
In-flight upset, Boeing 737-3M8, December 11, 1994

Micro-summary: This Boeing 737-3M8 experienced an uncommanded pitch-up while climbing on automatic flight, breaking a flight attendant's ankle.


Event Date: 1994-12-11 at 1435 AST

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

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

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		NTSB ID: ANC95FA019		Aircraft Registration Number: N681MA	
		Occurrence Date: 12/11/1994		Most Critical Injury: Serious	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place ANCHORAGE		State AK	Zip Code 99502	Local Time 1435	Time Zone AST
Airport Proximity: Off Airport/Airstrip		Distance From Landing Facility:		Direction From Airport:	
Aircraft Information Summary					
Aircraft Manufacturer BOEING		Model/Series 737-3M8 (300)		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 On December 11, 1994, at approximately 1435 Alaska standard time (AST), a Boeing model 737, series 3M8 airplane, U.S. registration N681MA, SN:24376, registered to and operated by MARKAIR Inc., as flight No. 308, with a flight crew of two, a cabin crew of three, and 116 revenue passengers, experienced an uncommanded pitch up during a cruise climb from the Anchorage International Airport, Anchorage, Alaska. As a result of the aberrant maneuver, the first flight attendant, standing in the rear of the airplane, sustained a fracture to a bone in her right ankle. The airplane was not damaged, and no additional injuries were reported. The scheduled 14 CFR Part 121 flight departed Anchorage on an instrument flight plan at 1425 and was en route to Seattle, Washington when the accident occurred.</p> <p>Both the Captain and the First Officer (F/O) filed trip reports with the airline and each were interviewed by the Safety Board investigator-in-charge (IIC). The F/O reported that he was the flying pilot. At 12,000 feet, he directed the captain to engage the "B" system autopilot. Passing 17,000 feet, the aircraft abruptly pitched up then down. The captain reported that the flight control yoke came back a "good eight inches". At the time of the event, he believed that the plane's indicated airspeed was around 300 knots and that there was some atmospheric turbulence. The F/O believed that the flight was experiencing a relatively smooth ride. The captain reported that he immediately disengaged the "B" autopilot and engaged the "A" autopilot. Neither the F/O or the Captain were interacting with the airplane at the time the event occurred. The flightcrew likened the short history of the event to the blinking of an eye, and that they did not have time to absorb the total kinematics of the event. The flight experienced no further problems and continued on to Seattle.</p> <p>The injured flight attendant initially believed that she had only bruised her right ankle. It wasn't until she went to a medical facility several days afterwards that she learned the extent of her injury. She subsequently notified the airline, who in turn notified the Safety Board on December 14, 1994.</p> <p>FLIGHTCREW INFORMATION The captain and first officer, both of whom were airline transport certificated, were medically and operationally qualified to conduct the flight. Neither pilot had experienced a pitch anomaly in a Boeing 737 previously.</p> <p>The captain had a total of about 21000 flight hours, of which about 5600 were in the B737.</p> <p>The First Officer had a total of approximately 9000 flight hours and had been assigned to the B737 for about two years. He had accrued about 1800 flight hours in the B737, of which approximately 300 were in the model 300.</p> <p>AIRPLANE INFORMATION The airplane was built in May of 1989 and subsequently delivered to Trans European Airlines (TEA). MARKAIR began leasing the airplane from the ITOCHU Corporation in</p>					
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National Transportation Safety Board

FACTUAL REPORT

AVIATION

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Narrative (Continued)


November of 1991. At the time of the accident, the airplane had accrued a total of 17725 flight hours since new and 32 hours since the last "B" check, which was performed on December 9, 1994. There were no entries in the plane's maintenance records prior to December 11, 1994 pertaining to uncommanded autopilot produced pitch up events.


MARKAIR maintenance personnel inspected the plane's autopilot system and initially determined that the problem was caused by a defective mode control panel (MCP) in the digital flight control system. The MCP was replaced on December 19, 1994. An operational test indicated satisfactory operation. During a subsequent flight on December 19, 1994, with the B autopilot engaged, the stabilizer out of trim light illuminated briefly. The flightcrew disengaged the autopilot and the airplane reportedly pitched nose down about 10 degrees. No problems were noted by the flightcrew with the A system autopilot. On December 22, 1994, the B system autopilot flight control computer (FCC) was changed out during the troubleshooting process, but the results proved unsatisfactory. On December 23, 1994, the A system FCC was installed in the B system. On December 29, 1994, the autopilot elevator position sensor was replaced; however, additional electronic testing continued to detect faults in the system. On February 2, 1995, the autopilot B channel elevator actuator (No. 7373 158300-101, SN:2314) was removed and replaced. No further problems have been reported with the B system autopilot.

The removed elevator actuator was shipped to E-Systems, the manufacturer, in Salt Lake City, Utah on an exchange basis. According to E-system records, the build date of the actuator was August 30, 1988. The "As Delivered Records" from the Boeing Airplane Company indicate that elevator actuator 2314 was not part of the originally installed equipment. According to MARKAIR personnel, the maintenance records on the airplane from Trans European Airlines did not show a history on the removal and replacement of the elevator actuator.

METEOROLOGICAL INFORMATION The flight crew reported that the weather conditions at the time of their departure from runway 32 at the Anchorage International Airport was scattered to broken clouds, with an overcast at 8500 feet. The visibility was good in light rain. The ambient temperature was 45 fahrenheit, and the wind was out of the southwest at about eight knots. Neither pilot recalled the presence of airframe icing.

TEST AND RESEARCH The rework record and failure analysis reports from E- Systems revealed that the elevator actuator failed continuity and dielectric testing; the manifold failed dielectric at the transducer, and the friction in the crank assembly was beyond the maximum limits authorized. Mr. Don Clavell, supervisor of product support for E-systems, informed the NTSB IIC that the problems noted with the elevator actuator were typical of those found with prior in service units. (Note. The recorded maintenance activity performed on the elevator actuator by E- Systems is included as an attachment to the investigation file.)

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>		NTSB ID: ANC95FA019			
		Occurrence Date: 12/11/1994			
		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: NONE					
VFR Approach/Landing: None					
Aircraft Information					
Aircraft Manufacturer BOEING		Model/Series 737-3M8 (300)		Serial Number 24376	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No		Number of Seats: 147	Certified Max Gross Wt. 135500 LBS		Number of Engines: 2
Engine Type: Turbo Fan		Engine Manufacturer: GE		Model/Series: CFM56-3	Rated Power: 22000 LBS
- Aircraft Inspection Information					
Type of Last Inspection Continuous Airworthiness		Date of Last Inspection 12/1994	Time Since Last Inspection 32 Hours		Airframe Total Time 17725 Hours
- Emergency Locator Transmitter (ELT) Information					
ELT Installed? Yes		ELT Operated? No		ELT Aided in Locating Accident Site?	
Owner/Operator Information					
Registered Aircraft Owner WILMINGTON TRUST CO.		Street Address TRADN RODNEY SQUARE N.			
		City WILMINGTON		State DE	Zip Code 19890
Operator of Aircraft MARKAIR, INC.		Street Address 12015 E. 46TH AVE, SUITE 500			
		City DENVER		State CO	Zip Code 80239
Operator Does Business As:			Operator Designator Code: MRKA		
- 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; Domestic; Passenger/Cargo					

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First Pilot Information

Name On File	City On File	State On File	Date of Birth On File	Age 45
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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; Multi-engine Sea; 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?
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Medical Cert.: Class 1	Medical Cert. Status: Valid Medical--no waivers/lim.	Date of Last Medical Exam: 09/1994
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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	21000									
Pilot In Command(PIC)										
Instructor										
Last 90 Days										
Last 30 Days										
Last 24 Hours										

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed?	Second Pilot? Yes
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Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point Same as Accident/Incident Location	State	Airport Identifier ANC	Departure Time 1435	Time Zone AST
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Destination SEATTLE	State WA	Airport Identifier SEA	
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Type of Clearance: IFR

Type of Airspace: Class E

Weather Information

Source of Briefing: Company

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: Visual Conditions			
Visibility (RVR): 0 Ft.	Visibility (RVV) 0 SM	Intensity of Precipitation: Light			
Restrictions to Visibility:					
Type of Precipitation: Rain					

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		1		2	3
Other Crew					
Passengers				116	116
- TOTAL ABOARD -		1		120	121
Other Ground	0	0	0		0
- GRAND TOTAL -	0	1	0	120	121

National Transportation Safety Board

FACTUAL REPORT

AVIATION



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Occurrence Date: 12/11/1994

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

TIMOTHY A. BORSON

Additional Persons Participating in This Accident/Incident Investigation:

HARTZEL G ACORD, FAA FSDO
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ANCHORAGE, AK 99502

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