



National Transportation Safety Board Aviation Incident Final Report

Location:	Atlanta, GA	Incident Number:	MIA07IA088
Date & Time:	05/02/2007, 1106 EDT	Registration:	N270AX
Aircraft:	MCDONNELL DOUGLAS DC-10-30	Aircraft Damage:	None
Defining Event:		Injuries:	306 None
Flight Conducted Under:	Part 121: Air Carrier - Non-scheduled		

Analysis

While flying at 13,000 feet mean sea level (msl), and decelerating to 250 knots in a DC-10-30 airplane, the horizontal stabilizer could not be moved by either commands from the autopilot or using the primary and alternate control switches from the cockpit. The horizontal stabilizer remained at approximately 1 degree airplane nose-up which resulted in excessive cockpit control forces. An emergency was declared with air traffic control and the flight landed uneventfully on runway 27R at ATL. The inoperative horizontal stabilizer trim system was caused by improper overhaul of the horizontal stabilizer chain drive unit drive assembly (horizontal stabilizer drive assembly) P/N AJH 7337-507, S/N DCA-418 by omission of one pin (P/N 3D0009-5-4), one nut (P/N MS21043-08), and one washer (P/N NAS 1252-BL) which secure the drive gear of the horizontal stabilizer drive assembly. The omission of the parts resulted in fatigue failure of another pin (P/N AJH7378-1) and shear failure of the single installed pin (P/N 3D0009-5-4). This prevented output of the horizontal stabilizer drive assembly being transmitted to acme screws of the horizontal stabilizer. There was no flight crew write-ups for the previous 93 days related to pitch trim. The horizontal stabilizer drive assembly was overhauled on April 30, 1999, and installed in the incident airplane on April 23, 2006. The airplane had accumulated 2,421 hours and 473 cycles since the overhauled assembly was installed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: The improper overhaul of the horizontal stabilizer chain drive unit drive assembly.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: DESCENT - NORMAL

Findings

1. FLT CONTROL SYST,STABILATOR TRIM - FATIGUE
2. (C) MAINTENANCE,OVERHAUL - IMPROPER - OTHER MAINTENANCE PERSONNEL
3. FLT CONTROL SYST,STABILATOR TRIM - FAILURE,TOTAL
4. STABILATOR TRIM - NOT POSSIBLE - FLIGHTCREW

Factual Information

On May 2, 2007, about 1106 eastern daylight time, a McDonnell Douglas DC-10-30, N270AX, registered to Omni DC-10 Leasing LLC, operated by Omni Air International, Inc., as flight "Reach 370," experienced a malfunction of the horizontal stabilizer during a normal descent, and landed uneventfully at the Hartsfield-Jackson Atlanta International Airport (ATL), Atlanta, Georgia. Visual meteorological conditions prevailed at the time and an instrument flight rules flight plan was filed for the 14 Code of Federal Regulations (CFR) Part 121 non-scheduled, international, passenger flight from Shannon International Airport (EINN), Limerick City, Ireland, to ATL. The airplane was not damaged and there were no injuries to the airline transport pilot-certificated captain and first officer, flight engineer, 8 cabin attendants, 3 additional flightcrew members, or 292 passengers. The flight originated about 0330 local, from EINN.

After takeoff the flight proceeded towards the destination airport and the captain later stated that while flying at 13,000 feet mean sea level (msl), and decelerating to 250 knots, the autopilot out of trim light illuminated and remained on for 5 to 6 seconds. The autopilot was then disengaged while the flight controls were guarded in anticipation of a change in pitch. The airplane pitched "aggressively" nose down, and attempts in resetting/moving the stabilizer setting using the pilot's and co-pilot's control wheel trim switches, alternate trim switches, and longitudinal trim handles were unsuccessful in repositioning the stabilizer which remained set at 1 degree airplane nose up. Readout of the airplane's flight data recorder (FDR) indicated the stabilizer remained at 333 counts through the autopilot disconnect and landing. The approach was discontinued, and an emergency was declared with air traffic control. A "demanding amount of elevator back pressure was required to maintain level flight...", and the airplane was vectored for an uneventful landing on runway 27R with the flaps extended to 35 degrees and the No. 2 engine at the flight idle. The airplane taxied to the gate and the passengers were deplaned. The FDR further recorded that the stabilizer values transitioned from 337 to 357 from the descent to just before touchdown of the previous landing.

Examination of the airplane after landing revealed the cockpit indicator for the stabilizer trim indicated slighter greater than 1 degree airplane nose-up trim. Postincident testing of the horizontal stabilizer trim system revealed no movement of the horizontal stabilizer using the cockpit control switches, though electrical continuity was noted at both

primary trim control valves. Additionally, both hydraulic motors tested satisfactory. Further examination of the horizontal stabilizer chain drive unit drive assembly (horizontal stabilizer drive assembly) P/N AJH 7337-507, S/N DCA-418, revealed the chain tension and chain wear were within limits. Misalignment of a detent ring installed on the horizontal stabilizer drive assembly was noted. The horizontal stabilizer drive assembly was removed and retained for further examination.

The horizontal stabilizer is movable to provide longitudinal trim, and the horizontal stabilizer system consists of five subsystems which are: electrical control, mechanical control, hydraulic actuation, mechanical drive, and position indicating and warning systems. Cockpit adjustment of the horizontal stabilizer trim is initiated by: actuation of dual trim switches located on the outboard horn of each pilots control wheel, actuation of alternate trim switches located on the pilots' control pedestal, and actuation of two control handles also located on the pilots' control pedestal which are linked by control cables to two control valves located on the forward side of

the stabilizer. Adjustment of the horizontal stabilizer trim is also performed while the autopilot is engaged based on input from command signals of the autopilot system.

Movement of the horizontal stabilizer using the cockpit control switches controls two electrically controlled hydraulically actuated primary control valves, which direct flow to two hydraulic motors. The hydraulic motors convert hydraulic flow into rotary mechanical action of output shafts that connect to a gearbox. The gearbox mechanically drives the horizontal stabilizer chain drive unit drive assembly (horizontal stabilizer drive assembly). Chains connect sprockets of the horizontal stabilizer drive assembly to sprockets near acme screws attached to the horizontal stabilizer.

Examination of the horizontal stabilizer drive assembly was performed at the manufacturer's facility with Federal Aviation Administration oversight. Visual examination of the unit revealed a ring (P/N AJH7342-503) was rotated approximately 30 degrees from its normally installed position based on an index mark on the ring and the assembly centerline. Further visual inspection revealed only one pin (P/N 3D0009-5-4), one nut (P/N MS21043-08), and one washer (P/N NAS 1252-BL) were received loose. The pin was fractured and the head was missing and not located; the remaining portion of the pin was retained for further examination. The illustration in the component maintenance manual (CMM) depicts only one pin, washer, and nut; however, the parts list for the same illustration specifies that two pins, washers, and nuts are required to be installed. The two pins, nuts, and washers in part secure a gear (P/N AJH7341-5) to the horizontal stabilizer drive assembly. The gear (P/N AJH7341-5) drives two driven gears attached to the horizontal stabilizer drive assembly which in turn move the horizontal stabilizer by chains. Additionally, a pin (P/N AJH7378-1) which was installed in accordance with Service Bulletin (SB) 27-181 was installed but extended approximately .360 inch beyond the gear. The pin was comprised of two pieces which were retained for further examination.

Examination of the fractured pins (P/N 3D0009-5-4 and P/N AJH7378-1) was performed by the National Transportation Safety Board Materials Laboratory located in Washington, D.C. The results of the examination of P/N 3D0009-5-4 revealed the fracture surface exhibited features consistent with shear. The results of the examination of P/N AJH7378-1 revealed it was bent approximately 7 degrees and was within specification with respect to diameter. The fracture surface exhibited features consistent with reverse bending fatigue. Hardness testing or material property confirmation was not performed on either of the fractured pins.

Review of the airplane's discrepancies for the previous 93 days revealed no write-up by any flightcrew member pertaining to the stabilizer trim.

The maintenance records indicate that the horizontal stabilizer drive assembly was overhauled on April 30, 1999, and installed in the incident airplane on April 23, 2006. The airplane had accumulated 2,421 hours and 473 cycles since the overhauled assembly was installed.

Pilot Information

Certificate:	Airline Transport; Flight Engineer; Private	Age:	48, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
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 Without Waivers/Limitations	Last FAA Medical Exam:	01/08/2007
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	04/08/2007
Flight Time:			

Co-Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	Age:	37, 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):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	Toxicology Performed:	No
Medical Certification:	Class 1 Without Waivers/Limitations	Last FAA Medical Exam:	10/27/2006
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	04/08/2007
Flight Time:			

Flight Engineer Information

Certificate:	Commercial; Flight Engineer	Age:	38, Male
Airplane Rating(s):	Single-engine Land	Seat Occupied:	
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 2 Unknown	Last FAA Medical Exam:	09/22/2006
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	MCDONNELL DOUGLAS	Registration:	N270AX
Model/Series:	DC-10-30	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	48318
Landing Gear Type:	Retractable - Tricycle	Seats:	373
Date/Type of Last Inspection:	03/01/2007, Continuous Airworthiness	Certified Max Gross Wt.:	572000 lbs
Time Since Last Inspection:		Engines:	3 Turbo Fan
Airframe Total Time:	39144 Hours at time of accident	Engine Manufacturer:	General Electric
ELT:	Installed, not activated	Engine Model/Series:	CF6-50C2
Registered Owner:	Omni DC-10 Leasing, LLC	Rated Power:	51800 lbs
Operator:	OMNI AIR INTERNATIONAL INC	Operating Certificate(s) Held:	Supplemental
Operator Does Business As:		Operator Designator Code:	CNMA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	ATL, 1026 ft msl	Distance from Accident Site:	
Observation Time:	1052 EDT	Direction from Accident Site:	
Lowest Cloud Condition:	Few / 15000 ft agl	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	5 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	280°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.06 inches Hg	Temperature/Dew Point:	25° C / 13° C
Precipitation and Obscuration:	No Precipitation		
Departure Point:	Shannon (EINN)	Type of Flight Plan Filed:	IFR
Destination:	Atlanta, GA (ATL)	Type of Clearance:	IFR
Departure Time:	0730 UTC	Type of Airspace:	Air Traffic Control

Airport Information

Airport:	Hartsfield - Jackson Atlanta (ATL)	Runway Surface Type:	
Airport Elevation:		Runway Surface Condition:	
Runway Used:	N/A	IFR Approach:	ILS
Runway Length/Width:		VFR Approach/Landing:	

Wreckage and Impact Information

Crew Injuries:	14 None	Aircraft Damage:	None
Passenger Injuries:	292 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	306 None	Latitude, Longitude:	33.636667, -84.428056 (est)

Administrative Information

Investigator In Charge (IIC):	Timothy W Monville	Report Date:	01/29/2009
Additional Participating Persons:	John T McCann; FAA/FSDO; College Park, GA Mark Ayemin; FAA/FSDO; Long Beach, CA Charles T Ferling; Omni Air International, Inc.; Tulsa, OK William C Steelhammer; Boeing Long Beach Division; Long Beach, CA Scott Ickes; GE Aviation / Smiths Aerospace; Santa Ana, CA		
Publish Date:	01/29/2009		
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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