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## Collision with ground tug, Boeing 727, November 27, 1999

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**Micro-summary:** This Boeing 727 rolled onto a tug following the failure of a shear pin on the tow bar.

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**Event Date:** 1999-11-27 at 1030 EST


**Investigative Body:** National Transportation Safety Board (NTSB), USA


**Investigative Body's Web Site:** <http://www.nts.gov/>

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  2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***
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		NTSB ID: NYC00LA040		Aircraft Registration Number: N521DA	
		Occurrence Date: 11/27/1999		Most Critical Injury: None	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place FLUSHING	State NY	Zip Code 11371	Local Time 1030	Time Zone EST	
Airport Proximity: On Airport		Distance From Landing Facility:		Direction From Airport:	
Aircraft Information Summary					
Aircraft Manufacturer Boeing		Model/Series 727-232		Type of Aircraft Airplane	
Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
<p>Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:</p> <p>On November 27, 1999, about 1030 eastern standard time, a Boeing 727-232, N521DA, operated by Delta Air Lines (DAL) as Delta Shuttle flight 1749, was substantially damaged during pushback from its gate at LaGuardia Airport (LGA), Flushing, New York. The 3 certificated pilots, a check airman, 4 flight attendants, 65 passengers, and 3 ground crew personnel were not injured. Visual meteorological conditions prevailed for the scheduled passenger/cargo flight that was destined for Ronald Reagan Washington National Airport (DCA), Washington, DC. An instrument flight rules (IFR) flight plan had been filed for the flight that was conducted under 14 CFR Part 121.</p> <p>The airplane was parked at gate number 3, at the Marine Air Terminal. It was being dispatched with the auxiliary power unit (APU) inoperative. The three engines were started prior to the start of the pushback.</p> <p>The cockpit was occupied by the captain, first officer, second officer, and a second officer check airman.</p> <p>According to the captain:</p> <p>"...A normal push-back commenced onto the company ramp. Initially, the tug pushed us straight back, and then it turned the aircraft approximately 90 degrees, tail pointing west...As the nose of the aircraft moved from left to right, simultaneously I heard 'set your brakes' from the tug driver as a 'crunching' sound emanated from the right side of the aircraft...."</p> <p>According to the second officer check airman:</p> <p>"...The backward movement [push] was then stopped, and the aircraft began a slight forward movement with the nose moving slowly to the right. Within a few seconds, the nose movement to the right accelerated, at which time the taxi director signaled to apply the brakes, and I heard the words 'Stop, Stop' several times...[the captain] immediately applied the brakes. At the same instant, a loud bang was heard emanating from the right side of the aircraft...."</p> <p>Similar statements were received from the first and second officers.</p> <p>There were three persons on the ground crew, two wing walkers, and the tug driver who was also in communication with the cockpit flight crew via the interphone.</p> <p>According to the tug driver:</p> <p>"...I pushed it back from gate #3 toward [taxiway] Alpha-Charlie and came to a full stop. I then put the tractor in reverse and began the pull-forward. While making the turn toward the yellow taxi line I heard a 'pop'. I told the captain on the headset to 'set your brakes' several times,</p>					
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## Narrative (Continued)

but the aircraft was already coming at me quickly since the engines were running. I stopped the tractor hoping it would stop the plane, but the plane bent the tow bar and hit the tractor. I was not at the turn limit when the shear-pin broke."

Both the left and right wing walkers reported they heard the shear pin break followed by the airplane striking the tug. The right side wing walker could see the first officer and signaled for him to set the brakes.

After electrical power was brought to the airplane, the engines were shut down, and the passengers exited the airplane through the rear air-stair door. The passengers were then escorted to the terminal.

The airplane was pushed back from the gate with hydraulic pressure removed from the nose wheel steering unit, and the torsion links connected. Two shear pins were installed on the tow bar to prevent nose wheel movement in excess of 78 degrees either side of center. An inspector from the Federal Aviation Administration (FAA) reported that one of the shear pins was fractured.

According to the Safety Board Materials Laboratory report, examination of the shear pins revealed, evidence of a pre-existing crack in the area of failure. Hardness testing on both shear pins revealed a lower level of hardness than specified by DAL.

The tow bar was forwarded to DAL Engineering Department in Atlanta, Georgia, for further examination. The examination was witnessed by an inspector from the FAA. According to a written report of the examination from DAL, the shear pin holes were elongated about 0.030 inches, and the tow bar was worn on the bottom of the head. In addition the head was loose on the tow bar.

At LGA, the Delta Shuttle was not co-located with the rest of the DAL flights. The ground handling was accomplished by contract personnel, who were not rated airframe and powerplant mechanics. DAL had developed and used a daily examination form for the condition of their tow bars. According to the form from LGA, tow bar 43677 had been examined daily, and continued in service with no problems noted. The investigation revealed that DAL did not have a preventative maintenance program for the tow bars, or a program in place to train the contract personnel on the proper inspection of the tow bars, and to monitor the inspections they conducted.

After the accident occurred, DAL conducted a fleet wide examination of their tow bars. According to data from the inspection, of 361 tow bars that were examined, 228 were found to have discrepancies that needed correction.

After the accident, the tug driver was given a toxicological examination in accordance with the operators procedures. The examination was negative for drugs and alcohol.

The readout of the digital flight data recorder (DFDR) revealed the airplane had been on a heading of about 073 degrees, and in 3 seconds shifted to a heading of about 85 degrees where it remained until loss of power to the recorder. As the airplane arrived on the new heading of about 085 degrees, the longitudinal acceleration recorded a peak of -0.16 Gs. The time of the peak G was 20 minutes and 24 seconds. Although the accident occurred during a forward tow, there was insufficient data from the DFDR to define the transition from pushback to forward tow.

The cockpit voice recorder was listened to at the Safety Board Laboratory and found to contain 30 minutes of back ground noise along with some non-pertinent conversations.

According to the DAL B727 manual, the APU inoperative procedure was to start engines one and three prior to pushback. According to the DAL Ramp Service Manual, the APU inoperative procedure was to start engines one and two. According to the expanded checklist for the Boeing 727, a pilot has the option of starting three engines at the gate. According to the DAL safety

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## Narrative (Continued)

representative who participated in the accident, all engines were started due to the close proximity to the departure runway which would have given time for the proper warm-up of the engines.

According to Boeing, each engine produces 800 pounds of thrust at idle. The minimum force necessary to keep an airplane in motion once it is rolling was 0.016 times the weight of the airplane. The brake away force to initiate movement was estimated at 1.5 times the force necessary to keep it moving. The computed takeoff weight was 142,740 pounds.

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<b>Landing Facility/Approach Information</b>					
Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
LA GUARDIA AIRPORT	LGA	22 Ft. MSL	0		
Runway Surface Type:					
Runway Surface Condition:					
Type Instrument Approach: NONE					
VFR Approach/Landing: None					
<b>Aircraft Information</b>					
Aircraft Manufacturer		Model/Series		Serial Number	
Boeing		727-232		21472	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 160	Certified Max Gross Wt.	185200 LBS	Number of Engines: 3	
Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:		
Turbo Jet	P&W	JT8D-15	15500 LBS		
- Aircraft Inspection Information					
Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time		
Continuous Airworthiness	11/1999	9 Hours	61269 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed? No	ELT Operated?	ELT Aided in Locating Accident Site?			
<b>Owner/Operator Information</b>					
Registered Aircraft Owner		Street Address			
DELTA AIR LINES		HARTSFIELD ATLANTA INTL ARPT			
		City	State	Zip Code	
		ATLANTA	GA	30320	
Operator of Aircraft		Street Address			
Same as Reg'd Aircraft Owner		Same as Reg'd Aircraft Owner			
		City	State	Zip Code	
Operator Does Business As:			Operator Designator Code: DALA		
- Type of U.S. Certificate(s) Held:					
Air Carrier Operating Certificate(s): Flag Carrier/Domestic					
Operating Certificate:			Operator Certificate:		
Regulation Flight Conducted Under: Part 121: Air Carrier					
Type of Flight Operation Conducted: Scheduled; Domestic; Passenger/Cargo					
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**First Pilot Information**

Name On File	City On File	State On File	Date of Birth On File	Age 45
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Sex: M	Seat Occupied: Left	Principal Profession: Civilian Pilot	Certificate Number: On File
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Certificate(s): Airline Transport; Flight Engineer

Airplane Rating(s): Multi-engine Land; Single-engine Land

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s): None

Type Rating/Endorsement for Accident/Incident Aircraft? Yes	Current Biennial Flight Review?
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Medical Cert.: Class 1	Medical Cert. Status: Valid Medical--no waivers/lim.	Date of Last Medical Exam: 08/1999
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- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Multi-Engine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time	7561	1111								
Pilot In Command(PIC)										
Instructor										
Last 90 Days	168	168								
Last 30 Days										
Last 24 Hours										

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed? No	Second Pilot? Yes
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**Flight Plan/Itinerary**

Type of Flight Plan Filed: IFR

Departure Point Same as Accident/Incident Location	State	Airport Identifier LGA	Departure Time 0000	Time Zone
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Destination WASHINGTON	State DC	Airport Identifier DCA	
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Type of Clearance: None

Type of Airspace:

**Weather Information**

Source of Briefing: Company

Method of Briefing:

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**Weather Information**

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
LGA	1051	EST	22 Ft. MSL	0 NM	0 Deg. Mag.

Sky/Lowest Cloud Condition: Scattered	2500 Ft. AGL	Condition of Light: Day
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Lowest Ceiling: Broken	14000 Ft. AGL	Visibility: 10	SM	Altimeter: 29.00	"Hg
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Temperature: 12 °C	Dew Point: 7 °C	Wind Direction: 320	Density Altitude: Ft.
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Wind Speed: 17	Gusts:	Weather Conditions at Accident Site: Visual Conditions
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Visibility (RVR): 0 Ft.	Visibility (RVV) 0	SM	Intensity of Precipitation: Unknown
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Restrictions to Visibility: None

Type of Precipitation: None

**Accident Information**

Aircraft Damage: Substantial	Aircraft Fire: None	Aircraft Explosion: None
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Classification: U.S. Registered/U.S. Soil

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot				1	1
Second Pilot				1	1
Student Pilot					
Flight Instructor					
Check Pilot				1	1
Flight Engineer				1	1
Cabin Attendants				4	4
Other Crew					
Passengers				65	65
- TOTAL ABOARD -				73	73
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	73	73

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**FACTUAL REPORT**

**AVIATION**



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Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

ROBERT L. HANCOCK

Additional Persons Participating in This Accident/Incident Investigation:

DENNIS SCARFEO  
FAA FSDO  
GARDEN CITY, NY

JOHN R POTTHAST  
DELTA AIR LINES  
ATLANTA, GA