Aviation Investigation Final Report

Location:	Tampa, Florida	**Accident Number:**	MIA03FA130
Date & Time:	June 23, 2003, 07:10 Local	**Registration:**	N633DL
Aircraft:	Boeing 757-232	**Aircraft Damage:**	None
Defining Event:		**Injuries:**	3 Serious, 27 Minor, 144 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

The airplane was pushed back from the gate and the left engine was started with no discrepancies reported. During the starting of the right engine, numerous passengers saw torching aft of the tailpipe. A commotion ensued which drew the attention of the three of the four flight attendants who reported seeing an orange glow either inside or outside the airplane. The captain later reported there were no abnormal engine indications in the cockpit, but he then secured the right engine. The captain secured the left engine after simultaneously noticing passengers on the ramp and illumination of entry door lights. A flight attendant reported a male passenger (who was bigger than her) approached her at door 2L and attempted to open the door by partially rotating the 2L door handle. The door did not open completely but was 'cracked.' The flight attendant eventually opened the door fully and locked it against the fuselage. The male passenger exited immediately, followed by several other passengers. She then opened the 2R door and passengers exited it as well. Passengers also evacuated the airplane via the 3L and 3R doors, which a flight attendant opened. Readout of the flight data recorder revealed that at the time the fuel cutoff switch for the right engine was recorded to be in the "run" position, the recorded fuel flow was 1,696 PPH. Within approximately 2 seconds of the right engine fuel cutoff switch being in the "run" position, the fuel flow was recorded to be 3,136 PPH. The maximum recorded fuel flow of 6,272 PPH occurred 2 seconds before the fuel cutoff switch was recorded to be in the "cutoff" position, or 24 seconds after the fuel cutoff switch was in the "run" position. In contrast, within 4 seconds of the left engine fuel cutoff switch being in the "run" position for engine start, the recorded fuel flow was 544 PPH. Further review of the previous eight engine starts revealed the left and right fuel flows were nearly matched, with no recorded fuel flow value greater than 580 PPH within the first 4 seconds after the fuel cutoff switch was recorded to be in the "run" position. The flight crews are trained that during hot starts, the fuel flow almost immediately exceeds 700PPH. The engine start procedures checklist indicates the engine start is to be aborted if abnormally high or fluctuation fuel flow is noted.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: a torching of the right engine caused by an abnormally high flow fuel during engine start for undetermined reasons. The torching resulted in an unwarranted evacuation of the airplane and serious injuries to three passengers . A contributing factor in the accident was the failure of the flightcrew to abort the engine start due to abnormally high fuel flow indication during the right engine start.

Findings

Occurrence #1: MISCELLANEOUS/OTHER
Phase of Operation: STANDING - STARTING ENGINE(S)

Findings
1. FLUID,FUEL - EXCESSIVE FLOW/OUTPUT
2. (F) REASON FOR OCCURRENCE UNDETERMINED
3. 1 ENGINE - TORCHED
4. (F) EMERGENCY PROCEDURE - NOT PERFORMED - FLIGHTCREW

Occurrence #2: MISCELLANEOUS/OTHER
Phase of Operation: STANDING - ENGINE(S) OPERATING

Findings
5. (C) INSTRUCTIONS,WRITTEN/VERBAL - DISREGARDED - PASSENGER
6. (C) EVACUATION - INITIATED - PASSENGER

Factual Information

HISTORY OF FLIGHT

On June 23, 2003, about 0710 eastern daylight time, a Boeing 757-232, N633DL, registered to Wilmington Trust Company, operated by Delta Air Lines, Inc., as flight 1036, experienced a passenger-initiated evacuation of the airplane while pushed away from the gate and stopped on the ramp at the Tampa International Airport, Tampa, Florida. Visual meteorological conditions prevailed at the time and an instrument flight rules flight plan was filed for the 14 CFR Part 121 scheduled, domestic, passenger flight from Tampa International Airport, to Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia. The airplane was not damaged and there were no injuries to the captain, first officer, three flight attendants, or 139 passengers (one of whom was a company flight attendant occupying a coach passenger seat). One flight attendant and 26 passengers sustained minor injuries, and three passengers sustained serious injuries as a result of the evacuation. The airplane had pushed back from the gate approximately 3 minutes earlier.

The flight data recorder indicates the No. 1 engine was started first following pushback; no abnormalities associated with the engine start were reported by the flightcrew. The captain reported that the tow tug was released from the airplane, and the right engine start sequence commenced. At 0709:07, the cockpit voice recorder (CVR) recorded the first officer to state "fuels on" followed two seconds later by, "... light off." The fuel cutoff switch was placed to the run position at 25 percent N2, and at 0709:14, the CVR recorded the first officer to state, "N1." The flight data recorder readout revealed that the N1 rotation speed increased to a maximum of 12 percent. The captain reported that during the No. 2 engine start, as it was spooling up, we felt a buffet that would be consistent with jet wash from another aircraft. The captain reported that he observed the ground crew walking back to the terminal and when they were about 100 feet away, he noticed that one of the ground crew members holding her hands to her mouth. At 0709:42, the CVR recorded the first officer to state "something wrong with the engine." At the same time the CVR recorded the captain to state "he's pointing at the engine. Something's wrong with the engine." The captain further reported that although there were no abnormal engine indications in the cockpit, he secured the No. 2 engine. At 0710:03, (determined by CVR transcript), the flight attendant assigned to Door 1R (determined in post accident interviews) advised the flightcrew, "we have fire in the back." The captain respond "okay, how's it look" followed by a comment from the first officer indicating, "where a fire in the back?" The flight attendant reported the fire was in the galley area, followed by a report of another flight attendant (later determined to be the On Board Leader) putting on the personal breathing equipment (PBE) and getting the Halon fire extinguisher.

The captain reported that about the time he was notified of the fire by door 1R flight attendant, he noticed that some passengers were on the ramp and the "emergency door and entry door

lights were illuminated." He then secured the No. 1 engine, and instructed the first officer to contact ground control and request the dispatch of emergency equipment. The ground controller advised the flightcrew that they had already dispatched emergency equipment due to the fact that they had observed what occurred. At 0710:40, the CVR recorded the captain to ask the door 1R flight attendant, "... do you see the fire cause we shut it down the engine's...." The flight attendant responded, "OK, they opened the door", followed by "they're out", to which the captain commented "they're out." At 0710:52, the CVR recorded the captain to state "...okay, we got an evacuation checklist." The first officer responded "... ATC, parking brakes, handle", to which the captain responded "set." The CVR transcript further indicates that at 0711:04, the first officer stated "engine and APU fire switches." Approximately 1 second later the door 1R flight attendant advised the flightcrew that they were still trying to figure out what was occurring in the cabin. The captain responded by stating "looks like people are already off the airplane", to which she reported "I know I know what do you want us to do cause", to which the captain reported "just stand by for right now. I mean there's, is there no fir is there any fire?" The flight attendant reported "it looks like the fire's extinguished" to which the captain reported "OK." The CVR records the captain to ask the Tampa International Airport ATCT ground controller if the airport fire rescue equipment was responding. The CVR transcript continues and at 0711:48, the captain advised the door 1R flight attendant to walk in the cabin to make sure there was no fire. At 0711: 58, the captain stated "no indication, no EGT, everything was normal." At 0712:28, a flight attendant on interphone reported "oh, the ladies they started ** hollering fire, fire, everybody came to the mid doors, and one of the man he pulled the slide bar, pulled both the slides and I let people out, and ** doors** and everybody evacuated from the back." At 0713:00, the captain stated, "so a passenger just unilaterally pulled...." At 0713:16, the CVR transcript records the first public announcement from the captain indicating "ladies and gentlemen for the rest of you on board the airplane..." with the rest of the announcement being unintelligible.

The captain further reported that he did not pull the fire bottle handles for the engines because a "fire marshal" who had boarded the aircraft informed him there was no fire. A request was made with Delta operations for stairs to be brought out to de-plane the remaining passengers. The first officer's written statement was nearly identical to the statement prepared by the captain; he offered no new information. According to the FAA inspector-in-charge, the flightcrew informed him they did not experience any indications or discrepancies during the No. 2 engine start.

All but one flight attendant (On-Board Leader) reported seeing an orange glow during the right engine start. The flight attendant who was occupying a seat in coach reported seeing "an orange glow, like flames flickering at the windows." One of the flight attendants reported to NTSB she couldn't tell if the orange glow was inside or outside. A flight attendant who was securing the galley area near the 2L door reported to NTSB hearing a noise from the "wing area" that sounded like passengers screaming. She stood up from her kneeling position and noted passengers standing directly in front of her. She could not see the wings because people were standing but did report seeing an "orange glow" in the cabin. She reported passengers were trying to reach the door which she was blocking with her body and a male

passenger who was wearing a "burgundy shirt and tan pants" yelled, "fire, [expletive], fire." He was bigger than her and reached over, grabbed the door handle and rotated it. The handle did not rotate fully and the door, "only was cracked." The male passenger then lifted her up and "put" her against the forward galley counter. She had a scratch on her back but was not disabled and felt no pain. She grabbed the door handle and opened the door fully and locked it against the fuselage. The slide/raft inflated normally, and was going initially to the left but straightened out quickly. The male passenger went down the slide immediately. She attempted to keep other passengers from exiting because the engines were running but they did not obey her. She then opened the 2R door, and passengers evacuated via it as well. The flight attendant assigned to door 3L reported that after assessing the outside conditions, she opened it first, followed by door 3R.

One of the 67 passengers who returned the NTSB questionnaire reported he was seated either in seat 21A or 22A, and he assisted the flight attendant. He reported he was the first out of the forward galley door and stayed at the bottom to assist other passengers. With respect to the question that asked "what proportion of your evacuation was spent on:" he reported 25 percent was spent opening the exit. The individual also reported that passengers over the wings had opened all four exits at that point, and someone in the back yelled there was a fire, so we kinda shrugged and decided it would be best to exit. He also reported that at the time they evacuated, 20 people were already out of the airplane via other exits. Another passenger who returned the questionnaire and was seated in 21B reported there was no flight attendant in my bulkhead galley, she was at the rear of the aircraft. With respect to the question that asked whether his physical size assisted me a in evacuation he responded "agree", and added a comment, "75 inches, 200 pounds, I took charge of my section!" He reported in writing that because there was no flight attendant in the mid-galley, "... it was up to me to assist others off the plane."

AIRCRAFT INFORMATION

The airplane was manufactured by Boeing in 1987, as a model 757-232, and was assigned serial number 23614. It was equipped with two Pratt and Whitney 2037 turbofan engines. The interior configuration consisted of 24 first-class seats, and 159 coach class seats. The airplane was also equipped with three "Type I" exits on each side of the aircraft, as well as two "Type III" exits over each wing. The airplane was last inspected in accordance with the continuous airworthiness inspection program on June 2, 2003, and had accumulated 22.6 hours since the inspection at the time of the accident. The airframe total time at the time the accident was 52,381.9 hours.

Review of aircraft discrepancies that go back 30 days prior to the accident revealed door 2L had been written up on three separate occasions; with each discrepancy being the door was difficult to arm/disarm. Each discrepancy was written up as being corrected. Additionally, during the same time period, there were no discrepancies associated with the right engine, or the right engine EEC.

The right engine electronic engine control (EEC) was modified/repaired on September 20, 2002, and installed in the accident airplane on October 13, 2002. The aircraft total time and cycles at the time of installation were 50,370.4 and 25,044, respectively. At the time of the accident, the aircraft total time was 52,381.9 hours, and 25,943 cycles, or a difference of 2,011.5 hours and 899 cycles since installation of the modified/repaired EEC.

Postaccident examination of the airplane exterior and interior revealed no evidence of heat damage or fire.

METEOROLOGICAL INFORMATION

A METAR weather observation taken on the airport at 0653, indicates scattered clouds existed at 3,100 feet, a broken ceiling existed at 25,000 feet, the visibility was 10 statute miles, the temperature and dewpoint were 24 and 23 degrees Celsius respectively, and altimeter setting was to 29.91 inHg. There were no reported restrictions to visibility.

COMMUNICATIONS

There were no reported communication difficulties between the flight crew and the Tampa International Airport, Air Traffic Control Tower.

AIRPORT INFORMATION

The Tampa International Airport (KTPA) is classified as an index "E" airport which is determined by a combination of the length of air carrier aircraft expressed in groups, and average daily departures of air carrier aircraft. The KTPA airport has two fire stations which are manned with a minimum staffing level of four firefighters per shift at each station. According to the Tampa Fire Rescue ARFF incident report and the ARFF training officer, personnel from the KTPA air traffic control tower notified airport fire rescue at 0711:16, and 15 vehicles were immediately dispatched from on-airport and mutual aid facilities. A total of 12 on-airport personnel responded in 8 vehicles, and mutual aid facilities respond with approximately 44 personnel in two aerial trucks, three engine companies, five paramedic rescue cars, and eight ambulances. The initial responding units which arrived approximately 2 minutes 45 seconds following notification found the airplane with emergency slide/rafts deployed, and approximately 150 passengers outside the airplane moving towards the terminal. There was no fire to extinguish, an incident command system was established, and additional mutual aid units were requested to assist with injured passengers.

National Transportation Safety Board review of security camera video footage obtained from the airport revealed the timestamp on the video began after the evacuation had ended. The video revealed that passengers were noted on the tarmac and grass near the airplane. The time stamp indicates the first airport rescue firefighting vehicles arrived on scene at approximately 0710:35, an air stair vehicle arrived at the 1L door at approximately 0718, and 11 passengers deplaned via the airstair. The video ended at 0734:45.

FLIGHT RECORDERS

The airplane was equipped with a L3 Communications CVR, P/N 20100-1020-00, S/N -01167, and a Lockheed flight data recorder Model 209, S/N 1240. Both recorders were removed from the airplane, and shipped to NTSB headquarters, for readout by the Vehicle Recorders Division.

The cockpit voice recorder contained two audio files which contained the most recent two hours of the flight operation and were fair to good quality. The other four audio files recorded the final 30 minutes of aircraft operation, and were of fair to good audio quality. The transcription which started as the aircraft was being pushed back from the gate for departure at 0705:10, was prepared of the 8 minute 21 second portion of the 2-hour 4 minute recording.

Readout of the flight data recorder indicated that at the time the right engine fuel cutoff switch was recorded to be in the "run" position for engine start, the fuel flow in terms of pounds per hour (PPH) was recorded to be 1,696. Within approximately 2 seconds of the right engine fuel cutoff switch being in the "run" position, the fuel flow was recorded to be 3,136 PPH. The maximum recorded fuel flow of 6,272 PPH occurred 2 seconds before the fuel cutoff switch was recorded to be in the "cutoff" position, or 24 seconds after the fuel cutoff switch was in the "run" position. In contrast, within 4 seconds of the left engine fuel cutoff switch being in the "run" position for engine start, the recorded fuel flow was 544 PPH. Further review of the previous eight engine starts revealed the left and right fuel flows were nearly matched, with no recorded fuel flow value greater than 580 PPH within the first 4 seconds after the fuel cutoff switch was recorded to be in the "run" position.

TESTS AND RESEARCH

As previously reported, the fuel flow for the right engine at the time the fuel cutoff switch was in the "run" position was 1,696 PPH. Review of the "Engine Start Procedures" listed in the "Delta 757/767 Operations Manual" revealed to abort the start if "Fuel flow is abnormally high or fluctuating." Airline personnel reported that during flight crew training, approximately 24 engine starts are performed in the simulator, and the flight crews are trained to recognize that fuel flow rises slowly and "...does not exceed 500 pph during a normal engine start. However, during a hot start scenario the fuel flow will rise rapidly and, almost immediately, fuel flow exceeds 700 pph."

Examination of the right engine EEC was performed with FAA oversight at the manufacturer's facility, located in Windsor Locks, Connecticut. The EEC is a dual channel, digital electronic engine control which in conjunction with a jet fuel control (JFC), monitors and controls the fuel flow to the engine. The initial examination of the EEC revealed the tamperproof seals were broken; there was no damage to the unit. The unit was placed on a test bench and failed the incoming verification test for the channel A burner pressure (Pb) sensor at all three test points. There were seven logged faults associated with channel A, while channel B had no stored faults.

The right engine fuel control unit (FCU) was removed from the airplane on July 23, 2003; there were no reports of discrepancies related to the engine or the fuel control unit between the accident date, and the date it was removed. The fuel control unit was disassembled which revealed an eroded "T-seal." The eroded seal was replaced, the unit was reassembled, bench tested, and placed back into service.

ADDITIONAL INFORMATION

The airplane minus the retained cockpit voice recorder, flight data recorder, and right engine electronic engine control (EEC) was released to Jason A. Ragogna, Specialist-Flight Safety Investigations, Delta Air Lines, Inc., on September 12, 2003. The retained components were also released to Jason A. Ragogna on April 11, 2005.

Pilot Information

Certificate:	Airline transport; Commercial; Private	**Age:**	45,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	March 11, 2003
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	May 16, 2002
Flight Time:	9378 hours (Total, all aircraft), 1933 hours (Total, this make and model), 124 hours (Last 90 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Commercial	**Age:**	39,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	March 11, 2003
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 6, 2003
Flight Time:	1919 hours (Total, all aircraft), 1264 hours (Total, this make and model), 14 hours (Last 90 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N633DL
Model/Series:	757-232	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	23614
Landing Gear Type:	Retractable - Tricycle	**Seats:**	191
Date/Type of Last Inspection:	June 2, 2003 Continuous airworthiness	**Certified Max Gross Wt.:**	232000 lbs
Time Since Last Inspection:	22.6 Hrs	**Engines:**	2 Turbo fan
Airframe Total Time:	52381.9 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	PW2037
Registered Owner:	Wilmington Trust Company Trustee	**Rated Power:**	37000 Lbs thrust
Operator:	Delta Air Lines, Inc.	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	DALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KTPA,26 ft msl	**Distance from Accident Site:**	
Observation Time:	06:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 3100 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 25000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/ None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.9 inches Hg	**Temperature/Dew Point:**	24°C / 23°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tampa, FL (KTPA)	**Type of Flight Plan Filed:**	IFR
Destination:	Atlanta, GA (KATL)	**Type of Clearance:**	None
Departure Time:	07:05 Local	**Type of Airspace:**	Class B

Airport Information

Airport:	Tampa International Airport KTPA	**Runway Surface Type:**	
Airport Elevation:	26 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	Unknown
Runway Length/Width:		**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	1 Minor, 5 None	**Aircraft Damage:**	None
Passenger Injuries:	3 Serious, 26 Minor, 139 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Serious, 27 Minor, 144 None	**Latitude, Longitude:**	27.975555,-82.533332

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Joseph G Murray; FAA Flight Standards District Office; Tampa, FL David D Lapa; FAA Manufacturing Inspection District Office, 41; Windsor Locks, CT Ralph E Hicks; Delta Air Lines, Inc.; Atlanta, GA Lawrence A Sittig; Delta Air Lines, Inc.; Atlanta, GA Neil Hosier; Delta Air Lines, Inc.; Atlanta, GA Sandra Kradas; Hamilton Sundstrand; Windsor Locks, CT Stuart C Browning; Hamilton Sundstrand; Windsor Locks, CT Daren W Dirkse; ALPA; Atlanta, GA
Original Publish Date:	September 13, 2005
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=57322

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.