Stuck elevator, Airbus A320, November 24, 1996

Micro-summary: **This Airbus A320-211's rudder stuck at zero deflection at 50' AGL on landing.**

Event Date: **1996-11-24 at 1450 EST**

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

Investigative Body's Web Site: **http://www.ntsb.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.

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National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: CHI97IA034	Aircraft Registration Number: N310NW
Occurrence Date: 11/24/1996	Most Critical Injury: None
Occurrence Type: Incident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
ROMULUS	MI	48174	1450	EST	

Airport Proximity: On Airport	Distance From Landing Facility: 1	Direction From Airport: 215

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
Airbus Industrie	A-320-211	Airplane

Sightseeing Flight: No Air Medical Transport Flight: No

Narrative

Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:

HISTORY OF FLIGHT

On November 24, 1996, at 1450 eastern standard time (est), an Airbus A320-211, N310NW, operated as Northwest Airlines flight 211, experienced a rudder system malfunction approximately 50 feet above ground level (agl) while transitioning from approach to landing on runway 3L at Detroit Metropolitan Airport, Romulus, Michigan. The airplane was subsequently landed with the rudder stuck at zero deflection. While taxiing to the gate, the rudder system returned to normal. Instrument meteorological conditions prevailed at the time of the incident. The flight was being conducted as regular scheduled domestic air carrier service under 14 CFR Part 121. An IFR flight plan was on file. There were no reported injuries to the 6 crew and 141 passengers who deplaned normally at the gate. The flight originated at Fort Lauderdale, Florida, at 1130 est.

In his written statement, the captain said that he "was at the controls, conducting a manually flown (autopilot off) ILS approach." He said that the weather conditions "were approximately 1,100 feet overcast with very light icing in the clouds. There was a right-quartering tailwind on final which subsided to a very light crosswind over the runway threshold. Due to this light crosswind, a slight application of rudder/wing low compensation was required for the flare and landing." When the captain attempted to use the rudder, he found that the rudder pedals "were locked in the neutral position." The captain used slight banking to keep the airplane on runway centerline through the touchdown. After touchdown, the captain used differential braking to stay on runway centerline. On reaching a ground speed of approximately 80 knots, the captain used nosewheel steering for directional control.

During the landing roll, the captain asked the first officer to come on the rudder pedals with him. The first officer stated that he did not apply any force, but did notice that "the rudder pedals seemed stiff or possibly locked."

After exiting the runway, the captain performed several autopilot disconnects using the autopilot disengage button on the control stick. "This had no effect other than to verify that there was truly no autopilot involvement." The captain then made several attempts to move the rudder pedals. "After about 15 seconds of this, the rudders became free and moved normally."

AIRCRAFT INFORMATION

Northwest Airlines Maintenance conducted a post-incident inspection at Romulus, Michigan, on November 25, 1996. First, a test of the autopilot disengagement system was conducted. The test revealed no anomalies in the autopilot system. Northwest Airlines Maintenance then examined all of the rudder system control components from the cockpit to the rudder control surfaces. No indications of mechanical anomalies were found. No signs of water or ice were found through the rudder cable inspection. The rudder attach points were cold soaked with dry ice. No binding was

National Transportation Safety Board

FACTUAL REPORT

AVIATION

NTSB ID: CHI97IA034

Occurrence Date: 11/24/1996

Occurrence Type: Incident

Narrative (Continued)

noted. The rudder autopilot artificial feel solenoid was removed, replaced and retained for further examination.

METEOROLOGICAL INFORMATION

The National Weather Service Weather Observation Facility at Detroit Metropolitan Airport's 1455 est observation was a 400 foot overcast ceiling, 3 miles visibility with drizzle and mist. The temperature was 33 degrees Fahrenheit. The dew point was 30 degrees Fahrenheit. The surface winds were 040 degrees magnetic at 7 knots.

TESTS AND RESEARCH

The flight data recorder was removed on November 26, 1996, and read out on December 6, 1996. A review of the flight data recorder readout showed that the autopilot was disengaged at the time of the incident. The data showed some movement in the crew's rudder pedal positions during the landing. The data showed little to no movement of the rudder surfaces.

A review of all airworthiness directives and service bulletins with respect to the A-320 rudder system revealed an Airbus Industrie service bulletin dated March 21, 1992 entitled "Flight Controls-Rudder-Increase Radial Play of Lever Bearing in the Artificial Feel and Trim Unit." The service bulletin addressed conditions where the A-320 rudder artificial feel and trim unit did not disengage from the autopilot mode to normal pedal operating forces during approach and landing. "Investigations have shown that the radial play of the autopilot mode engagement/disengagement lever bearing together with low temperature could cause an increased operating force. In this case, the back driving force is not able to rotate the lever to get the autopilot mode disengaged." The service bulletin introduced a new modified lever with a larger radial play of the bearing to eliminate this problem. The A-320-211, N310NW, did not have this modification at the time of the incident.

The rudder autopilot artificial feel unit was tested in the laboratories of Aerospatiale in Toulouse, France on January 27, 1997. A representative from the Bureau Enquetes-Accidents (BEA) was present to oversee the testing. The examination revealed that the "radial play of the autopilot mode engagement/ disengagement lever was not sufficient. This introduced a higher friction in the bearing of the lever, resulting in an increased operating force. In this case, the back driving force is not able to rotate the lever to get the autopilot mode disengaged. This results in increased pedal forces to move the rudder."

ADDITIONAL INFORMATION

Parties to the investigation were the Federal Aviation Administration, Northwest Airlines, Airbus Industrie of North America, and the Air Line Pilot's Association.

The airplane was released and put back into service on November 25, 1996. The flight data recorder and rudder autopilot artificial feel solenoid were released and returned to Northwest Airlines.

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: CHI97IA034

Occurrence Date: 11/24/1996

Occurrence Type: Incident

Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
DETROIT METROPOLITAN	DTW	640 Ft. MSL	3L	12001	200

Runway Surface Type: Concrete

Runway Surface Condition: Wet

Type Instrument Approach: ILS-complete

VFR Approach/Landing: Full Stop

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
Airbus Industrie	A-320-211	121

Airworthiness Certificate(s): Transport

Landing Gear Type: Retractable - Tricycle

Homebuilt Aircraft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	156	167000 LBS	2

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Fan	Cfm	CFM-56	25000 LBS

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
Continuous Airworthiness	05/1996	2972 Hours	20190 Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?

Owner/Operator Information

Registered Aircraft Owner	Street Address		
FIRST NATIONAL BANK OF BOSTON	2 INTERNATIONAL PLACE		
	City: BOSTON	State: MA	Zip Code: 02110

Operator of Aircraft	Street Address		
NORTHWEST AIRLINES	5101 NORTHWEST DRIVE		
	City: ST. PAUL	State: NM	Zip Code: 55111

Operator Does Business As:

Operator Designator Code: NWAA

- 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 Only

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: CHI97IA034

Occurrence Date: 11/24/1996

Occurrence Type: Incident

First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	45

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

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--no waivers/lim. | Date of Last Medical Exam: 08/1996

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Mult-Engine	Night	Instrument Actual	Instrument Simulated	Rotorcraft	Glider	Lighter Than Air
Total Time	5242	2883								
Pilot In Command(PIC)										
Instructor										
Last 90 Days	221	221		221						
Last 30 Days										
Last 24 Hours	8	8		8						

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

Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point	State	Airport Identifier	Departure Time	Time Zone
FORT LAUDERDALE	FL	FLL	1130	EST

Destination	State	Airport Identifier
Same as Accident/Incident Location		DTW

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: CHI97IA034

Occurrence Date: 11/24/1996

Occurrence Type: Incident

Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
DTW	1455	EST	640 Ft. MSL	1 NM	215 Deg. Mag.

Sky/Lowest Cloud Condition: Unknown 0 Ft. AGL

Condition of Light: Day

Lowest Ceiling: Overcast 400 Ft. AGL

Visibility: 3 SM

Altimeter: 30.00 "Hg

Temperature: 1 °C

Dew Point: -1 °C

Wind Direction: 40

Density Altitude: 750 Ft.

Wind Speed: 7

Gusts:

Weather Condtions at Accident Site: Instrument Conditions

Visibility (RVR): 0 Ft.

Visibility (RVV) 0 SM

Intensity of Precipitation: Unknown

Restrictions to Visibility: None

Type of Precipitation: Freezing Rain

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				4	4
Other Crew					
Passengers				141	141
- TOTAL ABOARD -				147	147
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	147	147

National Transportation Safety Board

FACTUAL REPORT
AVIATION

NTSB ID: CHI97IA034

Occurrence Date: 11/24/1996

Occurrence Type: Incident

Administrative Information

Investigator-In-Charge (IIC)

DAVID C. BOWLING

Additional Persons Participating in This Accident/Incident Investigation:

MARK LUND
FAA CMO-6020 28TH AVE. SOUTH
MINNEAPOLIS, MN 55450

TIMOTHY J LOGAN
NORTHWEST-5101 NORTHWEST DR.
MINNEAPOLIS, MN 55111

ROBERT F ARRON, JR.
ALPA-5101 NORTHWEST DR.
MINNEAPOLIS, MN 55111

ALAIN DERON
AIRBUS-7500 AIRLINE DR
MINNEAPOLIS, MN 55450