
Uncommanded pitch-up, McDonnell Douglas MD-11, July 13, 1996

Micro-summary: Uncommanded Pitch-up on descent for this McDonnell Douglas MD-11.

Event Date: 1996-07-13 at 2040 EDT


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

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

Cautions:

1. Accident reports can be and sometimes are revised. Be sure to consult the investigative agency for the latest version before basing anything significant on content (e.g., thesis, research, etc).
 2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***
 3. Reports may or may not represent reality. Many many non-scientific factors go into an investigation, including the magnitude of the event, the experience of the investigator, the political climate, relationship with the regulatory authority, technological and recovery capabilities, etc. It is recommended that the reader review all reports analytically. Even a "bad" report can be a very useful launching point for learning.
 4. Contact us before reproducing or redistributing a report from this anthology. Individual countries have very differing views on copyright! We can advise you on the steps to follow.
-

Aircraft Accident Reports on DVD, Copyright © 2006 by Flight Simulation Systems, LLC
All rights reserved.
www.fss.aero

		NTSB ID: NYC96LA148		Aircraft Registration Number: N1768D	
		Occurrence Date: 07/13/1996		Most Critical Injury: Serious	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place WESTERLY		State RI	Zip Code 02891	Local Time 2040	Time Zone EDT
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					
<p>Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:</p> <p>On July 13, 1996, about 2040 eastern daylight time, an McDonnell Douglas MD-11, N1768D, operated by American Airlines as flight 107, experienced an abrupt maneuver during a descent, while operating near Westerly, Rhode Island. The airplane was not damaged. There were 180 occupants onboard the airplane, of which, one passenger received serious injuries, and one passenger and two flight attendants received minor injuries. Visual meteorological conditions prevailed, and flight 107 which had departed London, England, at 1354, was operated on an Instrument Flight Rules (IFR) under 14 CFR Part 121.</p> <p>Flight 107 was inbound to John F. Kennedy Airport, Jamaica, New York. In a telephone interview the Captain reported that the flight had crossed Boston at FL350 (35,000 feet), and was then instructed by ATC to cross 20 miles northeast of PARCH intersection at FL 240 (24,000 feet). At that time the flight was 45 miles from PARCH. The flight was operating in visual meteorological conditions, and the air was smooth. The first officer was performing the duties of the operating pilot. The descent was initiated with the auto-pilot engaged in the vertical profile (PROF) mode. The speed brakes had been extended full, and as the airplane neared FL 250 (25,000 feet), he became concerned that the airplane would not level off at FL 240. He instructed the first officer to slow the rate of descent. The first officer complied by using the pitch thumbwheel on the auto-pilot control panel, but no effect was observed. The Captain then took control of the airplane, retracted the speed brakes, and a few seconds later, disconnected the auto-pilot. This was followed by an immediate pitch up, which the captain described as similar to flying through a jet wake. The captain then applied forward pressure to the yoke, and the airplane leveled off at FL237 (23,700 feet), after which it was hand flown back to FL 240.</p> <p>One passenger in the aft lavatory received a fractured ankle (serious injury). One passenger received minor injuries and refused treatment. Two flight attendants on duty in the aft portion of the airplane received minor injuries.</p> <p>Following the incident, the flight continued into John F. Kennedy Airport where an uneventful landing was made.</p> <p>The Digital Flight Data Recorder (DFDR) was forwarded to the NTSB laboratory in Washington, DC for readout. According to the recorder, the maximum vertical "G" loading was +2.28 Gs, at an indicated airspeed of 354 knots, and at a pressure altitude of 23,781 feet.</p> <p>Additionally, on the descent between 25,900 feet and 23,900 feet, there were 7 excursion of the pitch thumbwheel. As the airplane descended between 25,700 feet and 25,300 feet, there was a momentary increase of g loading on the vertical axis. As the airplane passed through 24,200 feet, there was an increase in the elevators to the airplane nose up position. As the airplane passed through 23,800 feet, there was a momentary further increase of the elevator displacement which corresponded to the peak g load of +2.28 gs observed on the DFDR. Following this the elevators</p>					
FACTUAL REPORT - AVIATION					
					Page 1

National Transportation Safety Board

FACTUAL REPORT

AVIATION

NTSB ID: NYC96LA148

Occurrence Date: 07/13/1996

Occurrence Type: Accident

Narrative (Continued)

immediately went to a negative position and then returned to their pre-incident position through a series of oscillations.

According to the American Airlines MD-11 Operating Manual, Auto-Flight section, when the auto flight system is engaged in the vertical profile (PROF) mode, rotation of the pitch thumbwheel will disengage the PROF mode. When the thumbwheel is released, the system reverts to the PROF mode.

According to MDC personnel, the auto-pilot was programmed to initiate a level off at a maximum g loading of 0.2 gs. Use of the pitch thumbwheel would interrupt the automatic level off process, and once released, the system would wait for two seconds prior to initiating the level off process again. Each time the pitch thumbwheel was released, the pre-programmed level-off routine would re-initiate after a 2 second pause. The continued use of the pitch thumbwheel allowed the airplane to continue its descent to an altitude whereby a level off at FL240 would exceed the maximum g load of 0.2 gs that the system was designed to handle.


Auto-pilot 2 was engaged and was driving the right inboard elevator. The other three sections of the elevator were being driven by the right inboard elevator through mechanical linkage. When the auto-pilot was overpowered by force to the control yoke, the three elevator sections not connected directly to the auto-pilot responded. The amount of force required for the deviation exceeded the control force necessary to move the elevators with the auto-pilot dis-connected. Additionally, when the auto-pilot was disconnected while control force was applied, two actions took place simultaneously. The auto-pilot driven section moved to match the position of the other three control surfaces and the control yoke, and the force that was restricting control movement before was removed.


According to MDC personnel, it would be extremely difficult for a person applying control force and releasing the auto-pilot to avoid having a further excursion of the elevator in the direction of control force applied due to the reduction in control force when the auto-pilot was dis-connected.

Examination of the MD-11 Flight Crew Operating Manual found the following under the title of "SEVERE TURBULENCE AND/OR HEAVY RAIN INGESTION" :

"...Do not attempt to overpower the auto-pilot with control forces. This can cause the auto-pilot to disengage with too much control input, which could result in over control during recovery. Every attempt should be made not to over control.

Longitudinal control forces at high altitude will be lighter than those which the pilot experiences at low altitude due to altitude effect as aft CG...."

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>		NTSB ID: NYC96LA148			
		Occurrence Date: 07/13/1996			
		Occurrence Type: Accident			
Landing Facility/Approach Information					
Airport Name	Airport ID:	Airport Elevation Ft. MSL	Runway Used 0	Runway Length	Runway Width
Runway Surface Type:					
Runway Surface Condition:					
Type Instrument Approach:					
VFR Approach/Landing:					
Aircraft Information					
Aircraft Manufacturer McDonnell Douglas		Model/Series MD-11		Serial Number 48436	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 283	Certified Max Gross Wt.	618000 LBS	Number of Engines: 3	
Engine Type: Turbo Fan	Engine Manufacturer: GE	Model/Series: CF6-80C2D1F	Rated Power: 61500 LBS		
- Aircraft Inspection Information					
Type of Last Inspection Continuous Airworthiness	Date of Last Inspection	Time Since Last Inspection Hours	Airframe Total Time Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed? No	ELT Operated?	ELT Aided in Locating Accident Site?			
Owner/Operator Information					
Registered Aircraft Owner AMERICAN AIRLINES, INC.		Street Address P.O. BOX 619616			
		City DALLAS	State TX	Zip Code 75261	
Operator of Aircraft AMERICAN AIRLINES		Street Address Same as Reg'd Aircraft Owner			
		City	State	Zip Code	
Operator Does Business As:			Operator Designator Code: AALA		
- Type of U.S. Certificate(s) Held:					
Air Carrier Operating Certificate(s): Flag Carrier/Domestic					
Operating Certificate:			Operator Certificate:		
Regulation Flight Conducted Under: Part 121: Air Carrier					
Type of Flight Operation Conducted: Scheduled; International; Passenger/Cargo					

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>	NTSB ID: NYC96LA148
	Occurrence Date: 07/13/1996
	Occurrence Type: Accident

First Pilot Information

Name On File	City On File	State On File	Date of Birth On File	Age 57
-----------------	-----------------	------------------	--------------------------	-----------

Sex: M	Seat Occupied: Left	Principal Profession: Civilian Pilot	Certificate Number: On File
--------	---------------------	--------------------------------------	-----------------------------

Certificate(s): Airline Transport; Flight Engineer

Airplane Rating(s): Multi-engine Land; Single-engine Land; Single-engine Sea

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s): None

Type Rating/Endorsement for Accident/Incident Aircraft? Yes	Current Biennial Flight Review?
---	---------------------------------

Medical Cert.: Class 1	Medical Cert. Status: Valid Medical--w/ waivers/lim.	Date of Last Medical Exam: 07/1996
------------------------	--	------------------------------------

- 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	19980	1818								
Pilot In Command(PIC)										
Instructor										
Last 90 Days										
Last 30 Days		6								
Last 24 Hours										

Seatbelt Used? Yes	Shoulder Harness Used? No	Toxicology Performed? No	Second Pilot? Yes
--------------------	---------------------------	--------------------------	-------------------

Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point LONDON, UK	State OF	Airport Identifier EGLL	Departure Time 1333	Time Zone EDT
-------------------------------	-------------	----------------------------	------------------------	------------------

Destination JAMAICA	State NY	Airport Identifier KJFK	
------------------------	-------------	----------------------------	--


Type of Clearance: IFR

Type of Airspace: Class B

Weather Information

Source of Briefing: Company

Method of Briefing:

 National Transportation Safety Board FACTUAL REPORT AVIATION	NTSB ID: NYC96LA148
	Occurrence Date: 07/13/1996
	Occurrence Type: Accident

Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
JFK	2100	EDT	13 Ft. MSL	100 NM	80 Deg. Mag.

Sky/Lowest Cloud Condition: Scattered	2800 Ft. AGL	Condition of Light: Day
---------------------------------------	--------------	-------------------------

Lowest Ceiling: None	0 Ft. AGL	Visibility: 10 SM	Altimeter: 29.00 "Hg
----------------------	-----------	-------------------	----------------------

Temperature: 23 °C	Dew Point: 18 °C	Wind Direction: 270	Density Altitude: Ft.
--------------------	------------------	---------------------	-----------------------

Wind Speed: 14	Gusts: 20	Weather Conditions at Accident Site: Visual Conditions
----------------	-----------	--

Visibility (RVR): 0 Ft.	Visibility (RVV) 0 SM	Intensity of Precipitation: Unknown
-------------------------	-----------------------	-------------------------------------

Restrictions to Visibility: None

Type of Precipitation: None

Accident Information

Aircraft Damage: None	Aircraft Fire: None	Aircraft Explosion: None
-----------------------	---------------------	--------------------------

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			2	9	11
Other Crew					
Passengers		1	1	165	167
- TOTAL ABOARD -		1	3	176	180
Other Ground	0	0	0		0
- GRAND TOTAL -	0	1	3	176	180

National Transportation Safety Board

FACTUAL REPORT

AVIATION



NTSB ID: NYC96LA148

Occurrence Date: 07/13/1996

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

ROBERT L. HANCOCK

Additional Persons Participating in This Accident/Incident Investigation:

LOUIS ALVAREZ
FAA FSDO
GARDEN CITY, NY

STEVE LUND
MCDONNELL-DOUGLAS
LONG BEACH, CA

EDUARDO JURONAVIC
AMERICAN AIRLINES
DFW ARPT, TX

JOHN DELISI
NTSB - AS-40
WASHINGTON, DC