



National Transportation Safety Board Aviation Incident Final Report

Location:	Chicago, IL	Incident Number:	CHI03IA097
Date & Time:	04/01/2003, 1115 CST	Registration:	N175UA
Aircraft:	Boeing 747-422	Aircraft Damage:	None
Defining Event:		Injuries:	319 None

Flight Conducted Under: Part 121: Air Carrier - Scheduled

Analysis

While in normal cruise flight, the crew experienced lateral control problems. An emergency was declared. The aircraft landed safely at the intended destination. Evidence of a water leak was identified by the cabin crew approximately 5 hours from the destination. Efforts to control the leak were effective, however it was not completely stopped. Water was reported coming from the upper deck and flowing through the main deck ceiling. The flight was subsequently directed by air traffic control to make an enroute course change. However, when this command was entered in the Flight Management Computer (FMC) the aircraft began a shallow left turn instead of a right turn as required. Initial attempts to disconnect the autopilot were not successful and the autopilot was manually overridden. The relief first officer at the controls stated the controls "felt unusual" and "stiff." The captain reported elevator and rudder were normal, but bank angle was limited. The landing was accomplished smoothly and safely according to the captain, and the aircraft was taxied to the gate without incident. After landing, the captain noted the controls felt normal. Ramp personnel reported a significant amount of water draining from the fuselage and the drain masts at the gate. A post-incident examination of the aircraft revealed that areas of the main deck carpeting was saturated. The canted pressure deck overboard drains were not obstructed. A 6-inch long by 0.125-inch wide gap was located along the outboard edge of the canted pressure bulkhead on the right side of the aircraft. The seam was not sealed as required. Immediately aft of the canted pressure bulkhead were aileron and flight spoiler control cables. Four (4) circuit breakers common to the external drain line heaters were found open. The external drain lines route wastewater from the cabin overboard. The breakers were pulled in conjunction with routine cleaning of the drain lines prior to departure. Ground functional testing of the aileron controls, the aileron trim and the autopilot did not find any anomalies. A flight test was completed to verify in-flight operation of the flight controls and potable water system. No anomalies were noted. Airline procedures related to the routine inspection and cleaning of the external drains were reviewed. Resetting of the drain heater circuit breakers was the last item. A service bulletin had been issued which recommended testing, cleaning and inspection of the canted pressure deck drainage system (overboard drains), general visual inspection of the deck structure a pressurization test. Service bulletin instructions included a visual inspection for loose, missing or cracked sealant. The airline was in the process of incorporating the service bulletin into its

maintenance program. As a result, the initial service bulletin procedures had not been completed prior to the incident. An airworthiness directive (AD) which required cleaning of "the cavity aft of the wing center section" and verification that all drains were open and clean was in effect at the time of the incident and had been complied with. A new AD was issued following the incident which mandated full compliance with the existing service bulletin.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: Failure of company maintenance personnel to fully comply with published maintenance/inspection procedures, as well as the resulting inoperative drain heaters and restricted movement of the aileron control cables. Contributing factors were the impeded waste water drain system due to the inoperative heaters and the reduced aileron control due to restricted movement of the control cables.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE - NORMAL

Findings

1. (C) MAINTENANCE, INSPECTION - NOT COMPLIED WITH - COMPANY MAINTENANCE PERSONNEL
2. (C) ANTI-ICE/DEICE SYSTEM - INOPERATIVE
3. (F) WATER AND WASTE SYSTEM - IMPEDED
4. (C) FLT CONTROL SYST,AILERON CONTROL CABLE/ROD - MOVEMENT RESTRICTED
5. (F) FLT CONTROL SYST,AILERON CONTROL - REDUCED

Factual Information

On April 1, 2003, at 1115 central standard time, a Boeing 747-422, N175UA, operated by United Airlines as flight 896, reported lateral control problems while enroute from Hong Kong International Airport (HKG) to Chicago O'Hare International Airport (ORD), Chicago, Illinois. An emergency was declared approximately 175 miles northwest of ORD. The flight landed at ORD without incident at 1146. No injuries were reported by the 20 crew members and 299 passengers. Visual meteorological conditions prevailed at the time of the incident. Flight 896 was conducted on an instrument flight rules (IFR) flight plan under 14 CFR Part 121.

According to the flight crew statements, when the aircraft was approximately 5 hours from its intended destination, the cabin crew notified the flight deck there was evidence of a water leak on the floor adjacent to the utility elevator. The source of the leak was not readily apparent.

Approximately 3 hours later, 2 hours prior to landing, the cabin crew informed the flight deck that the leak had worsened and water was now dripping from the overhead bins on the main cabin level. Maintenance control was contacted and advised the crew of the location of the shutoff valve. It was located and closed. The leak subsided at that time according to the cabin crew.

Approximately 1100 the flight was cleared direct to Janesville, Wisconsin (JVL). The flight was reportedly located approximately 40 miles northwest of Minneapolis, Minnesota, at the time. This command was entered in the Flight Management Computer (FMC). However, instead of a shallow right turn to proceed direct to JVL as expected, the aircraft began a shallow left turn.

Initial attempts to disconnect the autopilot were not successful and the autopilot was manually overridden. The autopilot and flight director were recycled. The autopilot was again engaged and the aircraft again started a shallow left turn. The autopilot was once again manually overridden.

The relief first officer at the controls stated: "I made a right input in the controls to counter act the left turn. At this time the flight controls felt unusual to me so I reported to the crew that we might have a flight control problem. I attempted a shallow turn to the left but the aircraft controls felt stiff."

At this point the captain and flying first officer took control of the aircraft. The captain reported: "Elevator and rudder were normal, but bank angle was limited to approximately 3-5 degrees left and about 7 degrees right."

The captain went on to state that they decided to declare an emergency and since the aircraft was positioned near the extended centerline for ORD runway 14R, they decided to land on 14R. The captain noted: "We were in a position that would allow us to intercept 14R with only a 20-30 degree right turn and that we would be able to fly a long final with minimum maneuvering." The landing was accomplished smoothly and safely according to the captain, and the aircraft was taxied to the gate without incident.

After landing, the captain reportedly performed a control check and noted the controls felt normal. Ramp personnel reported a significant amount of water draining from the fuselage and the drain masts at the gate.

A post-incident examination of the aircraft was conducted. The main deck carpeting between doors 2 and 3 was saturated. The cart lift shaft had water along the base on the main deck.

The canted pressure deck drainage system was inspected in accordance with Boeing Service Bulletin 747-51A2057. The overboard drains were not obstructed.

A 6-inch long by 0.125-inch wide gap was located along the outboard edge of the canted pressure bulkhead on the right side of the aircraft. The seam was not sealed as required. Immediately aft of the canted pressure bulkhead were aileron and flight spoiler control cables.

Four (4) circuit breakers common to the external drain line heaters were found open. The external drain lines route wastewater from the cabin overboard. According to United, the breakers were pulled in conjunction with routine cleaning of the drain lines in HKG prior to departure. This was normally accomplished every 500 flight hours, according to the airline.

United engineering and maintenance personnel performed further post-incident testing. The potable water tanks were filled and the system was checked. No leaks were found. The external drain masts were plugged and the system was observed. Water subsequently backed up through the upper deck galley refrigeration air chiller unit and flowed into the main cabin through the ceiling panels on the right side of the aircraft. The water subsequently drained into the canted pressure bulkhead below the main cabin floor, immediately forward of the aft wing spar.

Ground functional testing of the aileron controls, the aileron trim and the autopilot did not find any anomalies. A 3-hour flight test was completed to verify in-flight operation of the flight controls and potable water system. No anomalies were noted.

The United Airlines Instruction Sheet and the Boeing Maintenance Manual procedures related to the routine inspection and cleaning of the external drains were reviewed. Both specified resetting of the drain heater circuit breakers as the last item in each procedure.

Boeing Service Bulletin 747-51A2057, issued February 21, 2002, recommended testing, cleaning and inspection of the canted pressure deck drainage system (overboard drains) within 18 months of the date of the bulletin and every 18 months thereafter. A general visual inspection of the deck structure was recommended within, and thereafter, every 36 months and a pressurization test of the canted pressure deck within, and thereafter, every 72 months. Service Bulletin instructions included a visual inspection for loose, missing or cracked sealant with the 36-month requirements.

According to company engineering personnel, United was in the process of incorporating the service bulletin into its maintenance program. As a result, the initial service bulletin procedures had not been completed prior to the incident.

At the time of the incident, Federal Aviation Administration (FAA) Airworthiness Directive (AD) 89-12-07 (Amendment 39-6232) was in effect. This AD required cleaning of "the cavity aft of the wing center section" and verification that all overboard drains were open and clean. According to the airline, the AD was complied with during the most recent C-check maintenance inspection on December 18, 2002. In addition, a review of the airline maintenance job instruction cards for this task revealed that no discrepancies were noted at the time by maintenance personnel.

On May 29, 2003 the FAA issued AD 2003-11-01 (amendment 39-13160), with an effective date of July 3, 2003, which mandated full compliance with the Boeing Service Bulletin. This new AD also included the cleaning and verification requirements of AD 89-12-07.

Pilot Information

Certificate:	Airline Transport; Flight Engineer	Age:	55, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane; Helicopter	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	01/21/2003
Occupational Pilot:		Last Flight Review or Equivalent:	10/01/2002
Flight Time:	7747 hours (Total, all aircraft), 848 hours (Total, this make and model), 7747 hours (Pilot In Command, all aircraft), 140 hours (Last 90 days, all aircraft), 45 hours (Last 30 days, all aircraft), 12 hours (Last 24 hours, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport; Flight Engineer	Age:	45, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
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:	02/12/2003
Occupational Pilot:		Last Flight Review or Equivalent:	04/01/2002
Flight Time:	5145 hours (Total, all aircraft), 3501 hours (Total, this make and model), 162 hours (Last 90 days, all aircraft), 70 hours (Last 30 days, all aircraft), 12 hours (Last 24 hours, all aircraft)		

Other Flight Crew Information

Certificate:	Airline Transport	Age:	, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Rear
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
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:	11/01/2002
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	5291 hours (Total, all aircraft), 12 hours (Last 24 hours, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport; Flight Engineer	Age:	, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
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:	11/01/2002
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	5920 hours (Total, all aircraft), 12 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	Registration:	N175UA
Model/Series:	747-422	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	24382
Landing Gear Type:	Retractable - Tricycle	Seats:	370
Date/Type of Last Inspection:	12/18/2002, Continuous Airworthiness	Certified Max Gross Wt.:	875000 lbs
Time Since Last Inspection:	1036 Hours	Engines:	4 Turbo Jet
Airframe Total Time:	50293 Hours at time of accident	Engine Manufacturer:	Pratt & Whitney
ELT:	Installed, not activated	Engine Model/Series:	PW4056
Registered Owner:	Wilmington Trust Company	Rated Power:	56000 lbs
Operator:	United Airlines Inc	Operating Certificate(s) Held:	Flag carrier (121)
Operator Does Business As:	United Airlines	Operator Designator Code:	UALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	ORD, 668 ft msl	Distance from Accident Site:	175 Nautical Miles
Observation Time:	1156 CST	Direction from Accident Site:	135°
Lowest Cloud Condition:	Scattered / 15000 ft agl	Visibility	10 Miles
Lowest Ceiling:	Broken / 25000 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	240°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.69 inches Hg	Temperature/Dew Point:	21 °C / 6 °C
Precipitation and Obscuration:			
Departure Point:	Hong Kong (HKG)	Type of Flight Plan Filed:	IFR
Destination:	Chicago (ORD)	Type of Clearance:	IFR
Departure Time:	0440 UTC	Type of Airspace:	Class A

Airport Information

Airport:	Chicago O'Hare Intl (ORD)	Runway Surface Type:	Concrete
Airport Elevation:	668 ft	Runway Surface Condition:	Dry
Runway Used:	14R	IFR Approach:	ILS; Visual
Runway Length/Width:	13000 ft / 200 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	20 None	Aircraft Damage:	None
Passenger Injuries:	299 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	319 None	Latitude, Longitude:	41.979722, -87.904444

Administrative Information

Investigator In Charge (IIC):	Tim Sorensen	Report Date:	09/30/2003
Additional Participating Persons:	Samuel Latorre; FAA -- O'Hare FSDO; Schiller Park, IL John McCoy; United Airlines Inc.; San Francisco, CA Simon Lie; Boeing Commercial Airplane Group; Seattle, WA		
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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