



National Transportation Safety Board Aviation Accident Final Report

Location:	Louisville, KY	Accident Number:	NYC05FA094
Date & Time:	06/07/2005, 0125 EDT	Registration:	N250UP
Aircraft:	McDonnell Douglas MD-11F	Aircraft Damage:	Substantial
Defining Event:		Injuries:	4 None
Flight Conducted Under:	Part 121: Air Carrier - Non-scheduled		

Analysis

The McDonnell Douglas MD-11F was being flown by a captain seated in the left seat (PF), who was receiving initial operating experience (IOE). A captain seated in the right seat, was the pilot-in-command (PIC) of the flight. The airplane was landing on an 8,579-foot-long, concrete runway, during night visual meteorological conditions. After main gear touchdown, the nose gear touched down, and subsequently collapsed. The airplane sustained damage to and around the pressure bulkhead, at station 625. Data obtained from the flight data recorder revealed that after main gear touchdown, the control column was moved sharply forward resulting in a change in pitch angle from approximately 5 degrees nose up, to about 1 degree nose down, which was accompanied by a reduction in load factor to approximately 0.3 g's. The vertical load factor then spiked to approximately 2.5 g's on nose wheel contact, over twice that of a typical landing, with a load factor increment of 0.75 g's, also excessive. Metallurgical examination of the remnants of the nose landing gear assembly were consistent with overstress, and no evidence of any preexisting fractures were observed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The flying pilot's improper aircraft handling after main landing gear touchdown, which resulted in the collapse of the nose landing gear assembly. Contributing to the accident was the pilot-in-command's inadequate supervision during the landing.

Findings

Occurrence #1: HARD LANDING

Phase of Operation: LANDING

Findings

1. (F) SUPERVISION - INADEQUATE - PILOT IN COMMAND
2. (C) AIRCRAFT HANDLING - IMPROPER - OTHER CREWMEMBER
3. LANDING GEAR, NOSE GEAR ASSEMBLY - COLLAPSED

Factual Information

HISTORY OF FLIGHT

On June 7, 2005, at 0125 eastern daylight time, a McDonnell Douglas MD-11F, N250UP, operated by United Parcel Service Company (UPS) as flight 6971, was substantially damaged during landing at the Louisville International Airport-Standiford Field (SDF), Louisville, Kentucky. There were no injuries to the two flight crewmembers or two passengers. Night visual meteorological conditions prevailed and an instrument flight rules flight plan had been filed for the flight that originated from the Ted Stevens Anchorage International Airport, Anchorage, Alaska. The non-scheduled cargo flight was conducted under 14 Code of Federal Regulations Part 121.

According to the operator, the airplane experienced a hard landing with a different flight crew during the previous landing in Anchorage. Postflight inspection of the airplane and landing gear by maintenance personnel did not reveal any abnormalities, and the airplane was released for flight. In addition, the accident flight crew was aware of the hard landing and stated that they specifically examined the nose gear with the knowledge of the previous hard landing, and did not observe any discrepancies.

The pilot flying (PF) was a captain seated in the left seat, who was receiving initial operating experience (IOE) in the MD-11F. The pilot monitoring (PM) was a captain seated in the right seat, was also the pilot-in-command (PIC) of the flight.

Both pilots reported that the takeoff, en route, and approach portions of the flight were normal and uneventful. The airplane was cleared to land at SDF, on runway 17L, an 8,579-foot-long, concrete runway. The PIC reported that the landing approach speed was 163 knots. The airplane's main landing gear touched down normally, and was followed by a normal de-rotation rate; however, he heard a loud "explosion" when the nose landing gear contacted the runway. The nose gear lifted up momentarily, before contacting the ground again. During the landing rollout, after the thrust reversers were deployed, the PF observed sparks fly up past the cockpit window, and described feeling "tremendous" vibrations.

The airplane remained predominately on the runway centerline during the rollout, before coming to a stop on the runway. All occupants evacuated via the left main door emergency slide. Airport rescue and fire fighting (ARFF) personnel extinguished a fire that ensued, and surrounded the nose landing gear.

Examination of the runway indicated that the nose gear touched down about 150 prior to the 6,000 feet remaining sign, and 6 feet left of the runway centerline. A gouge was observed on the runway about 100 feet further along the runway, and portions of the nose landing gear assembly were strewn about 5,000 feet along, and around the runway. The remnants of the nose landing gear assembly were subsequently forwarded to the Safety Board's Metallurgical Laboratory, Washington, D.C., for further examination. The remnants included, the inboard and outboard wheel halves for both wheels; the inboard and outboard bearings for both wheels; axle sleeves, spacers, and end nuts from the left and right wheels; bearing seals and retaining rings for both wheels; wheel bolts, nuts, and washers for connecting the wheel halves; the left and right tires; the hubcap for the left wheel; and a support tube.

In addition to the damage to the nose gear assembly, the airplane sustained damage to and around the pressure bulkhead at station 625.

The airplane was equipped with an L-3 Communications Fairchild cockpit voice recorder and flight data recorder, which were forwarded to the Safety Board's Vehicle Recorders Laboratory, Washington, D.C., for readout.

The accident occurred during the hours of night at approximately 38 degrees, 10.46 minutes north latitude, and 85 degrees, 44.16 minutes west longitude.

PERSONNEL INFORMATION

The PIC captain was hired by UPS on July 18, 1988. He held airline transport pilot certificates for multiengine land airplanes, and rotorcraft, and commercial pilot certificates for single engine land airplanes, and gliders. He also held several type ratings, including Boeing 727, 757, 767, and McDonnell Douglas DC-3, DC-9, and MD-11 series airplanes.

The PIC reported 10,000 hours of total flight experience, which included about 425 hours in the MD-11F, of which, 160 and 26 hours were accumulated in the 90 and 30 days preceding the accident, respectively. His most recent company flight proficiency check was completed on May 26, 2004.

The PIC's most recent Federal Aviation Administration (FAA) first class medical certificate was issued on February 8, 2005.

The PF captain was hired by UPS on January 16, 1995. He held an airline transport pilot certificate for multiengine land airplanes, and a commercial pilot certificate for single engine land airplanes. He also held type ratings for Boeing 757, 767, Lockheed L-382, and McDonnell Douglas MD-11 series airplanes.

The PF reported 5,000 hours of total flight experience, which included 39 hours in the MD-11F, all of which was accumulated during the 90 days preceding the accident. The PF's most recent company flight proficiency check was completed on April 26, 2005.

The PF's most recent FAA first class medical certificate was issued on January 5, 2005.

AIRCRAFT INFORMATION

The McDonnell Douglas MD-11F, serial number 48745, was maintained under a continuous airworthiness inspection program, and had accumulated about 28,231 total hours of operation.

On June 5, 2005, a UPS maintenance crew performed a periodic check on the airplane while it was in Guangzhou, Peoples Republic of China. During the inspection, it was noted that the left hand nose wheel tire was beyond acceptable inspection limits, and the complete wheel assembly was subsequently replaced. During the wheel assembly replacement, it was noted that the wheel bearings and the axle were absent of any abnormalities.

Review of the airplane's maintenance records revealed that on June 6, 2005, the airplane experienced a hard landing in Anchorage, Alaska. A "hard landing A-check" inspection was subsequently accomplished by UPS maintenance personnel, in accordance with the appropriate maintenance manual. There were no abnormalities noted during the inspection, and the airplane was released.

The airplane's auto-spoilers were deferred per the operator's minimum equipment list procedures for the accident flight; however, the spoilers could be deployed manually by the flight crew. The PIC reported that manual deployment of the spoilers during landing would be performed after the nose gear was on the ground.

The airplane was equipped with a longitudinal stability augmentation system (LSAS), and flight control computer (FCC)-908 software update. According to Boeing, the software update included, but was not limited to, enhancing the handling of the airplane during landings compared to MD-11's equipped with previous versions of the FCC, by decreasing the pitch sensitivity through action of the pitch rate damper.

METEOROLOGICAL INFORMATION

Weather observations taken at SDF, reported:

At 0056, winds from 200 degrees at 9 knots; visibility 10 statute miles, few clouds at 15,000 feet, ceiling broken at 25,000 feet, temperature 23 degrees Celsius (C); dew point 18 degrees C; altimeter 29.99 inches of mercury.

At 0156, winds from 230 degrees at 5 knots; visibility 10 statute miles, few clouds at 15,000 feet, ceiling broken at 25,000 feet, temperature 23 degrees C; dew point 18 degrees C; altimeter 29.97 inches of mercury.

AIRPORT INFORMATION

Louisville International Airport-Standiford Field was positioned at 38 degrees, 10 minutes, 27.8 seconds, north latitude; 85 degrees, 44 minutes, 9.6 seconds, west longitude, at an elevation of 501 feet above sea level.

Runway 17L-35R, was 8,579-foot-long, 150-foot-wide, and constructed of grooved concrete. It was equipped with an instrument landing system (ILS), and an medium intensity approach lighting system with runway alignment indicator lights, runway centerline lights, and touchdown zone lighting.

All runway and approach lighting systems on runway 17L were operational at the time of the accident.

FLIGHT RECORDERS

Cockpit Voice Recorder

The airplane was equipped with an L-3 Communications Fairchild Model FA2100-1020-02 cockpit voice recorder (CVR). A CVR group convened on June 29, 2005, and a transcript of the CVR was prepared covering the period from 0117:17 to 0125:45. According to the Cockpit Voice Recorder Factual Report:

At 0118:11, the PIC made a radio call stating "Louisville UPS six nine seven one heavy has the airdrome in sight." Four seconds later, approach control responded "...sixty nine seventy one heavy cleared visual runway one seven left."

During the approximately three minutes while on the approach, the PIC discussed various aspects of flying the approach with the pilot flying (PF).

At 0221:58, the cockpit area microphone (CAM) recorded a warning tone and an electronic voice stating "autopilot, autopilot." One second later, the PIC commented "sink is eight...glideslope", to which the PF responded "yea I got quite a - nose dump out of this thing."

Starting at 0122:28, an electronic voice was recorded on the CAM counting down from 50 in ten foot increments, at a rate of approximately 10 feet per second.

At 0122:35, a high amplitude electronic sound and loud bang, followed by rattling sounds were

recorded. Nineteen seconds later, the PF stated "that feels like a blown tire."

At 0123:51, additional 'crashing sounds' were recorded. The PIC stated "shut down" and notified the air traffic control tower that the airplane was not clear of the runway.

Flight Data Recorder

The airplane was equipped with an L-3 Communications Fairchild Model FA2100 flight data recorder (FDR). According to the Flight Data Recorder Factual Report:

The airplanes gross weight was about 446,880 pounds, and the flaps were set at 35 degrees for the landing. At 1:24:00, the airplane's left and right inboard and outboard wheels spun up, indicating a status greater than 80 knots. The airplane's computed airspeed was 157 knots, and the pitch was 5.6 degrees nose up. The following second, the thrust reversers began to unlock.

At 1:24:03, the right nose gear indicated "ground" followed by the left nose gear the next second. All three thrust reversers were deployed by 1:24:04. The airplane's pitch then increased to 3.9 degrees nose up before decreasing again. Both nose gear parameters indicated "air" for two seconds before returning and remaining at "ground" beginning at 1:24:06. The computed airspeed at that time was 132 knots.

It was noted that the spoilers were in the "armed" position; however, they were not deployed by the flight crew.

TESTS AND RESEARCH

Examination of all retained portions of the nose landing gear assembly by a Safety Board Metallurgists were consistent with overstress, and no evidence of any preexisting fractures were observed.

Subsequent disassembly and inspection of the nose landing assembly by a maintenance facility did not identify any preaccident discrepancies.

ADDITIONAL INFORMATION

Airplane Performance Study

An airplane performance study was conducted by a Safety Board Vehicle Recorder Specialist using data obtained from FDR for the accident flight and previous flights. The study revealed that during the accident landing, a vertical load factor spike of 1.75 g's was noted at touchdown, and corresponded to main wheel spin-up. The control column was then moved sharply forward resulting in a change in pitch angle from approximately 5 degrees nose up, to about 1 degree nose down, which was accompanied by a reduction in load factor to approximately 0.3 g's. The vertical load factor then spiked to approximately 2.5 g's on nose wheel contact, with a load factor increment of 0.75 g's.

During the previous hard landing in Anchorage, the vertical spike at nose gear contact was observed at 2.2 g's; however, the load factor increment was only 0.3 g's.

The load factor spike on a typical landing was about 1.15 g's.

The ground spoilers were not deployed during the accident flight; however; when examining the previous flights, it was noted that the ground spoilers did not deploy until after nose gear touchdown.

McDonnell Douglas MD-11 Pilot Training Guide

The UPS MD-11 Pilot Training Guide, Chapter 5, Revision 3, pertaining to touchdown, stated in part:

"After touchdown, monitor ground spoiler deployment and be prepared to counter any pitch-up tendency as spoilers extend. Smoothly fly nose wheel to the runway, and if auto ground spoilers do not fully deploy upon nose wheel touchdown, Captain will manually deploy the spoilers....LSAS will assist the pilot in avoiding nose pitch-up after touchdown, and in lowering the nose to the runway.

Note: Ground spoiler deployment causes a nose up pitching moment....It is important to resist any pitch-up tendency with forward pressure on the control column and smoothly lower the nose wheel to the runway. The LSAS, on aircraft with FCC 908 will assist the pilot in the nose lowering task...."

Pilot Information

Certificate:	Airline Transport	Age:	57, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	Glider; Helicopter	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine	Toxicology Performed:	No
Medical Certification:	Class 1 With Waivers/Limitations	Last Medical Exam:	02/01/2005
Occupational Pilot:		Last Flight Review or Equivalent:	05/01/2004
Flight Time:	10000 hours (Total, all aircraft), 425 hours (Total, this make and model)		

Co-Pilot Information

Certificate:	Airline Transport	Age:	53, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):		Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:	Class 1 With Waivers/Limitations	Last Medical Exam:	01/01/2005
Occupational Pilot:		Last Flight Review or Equivalent:	04/01/2005
Flight Time:	5000 hours (Total, all aircraft), 39 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	McDonnell Douglas	Registration:	N250UP
Model/Series:	MD-11F	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	48795
Landing Gear Type:	Retractable - Tricycle	Seats:	7
Date/Type of Last Inspection:	05/01/2004, Continuous Airworthiness	Certified Max Gross Wt.:	633000 lbs
Time Since Last Inspection:	313 Hours	Engines:	3 Turbo Fan
Airframe Total Time:	28231 Hours	Engine Manufacturer:	General Electric
ELT:	Installed, not activated	Engine Model/Series:	CF-6
Registered Owner:	UNITED PARCEL SERVICE CO	Rated Power:	60800 lbs
Operator:	UNITED PARCEL SERVICE CO	Air Carrier Operating Certificate:	Flag carrier (121)
Operator Does Business As:		Operator Designator Code:	IPXX

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night
Observation Facility, Elevation:	SDF, 501 ft msl	Observation Time:	0056 EDT
Distance from Accident Site:		Direction from Accident Site:	
Lowest Cloud Condition:	Few / 15000 ft agl	Temperature/Dew Point:	23° C / 18° C
Lowest Ceiling:	Broken / 25000 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	9 knots, 200°	Visibility (RVR):	
Altimeter Setting:	29.99 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Anchorage, AK (ANC)	Type of Flight Plan Filed:	IFR
Destination:	Louisville, KY (SDF)	Type of Clearance:	IFR
Departure Time:	2316 UTC	Type of Airspace:	

Airport Information

Airport:	STANDIFORD FIELD (SDF)	Runway Surface Type:	Concrete
Airport Elevation:	501 ft	Runway Surface Condition:	Dry
Runway Used:	17L	IFR Approach:	ILS
Runway Length/Width:	8579 ft / 150 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	2 None	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 None	Latitude, Longitude:	38.174167, -85.735833

Administrative Information

Investigator In Charge (IIC):	Stephen M Demko	Adopted Date:	02/28/2008
Additional Participating Persons:	Jeffrey S Neuin; FAA FSDO; Louisville, KY		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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