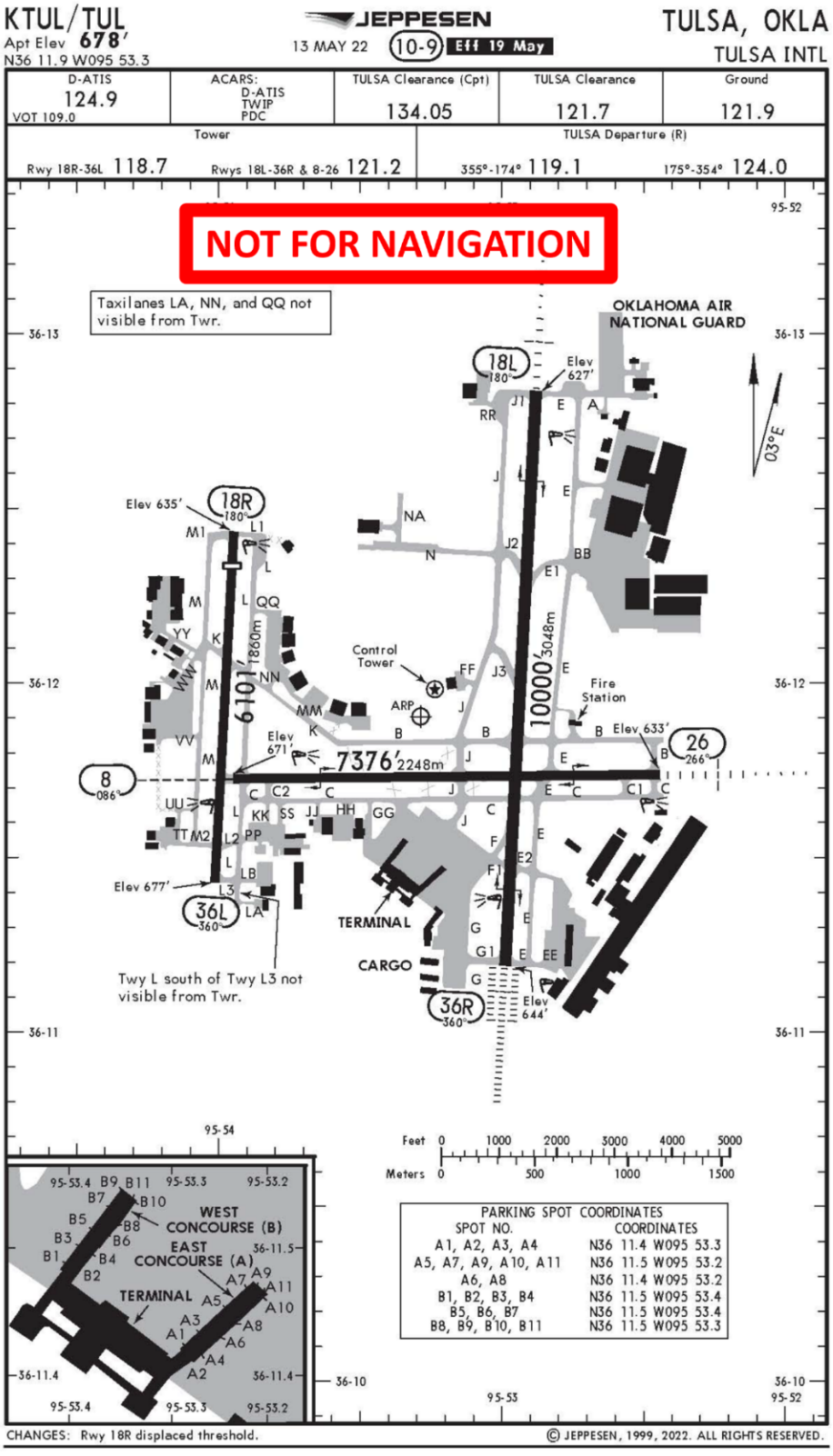

Figure 2: Tulsa International Airport 10-9 Airport Diagram. (Source: Jeppesen)

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	None
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	36.1988,-95.8839

Flight recorders

The NTSB Vehicle Recorder Division received a Smiths Industries (P/N: 175497-01-01, S/N: 0000638) combination flight data and cockpit voice recorder. The recorder was in good condition and the data were extracted normally from the recorder.

The flight data recording contained approximately 26.38 hours of data. The event flight was the last flight of the recording, and its duration was approximately 40 minutes.

This model cockpit voice recorder records a minimum of 120 minutes of digital audio stored on solid state memory modules. Four channels are recorded: one channel for each flight crew member, one channel for a cockpit observer, and one channel for the cockpit area microphone. All four channels had good to excellent quality audio and a transcript was created of the audio associated with the entirety of the incident flight.

Tests and Research

Operational Factors/Human Performance Group Simulator Evaluation:

The Operational Factors/Human Performance group conducted a simulator evaluation in one of the operator's B757 simulators. During the evaluation, the simulator was placed on a right downwind leg west of the airport for an approach to runway 18R and 18L. The simulator navigation was programed in accordance with the operator's policies and procedures provided for an ILS to runway 18L. During the visual approach to runway 18R the PFD (figure 3) and HUD (figure 4), indicated that the aircraft was to the right of course and below the glideslope.

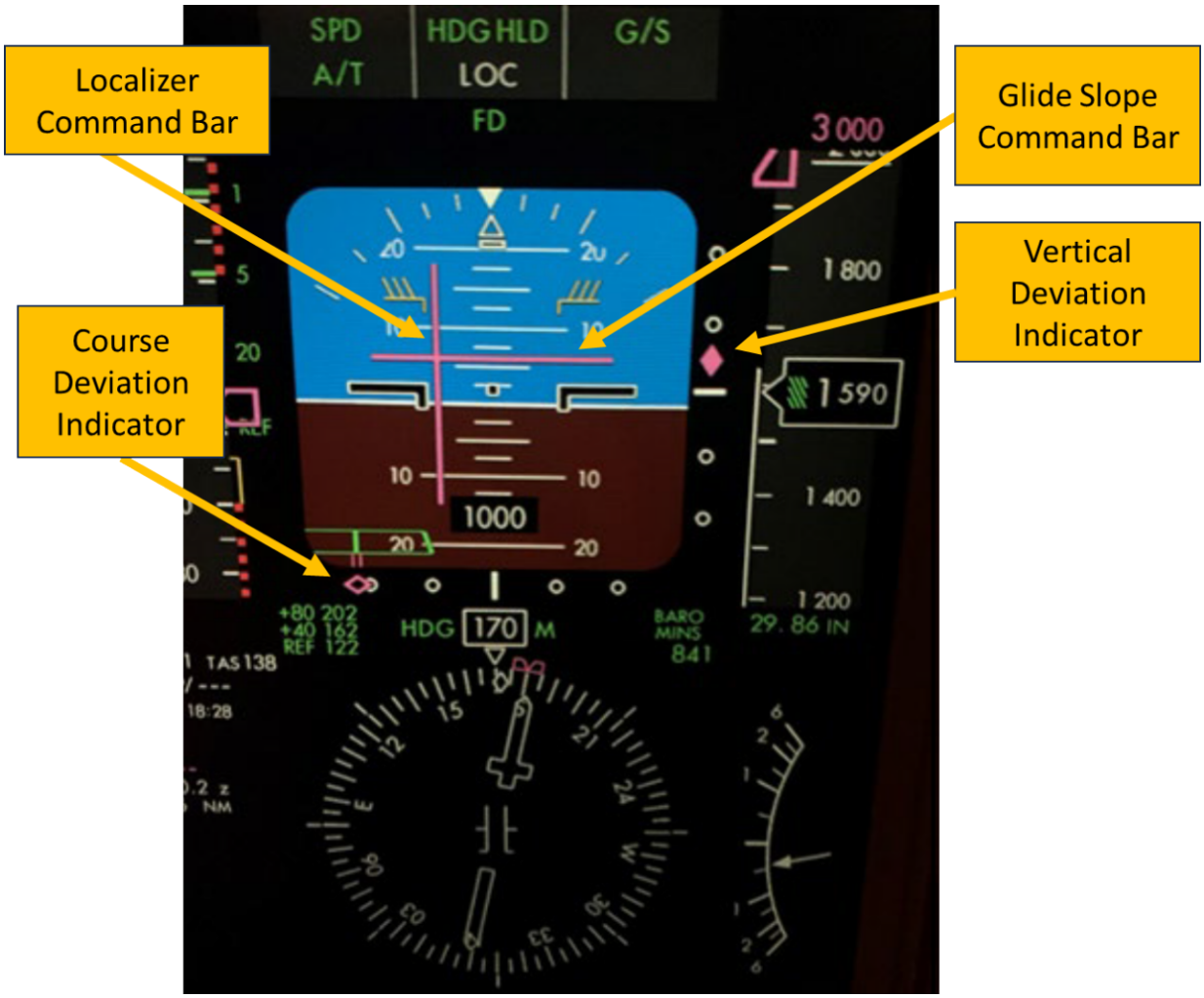

Figure 3. Simulator PFD as viewed approaching runway 18R. (yellow labels added for clarity)

Several approaches were made to runway 18R and 18L. In these approaches the RAAS annunciated approaching the runway the airplane was aligned with, irrespective of the ILS frequency that was selected. One item that was noted during the approach to runway 18R was the Enhanced Ground Proximity Warning System (EGPWS) "glideslope" audible warning was

annunciated approximately 13 times. The crew interviews and CVR did not indicate these warnings annunciated on the incident flight. On approaches to 18R the flight mode annunciator indicated the glideslope was captured but the localizer (LOC) was still illuminated in the armed (white) mode indicating it had not captured.

Figure 4 shows the HUD display from the operator's panel in a FedEx B-757 simulator. The depiction was consistent with that shown on the captain's HUD in the simulator. The image in figure 4 was taken while the simulator was in right turn from base to final for runway 18R. The identifier IDWE located in the lower left side of the display is associated with the identifier for the runway 18L localizer. The course deviation indicator for the localizer is on the left side of the horizontal situation indicator at the bottom of the display. The course deviation indicator and offset between the flight path indicator and command indicator show that the target runway is further to the left than the aircraft's actual path.

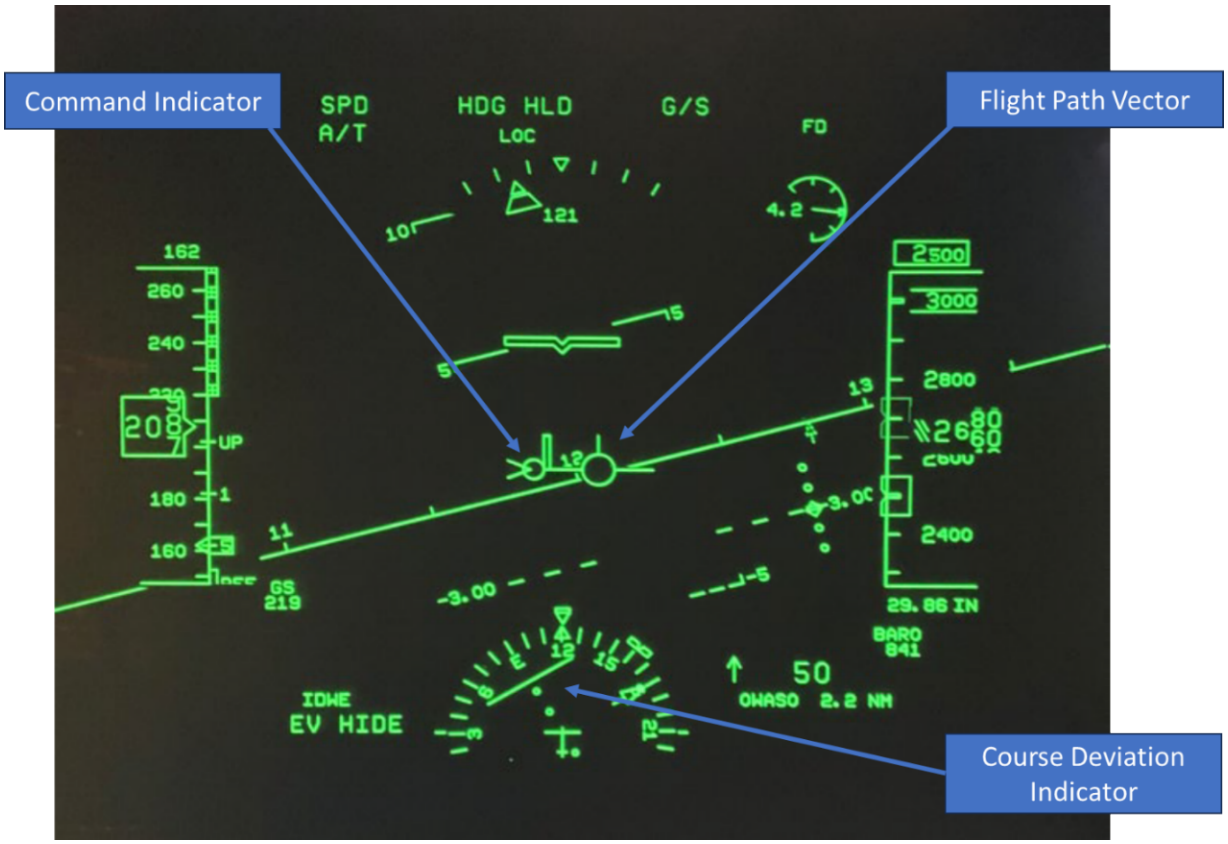

Figure 4. HUD display from the operator's panel in the FedEx B-757 simulator. (blue labels added for clarity)

Organizational and Management Information

FedEx's 757 Aircraft Systems Manual, "Warning Systems" provided, in part, the following information on RAAS:

> *"RAAS is a software enhancement hosted within the 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.*
>
> *The following RAAS characteristics must be considered:*
>
> - *RAAS voice annunciations are based upon RAAS database runway details NOT the runway intended or planned.*
> - *The voice annunciations do NOT take into account airplane performance factors such as airplane weight, wind, runway condition, slope, air temperature, or airport altitude.*
> - *Voice annunciations do not ensure that a runway is inappropriate for takeoff or landing nor does the absence of voice annunciations ensure that a runway is appropriate for takeoff or landing.*
>   - *Advisories do not ensure that the aircraft will land on the identified runway nor 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.*
> - *Flight crew is responsible to use other means available to ensure correct runway selection and the performance calculations are accurate for the conditions.*
> - *The design of RAAS does not include knowledge of ATC clearance or flight crew intent, and therefore factors such as clearance misunderstandings, incorrect or inappropriate clearances cannot necessarily be mitigated by use of RAAS.*

Voice Annunciations During Approach, Landing, Go-Around, and RTO on RAAS Airports

Voice Annunciation	Description
APPROACHING (RUNWAY IDENTIFIER)	Sounds once each time the airplane: • Approaches within approximately 3 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:** The 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.
APPROACHING RUNWAYS	Sounds once each time the description is met while approaching two runways that meet the APPROACHING RUNWAY criteria.
APPROACHING (RUNWAY IDENTIFIER) (LENGTH) AVAILABLE	Sounds once (with insufficient runway available for landing) each time the airplane: • Approaches within approximately 3 nautical miles of a runway threshold with the available distance for landing being less than 5000 feet, 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 450 feet and 300 feet AFE. **Note:** The 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.

Figure 5: Voice annunciations during approach, landing, go-around, and rejected takeoff (RTO) on RAAS airports. (Source: FedEx)

? *The following four routine advisories are intended to enhance aircraft position awareness and reduce the risk of a runway incursion:*
  - o *Approaching Runway (on ground)*
  - o *On Runway (on ground)*
  - o *Approaching Runway (in air)*
  - o *Distance Remaining (landing and rollout advisory) …"*

FedEx Fatigue Risk Management Program (FRMP):

According to the FedEx flight operations manager, their FRMP was focused on predictive, proactive, and reactive risk modeling and it was done in collaboration with ALPA. FedEx fatigue software used the Karolinska Sleepiness Scale on a 1-9 scaled rating. ALPA used both the KSS and the PVT to calculate a SAFTE-FAST score and the resulting scores were compared. Potential pairings were reviewed at least 6 weeks prior to schedule. A KSS score of 7 or higher typically indicated the pairing needed further review and was a high risk.

When a high risk KSS pairing was noted, it was discussed by the Fatigue Event Review Committee which then worked with scheduling to resolve the issue with the pairing. The incident flight score was a KSS of 6.39, PVT of 9, and SAFTI-FAST of 76.0%, and these scores incorporated the assumption that the crew would nap during their hub-turns. FedEx did not publish KSS pairing scores and they did not provide the scores or the napping assumption associated with the pairings to the crew.

Crews were provided accommodations at many of their hubs. Rooms were temperature and light controlled, and a wake-up call was provided on request. If a crew member felt he or she was too fatigued to proceed with a flight, he or she could make a call to the duty officer who would take one of three mitigative paths: 1) that leg of the pairing would slip to allow the opportunity for more rest; 2) another crew member could be dispatched to take the flight instead; or 3) the flight would be cancelled.

If a crew member called in fatigued, it resulted in a mandatory fatigue report and a forfeiture of sick leave hours. A review would be conducted to determine if the crew member's lost hours would be returned to his or her sick bank. The FRMP manager said that they averaged 35-40 fatigue calls a month. The FRMP was kept on file for two years, was approved by the FAA, and went through an internal auditing process routinely.

The interim human factors and training manager at FedEx provided an overview of the company's fatigue training. Crew members received a training manual that included a section dedicated to fatigue. The section discussed conditions that produce fatigue, the effects of fatigue, identified how fatigue might manifest, and provided mitigation techniques for combatting fatigue. The course used a combination of power point, case study and a training manual to facilitate training. Crew members received fatigue training at their new-hire indoctrination, at alternating 18- and 36-month training cycles, and during upgrade training.

The FedEx flight operations manager stated that the biomathematical software used to assess trip pairings assumed that a 30-minute nap was to be taken in hub-turns lasting 2 ½ hours or more. This assumption was not conveyed to flight crews.

Additional Information

Air Traffic Control Information:

There were two controllers on duty at the time of the incident with one in the tower and one on break. All radar and tower positions were combined to the ground control/ clearance delivery position in the tower. This staffing was the normal mid-shift “TRACAB” configuration, with the controller in-charge position also combined and providing oversight at the time of the incident.

During her interview, the tower controller said she categorized the traffic complexity and volume as being 1 on a scale of 1-5 (5 being high). In a recount of the events, she stated the incident flight had come in from the south, she confirmed they had the current ATIS, and were assigned runway 18L. She then assigned FedEx 1170 a northbound heading and at 6,000 feet, amended their altitude and pointed out the field 10 miles south of their position. The crew reported the field in sight, and she cleared them to land. She then diverted her attention from FedEx 1170 to provide taxi instructions to an unrelated aircraft being repositioned for maintenance.

The tower controller said she conducted a visual sweep of the runway when she initially cleared FedEx 1170 for the approach and to land but admitted she did not look back at the aircraft again. The last time she observed the aircraft on the radar was when it was on a “dogleg” turn to base. FedEx 1170 landed, and the pilot advised they had landed on the wrong runway. Once the pilot reported their position, the tower controller provided taxi instructions from runway 18R.

Administrative Information

Investigator In Charge (IIC):	Silva, Sathya
Additional Participating Persons:	David Keenan; FAA Scott Reeves; FedEx Norm Maxim; Airline Pilots Association Nathan Williams; Boeing Allison Mattioli; NATCA
Original Publish Date:	August 3, 2023
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=105216