Aviation Investigation Final Report

Location:	FORT LAUDERDALE, Florida	**Incident Number:**	MIA95IA214
Date & Time:	August 25, 1995, 12:30 Local	**Registration:**	N373US
Aircraft:	BOEING 737-3B7	**Aircraft Damage:**	None
Defining Event:		**Injuries:**	50 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

THE FLIGHT EXPERIENCED AN UNCOMMANDED ROLL TO THE RIGHT DURING DESCENT FOR LANDING. THE 'B' AUTOPILOT SYSTEM WAS ENGAGED AT THE TIME. POST INCIDENT EXAMINATION SHOWED THE 'B' AUTOPILOT AILERON ACTUATOR HAD LOW ELECTRICAL RESISTANCE. TESTS BY BOEING COMMERCIAL AIRPLANE COMPANY HAVE SHOWN THAT LOW ELECTRICAL RESISTANCE WITHIN THE AUTOPILOT AILERON ACTUATOR WILL CAUSE UNCOMMANDED ROLL OCCURRENCES.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: LOW ELECTRICAL RESISTANCE OF THE AUTOPILOT AILERON ACTUATOR FOR UNSPECIFIED REASONS WHICH RESULTED IN AN UNCOMMANDED ROLL TO THE RIGHT.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: DESCENT

Findings
1. (C) AUTOPILOT/FLIGHT DIRECTOR,SERVO - OTHER
2. AUTOPILOT/FLIGHT DIRECTOR,SERVO - UNDETERMINED
3. AUTOPILOT/FLIGHT DIRECTOR,SERVO - UNCOMMANDED

Factual Information

On August 25, 1995, about 1230 eastern daylight time, a Boeing 737-3B7, N373US, registered to Society National Bank and operated by USAir, Inc., as flight No. 93, a 14 CFR Part 121 scheduled, domestic, passenger service from Philadelphia, Pennsylvania, to Fort Lauderdale, Florida, experienced an uncommanded roll to the right during descent for landing. Visual meteorological conditions prevailed at the time and an instrument flight rules flight plan was filed. The aircraft was not damaged and the airline transport-rated pilot, first officer, 4 flight attendants, and 44 passengers were not injured. The flight originated from Philadelphia on August 25, 1995, about 1027.

The captain stated to USAir personnel that about 25 nautical miles northeast of Fort Lauderdale, the flight was descending to 6,000 feet, on a 222-degree heading, at 250 knots. The "B" autopilot system was on longitudinal and vertical navigation. The first officer was flying the aircraft. They felt a small "bump" and the aircraft suddenly rolled uncommanded to the right to about 30 degrees of bank angle. The captain disconnected the autopilot system and returned the aircraft to wings level with aileron control. There was no yaw associated with the roll event. The flight continued to Fort Lauderdale without further incident.

Postincident readout of the digital flight data recorder was performed by USAir personnel. The data shows the aircraft was descending through 6,250 feet on a 225-degree heading when the aircraft rolled to the left about 4 degrees and then rolled to the right to about 20 degrees of bank. It took about 4 seconds for the aircraft roll from 4 degrees left bank to 20 degrees right bank. See the Aircraft 373 Flight Recorder Data.

Postincident examination of the aircraft showed the "B" system aileron actuator had low electrical resistance when tested on the aircraft. Additionally a shear rivet was found failed in the aileron autopilot lever arm which connects the aileron autopilot actuators to the aileron bellcrank and aileron position sensor. Examination of the failed rivet showed it had been failed for a long period of time and the second shear rivet had moved in its hole causing elongation of the hole.

Testing of the "B" system autopliot actuator was performed by the manufacturer. The actuator manifold and electrical hydraulic valve failed the insulation resistance test and the de-energize friction test. See E Systems Failure Analysis Report.

Testing performed by Boeing Commercial Airplane Company after previous uncommanded roll incidents showed that low electrical resistance within the aileron autopilot actuator would cause uncommanded rolls. See Boeing 737 Autopilot Review.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	45,Female
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
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 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	April 5, 1995
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	10820 hours (Total, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	BOEING	**Registration:**	N373US
Model/Series:	737-3B7 737-3B7	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	22952
Landing Gear Type:	Retractable - Tricycle	**Seats:**	149
Date/Type of Last Inspection:	August 25, 1995 AAIP	**Certified Max Gross Wt.:**	135500 lbs
Time Since Last Inspection:	4 Hrs	**Engines:**	2 Turbo fan
Airframe Total Time:	31239 Hrs	**Engine Manufacturer:**	CFM
ELT:	Installed, not activated	**Engine Model/Series:**	CFM 56-3
Registered Owner:	SOCIETY NATIONAL BANK	**Rated Power:**	22000 Lbs thrust
Operator:	USAIR, INC.	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	USAA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	FLL ,11 ft msl	**Distance from Accident Site:**	25 Nautical Miles
Observation Time:	12:47 Local	**Direction from Accident Site:**	222°
Lowest Cloud Condition:	Scattered / 2000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 10000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	160°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	28°C / 26°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	PHILADELPHIA (PHL)	**Type of Flight Plan Filed:**	IFR
Destination:	(FLL)	**Type of Clearance:**	IFR
Departure Time:	10:27 Local	**Type of Airspace:**	Class C

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	

Wreckage and Impact Information

Crew Injuries:	6 None	**Aircraft Damage:**	None
Passenger Injuries:	44 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	50 None	**Latitude, Longitude:**	26.090032,-80.150047(est)

Administrative Information

Investigator In Charge (IIC):	Kennedy, Jeffrey
Additional Participating Persons:	RICHARD SHAFFER; FT. LAUDERDALE , FL ALOYSIUS J HAUCK; PITTSBURGH , PA NORM WHITE; PITTSBURGH , PA
Original Publish Date:	January 16, 1996
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=37679