
Pitch trim control system failure, McDonnell Douglas MD-11, November 7, 1996

Micro-summary: This MD-11 experienced a failure of the pitch trim control system.


Event Date: 1996-11-07 at 2015 EST

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

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

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 National Transportation Safety Board FACTUAL REPORT AVIATION		NTSB ID: IAD97IA018		Aircraft Registration Number: N814DE	
		Occurrence Date: 11/07/1996		Most Critical Injury: None	
		Occurrence Type: Incident		Investigated By: NTSB	
Location/Time					
Nearest City/Place DAYTON		State OH	Zip Code 45433	Local Time 2015	Time Zone EST
Airport Proximity: Off Airport/Airstrip		Distance From Landing Facility:		Direction From Airport:	
Aircraft Information Summary					
Aircraft Manufacturer McDonnell Douglas		Model/Series MD-11		Type of Aircraft Airplane	
Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:					
<p>HISTORY OF FLIGHT</p> <p>On November 7, 1996, at about 2015 eastern standard time, a McDonnell Douglas MD-11, N814DE, owned and operated by Delta Airlines, Inc., as Flight 37, experienced a horizontal stabilizer trim failure while en route to Covington, Kentucky. The aircraft diverted to Wright-Patterson Air Force Base in Dayton, Ohio, and landed without further incident. There were no reported injuries among the 13 crewmembers and 196 passengers who were deplaned normally. However, two passengers were taken to an area hospital for observation. The flight originated from Gatwick Airport, London, United Kingdom, at 0510 EST, with an intended destination of the Greater Cincinnati International Airport, Covington, Kentucky. Instrument meteorological conditions prevailed, and an instrument flight rules flight plan had been filed. The flight was conducted under the provisions of 14 CFR Part 121 as an international-scheduled-passenger flight.</p> <p>While en route, the flight crew experienced a failure the pitch trim control system. The flight crew was unable to change the pitch trim by the yoke mounted trim switches or the center console mounted horizontal stabilizer control handles. The flight crew stated that when the slats were extended on descent, they were unable to change stabilizer trim, and all hydraulic systems checked OK. When the autopilots were engaged a "STAB OUT OF TRIM" message appeared. Disengaging the autopilots caused the message to disappear, but the configuration showed 1.0-degree aircraft nose up, and aft pressure was needed on the control yoke to hold altitude. The flight crew declared an emergency, and the aircraft was diverted to Wright-Patterson Air Force Base near Dayton, Ohio where it landed uneventfully.</p> <p>AIRCRAFT INFORMATION</p> <p>The McDonnell Douglas MD-11, S/N 48623, Fuselage Number 605, Aircraft 814, was manufactured and certificated on September 8, 1996. Federal Aviation Administration records indicated that the aircraft was registered to Delta Airlines on September 26, 1996, and maintenance records indicated that the aircraft had accumulated 540 hours and 70 cycles, at the time of the incident.</p> <p>EXAMINATION OF THE HORIZONTAL STABILIZER</p> <p>Shortly after landing Delta maintenance personnel stated that they began trouble shooting the reason for the horizontal stabilizer lockout. They stated that they initially thought that the horizontal stabilizer gearbox was lacking oil, which caused the shear pin to fail, locking the stabilizer in place as designed. During removal of the gearbox it was noted that the jackscrews, both left and right, were lacking lubrication. The gearbox and both jackscrews were sent to Delta Airlines in Atlanta, Georgia for further examination, and the aircraft was repaired and returned to service on November 11, 1996.</p>					
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Narrative (Continued)

On November 12, 1996, the horizontal stabilizer pitch trim system was examined. Present at the examination were representatives from the National Transportation Safety Board, Federal Aviation Administration, Delta Airlines and McDonnell Douglas.

The system included: two (2) hydraulic motors, one (1) gearbox, one (1) drive unit, two (2) drive chains, and two (2) screw actuator assemblies. The examination revealed that the fuse pin had sheared in the output drive unit of the horizontal stabilizer drive gearbox. The sheared fuse pin locked the horizontal stabilizer in its last set position. In addition, there was no visible grease film on the screw actuator assemblies as called for in Douglas Parts Service manual DPS 3.17-51, which stated in part, "Apply heavy coat of DPM 5850 to threads of screw. Apply Lubricant to fitting on top of sprocket until lubricant extrudes between sprocket and screw." In addition, the Lubrication Chart on page 40 of DPS 3.17-51 depicted a brush symbol to indicate brush application of the required lubricant to the surface of the screw threads.

Douglas Aircraft Engineering agreed that the lack of adequate lubrication on the thread of the screw actuator assemblies, lead to a "chattering" on the nuts of the screw actuator assemblies which lead to the failure of the fuse pin. (See attached Photographs).

A review of Assembly Orders at Douglas Aircraft (DAC) for fuselage 605 revealed that lubrication requirements per DPS 3.17-51 were specified at two stages of the assembly.

1. After initial installation in the aft fuselage barrel assembly. 2. After wash, prior to delivery to the customer.

The assembly orders were found stamped by DAC production personnel and DAC Inspection personnel indicating completion and acceptance of the lubrication. However, the investigation revealed that no lubrication had been applied to the screw actuator nuts.

IN-SERVICE AIRCRAFT

Operators of fuselages 599 through 607, were notified of the suspected nonconformance. The following is a summary of the DAC Product Support findings:

Fuselages 599 and 601 were found properly lubricated.

Fuselages 602, 604, 606, and 607, were inspected for lubrication, and found to be inadequately lubricated.

Fuselages 608, 609, 610, and 611, while still in assembly were inspected and rejected, their horizontal stabilizer trim systems were subsequently lubricated properly per DPS 3.17-51.

All uninstalled screw actuators at DAC were returned to the manufacturer for proper lubrication was accomplished.

ADDITIONAL INFORMATION

As a result of this investigation, Douglas Aircraft Corporation (DAC) has disciplined the Production and Quality Assurance employees involved in this matter.

DAC Production has initiated an awareness flowdown program for Production employees.

DAC Product Verification (Quality Assurance) has developed a plan to elevate the skill level of DAC Inspectors by providing extensive training.

DAC Quality Assurance - Regulatory Affairs will conduct quarterly evaluations to validate the

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corrective action plan provided to the FAA.

In addition, Delta Airlines has added to their aircraft acceptance inspection program, a visual inspection of the horizontal stabilizer assembly, to ensure adequate lubrication is present.

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		Occurrence Date: 11/07/1996			
		Occurrence Type: Incident			
Landing Facility/Approach Information					
Airport Name	Airport ID:	Airport Elevation 825 Ft. MSL	Runway Used 23	Runway Length 12600	Runway Width 300
Runway Surface Type: Concrete					
Runway Surface Condition: Dry					
Type Instrument Approach: ILS-complete					
VFR Approach/Landing: None					
Aircraft Information					
Aircraft Manufacturer McDonnell Douglas		Model/Series MD-11		Serial Number 48623	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 280	Certified Max Gross Wt. 625500 LBS	Number of Engines: 3		
Engine Type: Turbo Jet	Engine Manufacturer: P&W	Model/Series: PW 4460	Rated Power: 60000 LBS		
- Aircraft Inspection Information					
Type of Last Inspection Continuous Airworthiness	Date of Last Inspection 09/1996	Time Since Last Inspection 550 Hours	Airframe Total Time 550 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed? Yes	ELT Operated?	ELT Aided in Locating Accident Site?			
Owner/Operator Information					
Registered Aircraft Owner DELTA AIR LINES, INC.		Street Address HARTSFIELD-ATLANTA INTL ARPT			
		City ATLANTA	State GA	Zip Code 30320	
Operator of Aircraft Same as Reg'd Aircraft Owner		Street Address 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: Large Aircraft Operator			Operator Certificate:		
Regulation Flight Conducted Under: Part 121: Air Carrier					
Type of Flight Operation Conducted: Scheduled; International; Passenger/Cargo					

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	Occurrence Type: Incident

First Pilot Information

Name On File	City On File	State On File	Date of Birth On File	Age 58
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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

Airplane Rating(s): Multi-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: 06/1996
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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	27500	1442								
Pilot In Command(PIC)										
Instructor										
Last 90 Days	268	268								
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 GATWICK	State UK	Airport Identifier LGW	Departure Time 0600	Time Zone EST
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Destination CINCINNATI	State OH	Airport Identifier CVG	
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Type of Clearance: IFR

Type of Airspace: Class A

Weather Information

Source of Briefing:

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
	0000		0 Ft. MSL	0 NM	0 Deg. Mag.
Sky/Lowest Cloud Condition: Unknown			0 Ft. AGL	Condition of Light: Day	
Lowest Ceiling: Unknown			0 Ft. AGL	Visibility: 0 SM	Altimeter: "Hg
Temperature: °C	Dew Point: °C	Wind Direction:		Density Altitude: Ft.	
Wind Speed:	Gusts:	Weather Conditions at Accident Site:			
Visibility (RVR): 0 Ft.	Visibility (RVV) 0 SM	Intensity of Precipitation: Unknown			
Restrictions to Visibility:					
Type of Precipitation:					

Accident Information

Aircraft Damage: None	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					
Flight Engineer					
Cabin Attendants				11	11
Other Crew					
Passengers				196	196
- TOTAL ABOARD -				209	209
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	209	209

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Occurrence Type: Incident

Administrative Information

Investigator-In-Charge (IIC)

BUTCH WILSON

Additional Persons Participating in This Accident/Incident Investigation:

RUSS HAYDEN
3939 INTERNATIONAL GATEWAY
COLUMBUS, OH 43219

WADE H REYNOLDS
DAC HARTSFIELD INTER. ARPT.
ATLANTA, GA 30320

MIKE DENARO
DELTA PO BOX 20706
ATLANTA, GA 30320