NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

September 2, 1999

MAINTENANCE RECORDS GROUP CHAIRMAN'S FACTUAL REPORT

DCA-99-MA-060

A. ACCIDENT

Location: Little Rock National Airport, Adams Field, Little Rock, Arkansas

Date: June 1, 1999

Time: 2351 Central Daylight Time (CDT)

Aircraft: McDonnell Douglas DC-9-82, N215AA, American Airlines, Flight 1420

B. MAINTENANCE RECORDS GROUP

Chairman: Frank McGill
National Transportation Safety Board
Washington, D.C.

Member: Ed Milliser
Federal Aviation Administration
Little Rock, Arkansas

Member: C. E. Williams
American Airlines
Tulsa, Oklahoma

C. SUMMARY

On June 1, 1999, at 2351 central daylight time[1] a McDonnell Douglas[2] model DC-9-82 (MD-82)[3] airplane, N215AA, operated by American Airlines Inc. (AAL)[4], as flight 1420, and

[1] Unless otherwise indicated, all times are central daylight time, based on a 24-hour clock.
[2] Boeing Commercial Airplane Group acquired the holdings of the McDonnell Douglas Company in 1997.
[3] The FAA Type Certificate Data Sheet states that the "MD" designator may be used in parentheses, but must be accompanied by the official designator.
[4] Three-letter International Airline Decoding Designator assigned on a worldwide basis by the International Civil Aviation Organization (ICAO). American Airlines is assigned AAL.

equipped with two Pratt & Whitney (P&W) model JT8D-217C turbofan engines, came to rest off the end of runway 04R at Little Rock National Airport, Adams Field (LIT), Little Rock, Arkansas. The airplane overran the runway and impacted several structures. Fatal injuries occurred, and the airplane sustained "substantial" damage.[5] The flight had departed Dallas-Fort Worth International Airport (DFW), Texas, and was operated under the provisions of 14 Code of Federal Regulations (CFR) Part 121, with 139 passengers and 6 crew on board. The crew comprised two pilots and four flight attendants.

D. DETAILS OF THE INVESTIGATION

1. Operations Specifications

A review of AAL's Air Carrier Certificate, which included the standards, terms, conditions, and limitations contained in the FAA approved Operations Specifications (Parts A, B, C, D, and E), revealed no discrepancies.

The FAA's Program Tracking and Reporting Subsystem (PTRS)[6] query on N215AA was reviewed from January 1998 to present. All status results were coded closed or satisfactory, and no discrepancies were noted.

2. Type Certificate Data Sheet

Federal Aviation Administration (FAA) "Type Certificate Data Sheet"[7] number A6WE (revision 24) for DC-9-82 airplanes was reviewed for compliance conditions and limitations. No discrepancies were noted.

3. Aircraft History

Registry Number	Serial Number	Line Number	Designator	Delivery to AA (New)
N215AA	49163	1111	S80	August 1, 1983

Notes on AAL DC-9-82 airplanes:

- Passenger configuration for N215AA was (139): 14 first class and 125 coach.
  An alternate configuration for S80 type airplanes is (133): 20 first class and 113 coach.
- There are an additional eight available seats for cockpit crew, observers, and flight attendants.

[5] Substantial damage means damage or failure that adversely affects the structural strength, performance, or flight characteristics of the aircraft, as defined in 49 CFR Part 830.
[6] The PTRS is a FAA computer-tracing program that includes information of inspection and surveillance activities made by Flight Standards Inspectors.
[7] The document that prescribes conditions and limitations under which the product, for which the type certificate was issued, meets airworthiness requirements.

- AAL is authorized to conduct operations with three flight attendants and a passenger seating capacity of 150.
- AAL is currently flying 226 (not including N215AA) DC-9-82 /-217A/-217C type airplanes (S80, S8V, and S8P).

4. Engines: P&W JT8D-217C Turbofan

	Engine Position 1 (Left Side)	**Engine Position 2 (Right Side)**
Serial number (SN)	718427	725712
Time since new (TSN)	29,734 hours	25,131 hours
Cycles since new (CSN)	15,711 cycles	13,216 cycles
Date of installation on N215AA	September 7, 1997	July 30, 1998
Location of installation	La Guardia (LGA)	New Orleans (MSY)
Time since installation (TSI)	5,256 hours	2,618 hours
Cycles since installation (CSI)	2,447 cycles	1,299 cycles
Date of last Engine Shop Visit (ESV)	August 6, 1997	July 9, 1998
Date of removal	July 25, 1997 off N248AA	June 29, 1998 off N205AA
Date of last Engine Heavy Maintenance (EHM)	July 27, 1995	EHM was scheduled on next ESV

The engine Airworthiness Directive (AD)[8] status list, including associated service bulletins (SB)[9], was reviewed, including repetitive, active, and open status.

Other engine service bulletin (SB)[10] modifications, including engineering change orders and (ECOs),[11] and fleet campaign directives (FCDs),[12] also were reviewed. No discrepancies were noted.

[8] Airworthiness Directive (AD) is a regulatory notice sent out by the FAA informing the operator of an action that must be taken for the aircraft to maintain its airworthiness status.
[9] A bulletin issued by the manufacturer of an aircraft, engine, or component that describes a service procedure that the manufacturer recommends to make the device safer, or to improve its service life.
[10] A document issued by the manufacturer to notify the operator of recommended modifications, substitution of parts, special inspections/checks, or a change in life limits.
[11] Engineering Change Order (ECO) is an authorizing document created by AAL engineering to perform modifications, alterations, new installations, technical evaluations, and other support equipment requirements to an aircraft.
[12] A Fleet Campaign Directive (FCD) is authorized by the AAL engineering department to initiate and record the results of special inspections or actions on an aircraft, engine, or component.

The engine maintenance records for the last shop visit and on-airplane (N215AA) installation were reviewed. No discrepancies were noted.

5. AAL Engineering Specification Maintenance (ESM) Intervals for DC-9-82/-83 Airplanes

Periodic Service (PS):	Accomplish maximum two flying days from last PS or higher check.
"A" Check:	65 flight hours.
"B" Check:	470 flight hours.
"C" Check:	First "C" Check not to exceed 5,000 flight hours, second and subsequent "C" Checks are not to exceed 4,200 flight hours.
Structural Significant Items: (SSIs)[13]	Progressive 7,000, 10,000, 15,000, and 25,000 flight hours.
Non-SSIs:	25,000 flight hours.
"HC" Check:	(Heavy "C" Check) First "HC" Check not to exceed 14,000 flight hours, second "HC" Check not to exceed 12,000 flight hours since first "HC" or 24,000 hours total ship time (TST). Third and subsequent "HC" Checks are not to exceed 12,000 flight hour intervals.

6. Airframe Summary (N215AA)

Total Airplane Hours at time of accident: 49,136

Total Airplane Cycles at time of accident: 27,103

"PS" Check and "A"Check:

The last "PS" Check was scheduled in conjunction with an "A" Check. The "PS/A" Check was accomplished on May 31,1999, at DFW. The airplane had 49,125 flight hours and 27, 098 cycles.

The previous "A" Check was performed May 27, 1999, at DFW (49,085 flight hours and 27,078 cycles).

[13] Structural Significant Item (SSI) is any detail, element, or assembly that contributes significantly to carrying flight, ground, pressure, or control loads, and whose failure could affect the structural integrity necessary for the safety of the aircraft.

Included in the "A" Check were: checking all tires and wheels for airworthiness condition and tire inflation pressure per AD 87-08-09, and brakes for wear per AD 92-09-03. These two AD requirements are performed on both the "PS" Check and "A" Check. Normal inflation pressure for nose gear tires is 150-160 pounds per square inch (psi) and 174-185 psi for main gear tires. These ranges are only accurate after the tire has cooled to ambient temperature. When servicing tires that have not been cooled to ambient temperature, AAL procedures allow tires to be maintained at a pressure above the normal range. Dry nitrogen is required for servicing tires. The recorded tire inflation pressures were:

	165 psi Left	**Nose Gear**	167 psi Right	
200 psi	205 psi	**Main Gear**	199 psi	203 psi
1.	2.		3.	4.

A digital flight guidance system (DFGS) return-to-service (RTS) test was added to the standard "A" Check requirements, and was accomplished by a Lower Minimum Program (LMP)[14] qualified mechanic using LMP procedures. The system test is performed at 450-hour intervals (threshold)[15], unless otherwise required.

There was one deferred discrepancy coming into the check that was authorized by the minimum equipment list (MEL)[16] concerning an abnormal reading on a pressure gauge, which occurred from Flight 1528 on May 31, 1999. The problem was corrected by replacing the auxiliary power unit (APU) pneumatic pressure-indicating gauge on May 31, 1999, at DFW.

Three nonroutine maintenance discrepancies were noted from the "A" Check. One of the discrepancies involved an air outlet above a passenger seat, and the other two involved baggage compartment discrepancies. None were considered relevant to the accident. There were no deferred items remaining after the completion of the check.

"B" Check:

The last "B" Check, # 58, was accomplished on April 21, 1999, at DFW. The airplane had 48,776 flight hours and 26,926 cycles.

The previous "B" Check, # 57, was performed on March 2, 1999, at LGA (48,335 flight hours and 26,722 cycles).

[14] LMP is an approved program authorizing aircraft operations for lower than standard landing minimums. Maintenance repairs to a LMP system/component must be accomplished in accordance with defined procedures. To return an aircraft to the lower landing minimum status, a return-to-service (RTS) test is necessary.

[15] A "threshold interval" is a specific value for a usage parameter (flight hours, flight cycles, etc.), which the first inspection of some particular level or method must be conducted.

[16] The FAA approved Minimum Equipment List (MEL) contains a list of equipment and instruments that may be inoperative on a specific type of aircraft for continuing flight beyond a terminal point.

Included in the "B" Check were: checking all tires and wheels for an airworthy condition, tire pressure, brakes, wing spoilers, and hydraulic subsystems. A DFGS return-to-service test was performed upgrading LMP status.

Before the "B" Check inspection, there was one discrepancy listed in the logbook concerning a crewmember seatbelt strap. A new strap was installed.

AD 98-11-10 was performed during the "B" Check. The AD was an inspection of the speed brake latching lever pin. The actions specified by this AD are intended to prevent a jammed speed brake handle pin, which could result in retraction of the spoilers and full advancement of the left throttle during a go-around.

There were 23 nonroutine maintenance discrepancies noted from the "B" Check. 15 of the discrepancies were interior cabin items, 7 were cargo compartment items, one was a background light plate, and one was an engine ignition lead. None were considered relevant to the accident.

"C" Check:

The last "C" Check, # 15, was accomplished on January 6, 1999, at Tulsa (TUL). The airplane had 47,896 flight hours and 26,512 cycles.

The previous "C" Check, # 14, was performed on September 20, 1997, at TUL (43,993 flight hours and 24,714 cycles).

"HC" Check:

The last "HC" Check, # 4, was accomplished on September 20, 1997, at TUL. The airplane had 43,993 flight hours and 24,714 cycles.

The previous "HC" Check, # 3, was performed on January 22, 1994, at TUL (32,878 flight hours and 19,370 cycles).

7. Weight and Balance Summary

AAL airplanes operate on a fleetweight basis, with a specified number of airplanes weighed at 36-month intervals to reestablished weight and balance. The number of weighings depends upon fleet size. The weights of the airplanes not weighed are adjusted by the average difference between the anticipated weigh and the actual weigh of the weighed airplanes.

N215AA was last weighed on September 2, 1989, at TUL. The results were:

Basic Empty Weight:	77,914 pounds
Arm:	952.035 inches
Moment:	74,176,859

As ECOs change the master weighing, new summaries are computed. From AAL's weight and balance management control system dated June 25, 1999 (replaced flight data recorder), N215AA's current summary was:

Corrected Empty Weight:	79,814 pounds
Arm:	951.160 inches
Moment:	75,915,849

8. Tires and Wheels

Two nose landing gear (NLG) tires:

Size 26×6.6, 12 ply rating, maximum weight is 33 pounds, normal inflation pressure is between 150 and 160 pounds per square inch (PSI) using dry nitrogen only per AD 87-08-09, speed rating is 225 miles per hour (MPH), and the maximum number of retreads per carcass is seven.

#1 left nose landing gear tire and wheel assembly was last replaced on May 27, 1999, at DFW. The maintenance action resulted because of a pilot discrepancy, which noted excessive nose wheel vibration at liftoff.

#2 right nose landing gear tire and wheel assembly was last replaced on February 4, 1999, at Washington (DCA). The nonroutine discrepancy was generated from a "PS" Check inspection.

Four main landing gear (MLG) tire and wheel assembly:

Size H44.5×16.5-20, 28 ply rating, maximum weight is 210 pounds, normal inflation pressure is between 174 and 185 PSI using dry nitrogen only per AD 87-08-09, speed rating is 225 MPH, and the maximum number of retreads per carcass is eight.

#1 left main landing gear tire and wheel assembly was last replaced on May 7, 1999, at TUL. The nonroutine discrepancy was generated from a "PS" Check inspection.

#2 left main landing gear tire and wheel assembly was last replaced on May 7, 1999, at TUL. The nonroutine discrepancy was generated from a "PS" Check inspection.

#3 right main landing gear tire and wheel assembly was last replaced on May 15, 1999, at Newark (EWR). The nonroutine discrepancy was generated from a "PS" Check inspection.

#4 right main landing gear tire and wheel assembly was last replaced on April 7, 1999, at Minneapolis (MSP). The nonroutine discrepancy was generated from a "PS" Check inspection. No tire and wheel assembly discrepancies (pilot or maintenance nonroutine) were noted after the last replacement dates.

9. Brakes

#1 left main landing gear brake was last replaced on April 3, 1999, at PHX. The nonroutine discrepancy was generated from a "PS" Check inspection.

#2 left main landing gear brake was last replaced on April 2, 1999, at Detroit (DTW). The nonroutine discrepancy was generated from a "PS" Check inspection.

#3 right main landing gear brake was last replaced on December 29, 1998, at Boston (BOS). The nonroutine discrepancy was generated from a "PS" Check inspection.

#4 right main landing gear brake was last replaced on April 3, 1999, at Phoenix (PHX). The nonroutine discrepancy was generated from a "PS" Check inspection.

Four ATA 3242 (wheels and brakes) discrepancies were noted in January 1999. None were recorded (pilot or maintenance nonroutine) after this date.

10. Airplane Landing Category

AAL is authorized to conduct Airplane CAT III Operations by section A4 (Summary of Special Authorizations and Limitations) of Operations Specifications. DC-9-82 airplanes are authorized CAT IIIa Instrument Approach and Landing Operations, including equipment limitations, as defined in section C60 of Operations Specifications. Basic weather categories are:

CAT I- 200 feet DH[17]/2400 feet RVR[18]
CAT II- 100 feet DH/1200 feet RVR
CAT IIIa- 50 feet DH/700 feet RVR
CAT IIIb- 0 feet DH/150 feet RVR
CAT IIIc- 0 feet DH/0 feet RVR

The last recorded CAT IIIa autoland for N215AA was on May 24, 1999. The last RTS maintenance test was accomplished on June 1, 1999, at DFW, during the "A" Check inspection.

The airplane was listed in LMP CAT IIIa status at the time of the accident.

At every third "HC" Check, a "functional flight check"[19] is required. The functional acceptance check includes an autoland with a flap setting of 28° using Digital Flight Guidance Computer

[17] Decision Height (DH) is the height at which a decision must be made as to whether a landing or a go-around will be made.
[18] Runway Visual Range (RVR) is an instrumentally derived value that represents the horizontal distance a pilot will see down the runway from the approach end.
[19] A "functional flight test" is a quantitative check to determine if one or more functions of a system perform within specified limits. AAL requires functional flight flights subsequent to certain maintenance actions, or component replacement or repair.

(DFGC)[20] # 1, and a flap setting of 40° using DFGC # 2. This check was performed on February 11, 1994, during "HC" Check, # 3.

11. Structural Repairs

A list of work records for six "major repairs"[21] was reviewed, and no discrepancies were noted. The repairs were accomplished with either Special Federal Aviation Regulation (SFAR) #36[22] approval or Designated Engineering Representative (DER)[23] approval. The repair records were:

(1) Repairs made on January 31, 1994, for gouges discovered on horizontal stabilizer lug caused by the rotation of the pivot lug shim.
(2) Repairs made on January 30, 1992, for a gouge discovered on the edge of the 4th window belt aft of the aft right emergency exit door.
(3) Repairs made on November 3, 1989, for forward lower fuselage damage. "Formers"[24]and skin were dented beyond structural repair manual limits.
(4) Repairs made on March 16, 1989, for cracks discovered in the right wing.
(5) Repairs made on March 20, 1987, for missing rivets (3) discovered on former to fuselage attachment near station 1430.
(6) Repairs made on February 12, 1984, for hail damage to aileron and elevator control tabs. Dented surfaces exceeded limitations.

12. Logbook

The aircraft maintenance logbook forms (AA E6) were reviewed from May 15, 1998, to June 1, 1999, for discrepancies that referenced flight controls (spoilers), autoland systems, antiskid control, wheels, brakes, ice and rain protection, engine controls, and engine reversing.

AAL Field Maintenance Reliability (FMR)[25] on-request reports were generated for N215AA from June 1, 1998 to May 31, 1999 by Airline Transport Association (ATA)[26] codes.

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[20] The Digital Flight Guidance Computer (DFGC) is an independent system that provides control data for various airplane functions. These functions include: autopilot, flight director, yaw damper, autothrottle/speed control, auto reserve thrust, and altitude advisory.
[21] Title 14 CFR Part 1 defines "major repair" as a repair that, if improperly done, might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, of other qualities affecting airworthiness; or that is not done according to accepted practices or cannot be done by elementary operations.
[22] Special Federal Aviation Regulation (SFAR) #36 allows selected certificate holders to perform major repairs using technical data that has not been approved by the FAA.
[23] A Designated Engineering Representative (DER) is approved by the FAA to perform various examinations, testing, and inspections necessary to determine compliance with applicable airworthiness standards.
[24] A "former" is a frame that attaches to a structural truss to provide a desired aerodynamic shape.
[25] Field Maintenance Reliability Report (FMR) is a real-time management computer system that maintains the maintenance status of each airplane in AAL's fleet. The report monitors and controls the various aircraft maintenance requirements, such as: discrepancies reported by flight crewmembers, parts required, and selected repairs requiring technical review.
[26] Air Transport Association (ATA) system designations for a standardized format to be used in aircraft maintenance.

The data fields include: mechanical discrepancies, corrective maintenance actions, and MEL deferrals.

The following are selected discrepancies from ATA: 2230 (autothrottle/speed control), 2240 (LMP/landing), 2760 (spoilers/drag devices), 3040 (windows/windshields), 3242 (brakes), 5388 (fuselage), 7320 (engine fuel and control), 7600 (engines controls), and 7830 (thrust reversers) systems:

2230 December 25, 1998:	Autothrottles failed to engage. DFGS #2 selected. *Placarded autothrottles inoperative per MEL. Downgraded LMP status. DFW.*
	On December 25, 1998, no flight faults were recorded. Performed RTS. #1 and #2 both go. Autothrottle system checked normal. Cleared for maintenance item control (MIC). DFW.
2230 February 26, 1999:	Autothrottles will not engage DFGC 1 or DFGC 2. *Placarded autothrottles inoperative per MEL. LMP downgraded to CAT II status. DFW.*
	On February 26, 1999, replaced left engine autothrottle disengage switch. Operations checked ok. LMP upgraded to autoland status. EWR.
2230 April 20, 1999:	Autothrottles fail to move both throttles together, right throttle sticks, while left moves. Right throttle stiff and binding. *Placarded autothrottles inoperative per MEL. Downgraded LMP to CAT II status. DFW.*
	On April 28, 1999, accomplished autothrottle lube. Autothrottles operations check OK. Throttle well within limits. Removed placard and cleared MIC sheet. Accomplished RTS and upgraded to autoland. LGA.
2230 May 15, 1999:	Right throttle is sticking, and sometimes does not move in conjunction with the left throttle in autothrottle operation. *Placard autothrottles inoperative per MEL. DFW.*
	On May 16, 1999, cleaned throttle quadrant, cam and cables lubed. Autothrottles checked OK. LMP status upgraded to CAT IIIa. EWR.
2230 May 17, 1999:	Right throttle still sticks.

Checked force to move throttles fore and aft. The left throttle reads 7 pounds of force and the right throttle reads 6.5 pounds maximum force. Both throttles are within limits. Accomplished RTS, all tests pass. Accomplished autothrottle test, no faults noted. No sticking noted. System operations check normal. Chicago (ORD).

2230 May 18, 1999: Right throttle sticks. Auto throttles unable to control right throttle when engaged. At level off, flight level 370, left throttle came back to 1.4 engine pressure ratio (EPR), while the right stayed at 1.99 EPR.
Deferred autothrottles per MEL. Downgraded LMP to CAT II only. DCA.

On May 22, 1999, accomplished Technical Forman Items (TFI)[27] *that were listed for troubleshooting. LMP status upgraded to CAT IIIa. Raleigh/Durham (RDU).*

2240 December 20, 1998: On autoland attempt on runway 35R DFW, wind from 030° at 4 knots, on speed with "LOC and G/S" centered, autopilot disconnected at 300 feet. Possible "stablizer motion" aural warning also at that time. DFGS on #1.
Placarded land mode inoperative per MEL. Downgraded LMP status. DFW.

On December 20, 1998, flight fault review (FFR)[28] *shows no associated faults. RTS checks both sides go. Placard removed and LMP upgraded to autoland. Las Vegas (LAS).*

2760 June 3, 1998: Autospoiler do-not-use light came on shortly after takeoff at LAS. Light went out after pulling and resetting spoiler-control circuit breakers.
Accomplished test on autospoiler system. No faults noted. Operations check normal. ORD.

2760 November 22, 1998: Autospoiler do-not-use annunciator illuminated, followed procedure in Volume 1, pulled and reset circuit breakers (CBs), out light came back on.

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[27] Technical Forman Item (TFI) is an action to be taken (ATBT) that describes work to be accomplished to correct a specific discrepancy.

[28] Flight fault review (FFR) is a means to run a series of tests from a status test panel (STP) that is located on the aft overhead cockpit panel. The STP has the capability of accessing, monitoring, and displaying information provided from the DFDG.

	Operated autospoilers system through several cycles. Accomplished autospoiler check. No faults found. System checks and operates normal. DFW.
2760 March 7, 1999:	After take off, autospoiler do-not-use light illuminated. Spoiler auto-switching unit reset. *Ground checked OK at this time. Calgary (YYC).*
2760 March 7, 1999:	Repeat of first discrepancy. *Ground checks good. OK for service. DFW.*
2760 April 22, 1999:	Autospoiler do-not-use light illuminated en route. Spoiler reset itself, and light went out after engine shutdown at gate. *Reseated autospoiler CB. Performed all required checks. Operations check normal. LGA.*
2760 May 22, 1999:	Autospoiler do-not-use light illuminated in flight and stayed on. *Deferred autospoiler system per MEL, and downgraded LMP status. PDX.* *On May 22, 1999, cleared discrepancy by autospoiler maintenance manual check. Brake de-spin check normal. Test of proximity switch electronics unit (PSEU) and related sensors, and time-delay relay. Replaced lamps for autospoiler do-not-use (ASDNU) indicator. Upgraded LMP status. RDU.*
3040 May 23, 1999:	Left (captains) windshield wiper inoperative. *Checked and found left (captains) windshield wiper operated normal in all modes. Blade cleans with no streaking. No other defects found. ORD.*
3242 January 1, 1999:	Suspect possible dragging brakes on left side or perhaps hydraulics line backoff. Left brakes heat up more than right with normal braking, with brake chatter during taxi-in. *Checked left brakes and verified both brakes released. No defects noted. DFW.*
3242 January 5, 1999:	Right brake pressure bled down to 750 psi in 5 minutes, while parked at the gate. *Performed brake bleed-down test in hangar. Found to be within limits. ORD.*
3242 January 21, 1999:	Info to maintenance: left brakes consistently hotter than right brakes.

Visually inspected main landing gear brakes for condition and connections. Temperature differential normal range excessive. Request further flight crew observation. OK for service. DFW.

5388 May 12, 1999: Lighting strike during descent into Columbus (CMH). Appeared to be on left side of airplane. No abnormal instrument, fuel, electrical, or control problems. First Officer walkaround in CMH found nothing abnormal.
Accomplished lighting strike inspection, no damage noted. CMH.

7320 January 21, 1999: #2 engine slow to accelerate from idle to 1.4 EPR. Lags #1 engine by 10 to 15 seconds. Very slow to accelerate from idle reverse to 1.3 EPR. Normal acceleration from 1.4 EPR to maximum power.
Drained and cleaned moisture traps on right engine. DFW.

7320 January 27, 1999: Right engine slow to accelerate out of idle to takeoff or powerback and reverse.
Inspected intake and exhaust. Checked moisture trap and ran engine. All indications normal on run-up. DFW.

7320 January 27, 1999: Info to maintenance: Right engine slow to accelerate from idle to takeoff power. Once spooled, operation seems normal.
Performed acceleration check. Both engines from approach idle to takeoff power are well below allowable time. Right engine is of a different bleed configuration. It is not uncommon to experience a slight difference in acceleration times. Normally, there should be approximately a two second difference between engines with different bleed configurations per maintenance manual card. DFW.

7320 January 29, 1999: Right engine slow to accelerate from idle to takeoff power. Also, slow to go into reverse on landing.
Checked and drained moisture traps on right engine and cleaned drain holes. Ran engines and checked for approach idle. Engine ground run showed no defect. Operation normal. DFW.

7320 February 1, 1999: Right engine slow to spool up on takeoff. Considerably slower than left engine. Right lags left on ground run up 3 to 5 seconds.
Checked engines. Number 1 and 2 engines have different bleed configurations. It is not uncommon for a difference in acceleration times from ground idle. OK for continued service. DFW.

7600 January 11, 1999: In flight, after approximately 1 hour at flight level 370, right throttle would bind when throttles were retarded for descent. They

became very hard to move the last 1 1/2 inches of travel to idle. Binding ceased at lower altitudes and on the ground.
Inspected throttle pedestal linkage. Operated several times, no abnormality noted. Open right engine, inspected linkages, lubricated cable cylinder to remove moisture. Operated throttles several times. No abnormality noted at engine. Started and operated right engine at and above idle. No binding noted. Shut down right engine and closed up. OK for service. DFW.

7600 January 11, 1999: After 2.5 hours of flight, the throttles disconnected. At that time, there was a one-knob width split between the throttles in the "MAN" position. The right throttle stopped as the left throttle advanced. When matching the throttles, the right throttle was stiff and felt binding.
Removed and replaced right throttle control cable. Operations checked normal during engine run. San Francisco (SFO).

7600 January 26, 1999: During cruise, the right throttle was stuck, and it took noticeable force to free it back to normal movement. This occurred several times during the flight.
Re-torque right throttle idler-pulley. Mount bolt checked OK. DFW.

7600 January 29, 1999: At cruise, the right throttle would stick at mid-range position, and would take very considerable force to get it to move either direction. It was like this with autothrottle on or off. Stayed like this throughout cruise for 3-plus hours.
Removed and replaced fuel control. Rig and trim both engines. Operations check normal. ORD

7600 April 21, 1999: Left throttle sticks, while pushing throttle forward. It appears to be binding in cable linkage.
Checked throttle pull. Found to be within limits. OK for service. DFW.

7600 May 15, 1999: Right throttle binding last third of movement toward idle in both fore and aft movement.
Opened right engine cowl and inspected linkage for abrasions or binding. Operated right throttle several times, no binding observed. Linkages lubed precautionary. Downgraded LMP to CAT II status. DFW.

On May 16, 1999, cleaned throttle quadrant, cam and cables lubed. Autothrottles checked OK. LMP status upgraded to CAT IIIa. EWR.

7600 May 19, 1999:	Engine throttles right side only binding at cruise. *Checked throttle quadrant in pedestal, no binding found. Opened engine cowling and checked throttle cables. Checked OK. Lubed cables through engine pylon. Right hand throttle checked OK. Checked pulleys under pedestal. All checks OK. DFW.*
7830 January 14, 1999:	Right thrust reverser very difficult to get into reverse. Also, when coming out of reverse, reverser stows before reverse lever reaches the idle thrust position. *Adjusted right thrust reverser control-valve per maintenance manual. Operated reverser several times. Operations checks normal. DFW.*
7830 January 27, 1999:	Right reversers very stiff trying to get into reverse. *Inspected cables and pulleys. Operated reverse several times, all indications normal. DFW*
7830 February 1, 1999:	Right thrust reverser grinds and binds. *Checked reverser controls. Cleaned and lubricated rod ends at fuel control. Cycled reverser several times and no binding noted. OK for service. DFW.*
7830 February 12, 1999:	Right reverser very difficult to get buckets open. *Item deferred per MEL. DFW.* *On February 12, 1999, inspected and lubricated pedestal thrust reverser control-linkage, and adjusted control-valve linkage. Operations check good. No defects noted. Removed placard. Austin (AUS).*

At the time of the accident, there were no items deferred from AAL's Configuration Deviation List (CDL),[29] and none from the Minimum Equipment List (MEL).

13. Airworthiness Directive (AD) Summary

A review of AAL's electronic record of accomplishments for the AD status on N215AA included the airframe, engine, and appliances. The document denotes methods of compliance (ECOs, FCDs, SBs, maintenance manual references, etc.) and affected components (part numbers, serial numbers, position, etc.). AD 92-22-08 RVN 01 controls the Corrosion Prevention and Control Program (CPCP), report MDC-K4606 RVN 02. No discrepancies were noted.

14. Engineering Change Orders and Fleet Campaign Directives for N215AA

[29] Deviations from configuration requirements (missing equipment) are permitted under the approved CDL list.

Accomplishment records, including job numbers, locations, and dates, were reviewed for ATA codes 22 (autopilot), 27 (flight controls), 32 (landing gear), and 78 (engine exhaust). No discrepancies were noted.

The last ATA 22 recorded task was on February 14, 1998, at ORD. A LMP cockpit placard indicator was modified.

The last ATA 27 recorded task was on January 8, 1999, at TUL. The elevator servo cable and cable guard was checked.

The last ATA 32 recorded task was on January 8, 1999, at TUL. The main landing gear (MLG) shimmy damper retainer was modified.

The last ATA 78 recorded task was on August 8, 1994, at DFW. Engine thrust reverser control-valves were checked.

15. Maintenance Reliability

The Maintenance Reliability Program[30] authorization (D74 of the Operations Specifications) allows AAL to establish and change the frequency and work content of all maintenance and overhaul activities. It also provides a method to relate actual operating experience to established maintenance controls by various applications, data analysis, and evaluations. This document is administered by the maintenance and engineering (M & E) division, and is called "Airplane Reliability & Change Control Program (RECON)."

Pilot reports (PIREP)[31] data rate per 1000 flying hours for MD80 airplanes over a two year period were reviewed for ATA systems: 22, 27, 32, 73, 76, and 78. Since January of 1999, none of these systems was noted to exceed the upper control limit standard.[32]

The last RECON "significant reliability problem" for MD-80 airplanes was:[33]

ATA 22 (auto flight) was in October 1996.
ATA 22 (annuniciator, flight mode) was in April 1997.

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[30] A Maintenance Reliability Program is an advanced set of factors that control inspections, checks, and overhaul times for the entire aircraft, and is the sole control as far as operations specifications are concerned. The analytical nature of reliability control emphasizes the existence of components and systems to determine maintenance intervals and processes.

[31] Suspected or known malfunctions or unsatisfactory conditions entered by flightcrew into the aircraft log, which requires maintenance.

[32] A system performance number that indicates when investigative action is appropriate to determine whether some corrective action may be necessary. Limits for PIREPS are established using 12 consecutive months of 3 month moving averages using ATA system designations.

[33] A problem which is determined by analysis to cause any of the following: adverse effect on aircraft operating safety, appreciable effect on aircraft operating performance, condition, appearance, or passenger comfort, failure to meet performance standards.

ATA 27 (flight controls) was in May 1997.
ATA 32 (landing gear) was in October 1996.
ATA 78 (engine exhaust) was in October 1998, for the months of July, August and September.

ATA 73 (engine fuel and control), for one month only, in September 1997 exceeded upper control limit.

ATA 76 (engine controls) did not exceed the upper control limit from July 1997 to June 1999.

16. Service Difficulty Report Data

FAA Service Difficulty Reports (SDR)[34] were reviewed from all operators flying DC-9-82 airplanes for ATA system code 2700 (flight controls/spoilers). Forty of the SDRs were from January 1984 to December 1989. Nine were from January 1990 to the present. No maintenance trends or discrepancies were noted.

SDRs on N215AA for all ATA system codes were reviewed. Six of the SDRs were from September 1985 to October 1987. Six more SDRs were from November 1994 to February 1999. There was one SDR listed for 1999, and one SDR listed for 1998. None of the SDRs were noted as being relevant to the accident.

The last SDR was reported on February 21, 1999, from an overnight check at DFW. Wiring was repaired on the cabin emergency exit floor path lighting (ATA 3350).

Another SDR was reported on May 26, 1998, at DFW. During take-off roll, the wheel-not-turning light illuminated, and the take-off was aborted. Maintenance found "antiskid transducers"[35] loose. The transducers were secured, and the antiskid control unit was replaced (ATA 3260).

17. Supplemental Type Certificates on N215AA

The vender Supplemental Type Certificate (STC)[36] list and AAL's Designated Alteration Station (DAS)[37] authorization STC list were reviewed.

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[34] A Service Difficulty Report (SDR) is a FAA summation of a "mechanical reliability" report, which is submitted by an aircraft operator or maintenance facility, as required by regulation.

[35] Antiskid system wheel speed transducers are variable reluctance sine-wave generators used to detect a skid condition on each of the main gear wheels.

[36] A certificate issued by the FAA authorizing a major change or alteration to aircraft, engine, or component that has been built under an approved type certificate.

[37] The DAS program was promulgated to alleviate delays that modifiers of aircraft and aircraft components were experiencing in obtaining STC's under normal FAA approval procedures. An eligible domestic repair station, air carrier, or manufacturer may hold a DAS authorization. A DAS holder has, within certain limits, the delegated authority of the FAA to issue STCs, which are official design approvals for aircraft and which have undergone major changes in type design. In addition, the DAS is authorized to issue amended standard airworthiness certificates for aircraft, which incorporate alterations covered by an STC issued by the DAS.

There were 8 vendor STCs and 11 DAS STCs listed. No discrepancies were noted.

The last vendor STC was applied on April 13, 1998. The document authorized installing a cabin food service cart.

The last DAS STC was applied on December 11, 1998. The document authorized the installation of new cabin seats.

18. Digital Flight Data Recorder

14 CFR Part 121.344 was revised on August 17, 1997, to upgrade the requirements for flight data recording systems on all aircraft. Compliance dates: next heavy maintenance after August 18, 1999, but no later than August 18, 2001. The revision increases the number of mandatory parameters that are to be recorded.

AAL's MD80 airplanes are to be modified per ECO K2117 to record a total of 44 parameter groups (61 total parameters), including new solid-state flight data recorders (SSFDR). The added group parameters are: pitch control input, lateral control input, yaw control input, marker beacons, master warning, air/ground discrete, and angle of attack. Many of AAL's MD-80 airplanes are modified already; N215AA was not.

The last functional check/parameter check was reviewed and accepted by AAL engineering in TUL on January 4, 1999. This check was performed with the older DFDR on the airplane.

However, a new SSFDR had been subsequently installed on N215AA before the ECO K2117 modification, with ECO K2223XX procedures. The installation was completed on March 1, 1999, at DFW. The SSFDR was a L-3 Communication unit, Fairchild model FA2100, part number (P/N) 2100-4042-99, serial number (S/N) 00718. This model can be used on any MD80 airplane, pre or post modification.

The acceptance test data record for the new unit was performed on November 11, 1998, by L-3 Communications, Aviation Recorders Division, Sarasota, Florida. The test record included, the FA2100 flash memory module, P/N 253-E1568-03, with its test results.

[original signed]

Frank McGill
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