Aviation Investigation Final Report

Location:	Memphis, Tennessee	**Accident Number:**	ATL06LA024
Date & Time:	December 14, 2005, 02:30 Local	**Registration:**	N213FE
Aircraft:	Boeing 727-2S2F	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Serious, 3 None
Flight Conducted Under:	Part 121: Air carrier - Non-scheduled		

Analysis

The flight crew stated that as the number 3 engine was being started, the captain mentioned that the tug was out of position for a normal pushback. As the airplane was being pushed back the flight crew heard and felt a few rough jolts from the nose wheel area. When the airplane stopped moving, the wing-walker gave the flight crew the emergency stop signal and the captain set the parking brake. The tug driver stated that during the pushback they did not notice anything unusual. The tug driver stated while towing the airplane forward and looking back to align the airplane with the taxiway, she heard the wing walker yell as the airplane rolled forward, and collide with the tug. The wing-walkers stated that it was raining as pushback procedure was initiated, and they noted a smell of glycol. The tug appeared to lose traction as the airplane moved passed the main landing gear chocks. The tug driver regained control of the tug, and continued the push back. As the tug operator began to tow the airplane forward, the wing-walker noticed that the airplane continued to roll forward when the tug stopped. The airplane collided with the tug and stopped with the tug on the right underside of the airplane. Examination of the airplane revealed that the hull of the airplane had a 5-foot tear on the underside of the belly. Further examination of the belly revealed two ribs and five stringers were damaged. Examination of the tow bar revealed the shear pin of the hitch head was sheered off. Metallurgical examination of the shank of the pin revealed that the pin was separated in two locations. Both fractures consisted of a flat surface displaying a small crescent shape with the remaining surface displaying a grainy texture. The features are typical of what is termed "double shear". Review of records showed that the tow bar was last inspected on September 21, 2005, and the shear pin was replaced on November 30, 2005.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The improper towing of the airplane by the tug operator which resulted in the shearing of the towbar shear pin and subsequent collision of the airplane and tug.

Findings

Occurrence #1: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: TAXI - PUSHBACK/TOW

Findings
1. MISC EQPT/FURNISHINGS,TOW BAR - OVERLOAD
2. (C) AIRCRAFT HANDLING - IMPROPER - GROUND PERSONNEL
3. OBJECT - VEHICLE

Factual Information

HISTORY OF FLIGHT

On December 14, 2005, at 0230 central standard time, a Boeing 727-2S2F, N213FE, Flight 1472, registered to and operated by Federal Express Corporation, collided with a tug during pushback at Memphis International Airport, Memphis, Tennessee. The scheduled domestic/international cargo flight was operating under the provisions of Title 14 CFR Part 121, with an instrument flight plan filed. Visual meteorological conditions prevailed at the time of the accident. The airplane was substantially damaged. The airline transport rated pilot-in-command (PIC), airline transport rated first officer, and airline transport rated flight engineer reported no injuries. The tug driver received serious injuries. The flight was originating from the Memphis International Airport, Memphis, Tennessee, on December 14, 2005 at 0230.

The flight crew stated that as the number 3-engine was being started the Captain mentioned that during the initial movement the tug was out of position for a normal push back. As the airplane was being pushed back the flight crew heard, and felt a few rough jolts from the nose wheel area. When the airplane stopped moving, there was no communication from the pushback crew over the intercom. The wing-walker gave the flight crew the emergency stop signal, and the Captain set the parking brake.

In an interview by an FAA inspector, the tug driver stated that the tow bar, and the tug were inspected before it was used. The tug driver felt that the both pieces of equipment were acceptable for the pushback. The tug driver stated that during the pushback they did not notice anything unusual. The tug driver stated while towing the airplane forward and looking back to align the airplane with the taxiway, she heard the wing walker yell as the airplane rolled forward, and collide with the tug.

The wing-walkers stated that it was raining as the push back procedure was initiated and they noted a smell of glycol. The tug appeared to loose traction as the airplane moved passed the main landing gear chocks. The tug driver regained control of the tug, and continued the push back. The tug driver stopped the airplane and motioned the wing-walkers to reposition so that the airplane could be towed forward. As the tug operator began to tow the airplane forward the wing-walkers noticed that the airplane continued to roll forward when the tug stopped. The airplane collided with the tug, and stopped with the tug on the right underside of the airplane. The wing-walker gave the flight crew the emergency stop signal, however the airplane had already stopped.

PERSONAL INFORMATION

Review of personnel records revealed that the Federal Express Corporation hired the tug

operator on November 1, 1991. Training records revealed that the tug operator completed the Federal Express T-300 tug-training course on February 21, 2005, and completed the Federal Express 727-100/200 pushback-training course on June 6, 2005. Further review of training records revealed that the tug driver also completed the 727 push back & tow safety course on June 6, 2005. The tug operator had no other collisions or mishaps within the last calendar year.

AIRCRAFT INFORMATION

The airplane is a Boeing 727-2S2F, serial No. 22935, registration No. N213FE. The airplane is registered to and operated by Federal Express Corporation Memphis, Tennessee. The airplane is equipped with three Pratt & Whitney JT8D-17 SER, 16,000 pounds of thrust engines. Maintenance records indicate the last continuous airworthiness inspection was conducted on December 2, 2005. The airplane has flown 18 hours since the last inspection and has accumulated 23,717 total airframe hours.

METEOROLOGICAL INFORMATION

The Memphis International Airport, 0253 surface weather observation was clouds scattered at 5,500 feet, visibility 10 miles with light rain, temperature 57 degrees Fahrenheit, dew point temperature 32 degrees Fahrenheit, wind 330 degrees at 12 knots, and altimeter 30.03.

MEDICAL INFORMATION

Toxicology testing of specimens from the tug driver was not preformed.

WRECKAGE AND IMPACT INFORMATION

Post-accident examination of the airplane revealed, that the right side of the airplane had a 5-foot tear on the underside of the belly. Further examination of the belly revealed two ribs, and five stringers were damaged.

Examination of the tow bar revealed the shear pins of the plane hitch head were sheered off. The aircraft hitch was still attached to the landing gear, and the tow bar was buckled at the pushback hitch end main structure.

TESTS AND RESEARCH

Metallurgical examination of the shank of the pin revealed that the pin was separated in two locations. Both fractures consisted of a flat surface displaying a small crescent shape with the remaining surface displaying a grainy texture. The fracture face adjacent to the nut also displayed a small lip directly opposite to the crescent shape. The features are typical of what is termed "double shear".

Review of records revealed the Flight Line Company manufactured the 1980 model tow bar, model number FLTB272. Examination of the tow bar revealed it was equipped with a 727-shear pin, part number AN5-36A. Review of records showed that the tow bar was last inspected on September 21, 2005, and the shear pin was replaced on November 30, 2005.

Pilot Information

Certificate:	Airline transport; Flight engineer	**Age:**	50,Male
Airplane Rating(s):	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 None	**Last FAA Medical Exam:**	July 1, 2005
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	September 1, 2005
Flight Time:	3000 hours (Total, all aircraft), 3000 hours (Total, this make and model), 1100 hours (Pilot In Command, all aircraft), 32 hours (Last 90 days, all aircraft), 27 hours (Last 30 days, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Flight engineer	**Age:**	50,Male
Airplane Rating(s):	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 None	**Last FAA Medical Exam:**	May 1, 2005
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	August 1, 2005
Flight Time:	1930 hours (Total, all aircraft), 1930 hours (Total, this make and model), 114 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N213FE
Model/Series:	727-2S2F	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	22935
Landing Gear Type:	Retractable - Tricycle	**Seats:**	3
Date/Type of Last Inspection:	December 1, 2005 Continuous airworthiness	**Certified Max Gross Wt.:**	204000 lbs
Time Since Last Inspection:	18 Hrs	**Engines:**	3 Turbo jet
Airframe Total Time:	23717 Hrs as of last inspection	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	JT8D
Registered Owner:	Federal Express Corp.	**Rated Power:**	16000 Lbs thrust
Operator:		**Operating Certificate(s) Held:**	Supplemental
Operator Does Business As:		**Operator Designator Code:**	FDEA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	MEM,250 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	02:53 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Scattered / 5500 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	12 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	330°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.03 inches Hg	**Temperature/Dew Point:**	14°C / 0°C
Precipitation and Obscuration:	Light - None - Rain		
Departure Point:	Memphis, TN (MEM)	**Type of Flight Plan Filed:**	IFR
Destination:	OKLAHOMA CITY, OK (OKC)	**Type of Clearance:**	Unknown
Departure Time:	02:30 Local	**Type of Airspace:**	

Airport Information

Airport:	Memphis International MEM	**Runway Surface Type:**	
Airport Elevation:	250 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	Unknown
Runway Length/Width:		**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	3 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	1 Serious	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 3 None	**Latitude, Longitude:**	35.038612,-89.972778

Administrative Information

Investigator In Charge (IIC):	Alleyne, Eric
Additional Participating Persons:	Autrey O Ivy; Memphis FSDO-25; Memphis, TN
Original Publish Date:	May 30, 2006
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=62983