Runway underrun, McDonnell Douglas DC-9-82, November 21, 2004

Micro-summary: **This McDonnell Douglas DC-9-82 landed a bit short of the runway.**

Event Date: **2004-11-21 at 1038 MST**

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

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

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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: DEN05IA027	Aircraft Registration Number: N234AA
	Occurrence Date: 11/21/2004	Most Critical Injury: None
	Occurrence Type: Incident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
Denver	CO	80249	1038	MST	

Airport Proximity: On Airport	Distance From Landing Facility: 1	Direction From Airport: 160

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
McDonnell Douglas	DC-9-82	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 21, 2004, at 1038 mountain standard time, a McDonnell Douglas DC-9-82, N234AA, operating as American Airlines Flight 1115, sustained minor damage when during landing at the Denver International Airport (DEN), Denver, Colorado, the airplane struck several approach and runway threshold lights. Instrument meteorological conditions prevailed at the time of the incident. The scheduled domestic passenger flight was being conducted on an instrument flight rules flight plan under the provisions of Title 14 CFR Part 121. The captain, first officer, 3 flight attendants, and 101 passengers on board reported no injuries. The flight originated at the Dallas-Fort Worth International Airport, Ft. Worth, Texas, at 1004 central standard time, and was en route to DEN.

The captain reported that the first officer was flying the airplane. The crew received two previous ATIS (Automated Terminal Information System) reports that DEN weather was VFR (Visual Flight Rules). At 1017, the company's dispatch informed the crew of a special observation that DEN weather was ceilings 300 feet and 1,000 feet broken, and 1/2 mile visibility and fog. The crew briefed the ILS (Instrument Landing System) approach for runway 35L. The captain reported that when DEN Approach Control (TRACON) cleared the airplane for the ILS approach, the airplane was at 9,000 feet. The fog bank over the airport looked at if it went from the surface to 6,500 feet. The captain said that as they continued, the glide slope indicator "came up and actually went below us," and that the airplane was not yet on the localizer. The captain asked DEN TRACON for lower [altitude]. TRACON "apologized," cleared the airplane to 7,000 feet, and asked the crew if they would still be okay for the approach. The crew felt that they would be okay to continue. The airplane was configured and was approaching the glide slope from above, as it was intercepting the localizer. The crew finished the checklist at 1,000 feet. The first officer was on the localizer and glide slope. The crew was cleared to land. At 100 feet, the captain called approach lights in sight, and the first officer acknowledged. When the captain called reaching the decision altitude, the first officer called landing. The captain said he started to see the threshold lights and then heard the "glide slope" GPWS (Ground Proximity Warning System) warning. The captain said he called "pull up." He said as they touched down he thought he could see some approach light bars below the nose, but did not feel or hear anything unusual. The landing roll out was normal. After parking, the crew discovered damage to the left main brake line and loss of hydraulic fluid from the right system.

The first officer said they began the day in Dallas. It was the second day of a 2-day trip. He said they had good weather in Dallas and good weather en route. The first officer said that he was flying the airplane. He said that the initial weather they received for Denver was good - VFR. He said at one point, they received Denver ATIS (Automated Terminal Information System) over ACARS - it was VFR and landing to the south. Later, they received an ATIS report stating that Denver was still VFR, but landing to the north. The first officer said that somewhere nearing Denver, they

National Transportation Safety Board

FACTUAL REPORT

AVIATION

NTSB ID: DEN05IA027

Occurrence Date: 11/21/2004

Occurrence Type: Incident

Narrative (Continued)

received a message from their company dispatch that the airport had gone to 1/4-mile visibility. The first officer said they switched to Denver ATIS again. The reported weather at Denver was 100 broken, 1/4-mile visibility and fog, and landing to the north. They decided to plan for a category one ILS to one of the runway 35s. The first officer said he thought it would be 35R, so he briefed that approach. He said they started descending about 80 to 90 miles from the airport. The weather was good - clear weather at, above, and below. Approximately 50 miles from Denver he turned off the autopilot and throttles, and hand flew the airplane. He said they were handed over to approach control. Approach control gave them vectors to the ILS for runway 35L. The captain and the first officer went over the changes to the approach.

The first officer said that during the vectors, approach control gave them speed reductions. He said they began configuring with slats. He said that the final airspeed he recalled they gave was 170 knots. He said then they went to flaps 15 degrees. The approach controller assigned them 9,000 feet, and gave them a heading to the localizer for 35L. The first officer said that the intercept heading was very shallow, about 340 degrees. He said he figured they were close to the localizer.

At 9,000 feet and 170 knots, with the localizer indicator bar still on the side, the glide slope indicator bar began to come down. As it was coming down and through center, the first officer asked the captain to tune in Denver VOR to see where they were laterally. He did and said that they were 5 degrees off of centerline. The first officer said, "We need lower." The captain called approach and said they needed lower. Approach Control gave them 7,000 feet for the intercept. The first officer said that at that point, the controller apologized for the vector and asked if they would be okay, and did they want to be brought back around to set up for the approach again? The first officer said that he and the captain thought they would be okay. The localizer bar came off the side of the case. The first officer asked the captain to lower the landing gear and set the flaps to 28 degrees, then 40 degrees. The first officer said, "We started descending to catch up to the glide slope. I believe we were around DYMON (a published fix on the approach) when the glide slope came back. We continued down centered on the glide slope. The speed was fast, but coming back. It was still VMC. I could see the ground right under us, but could not see the runway looking straight ahead. I believe I could see runway 35R. Other than that, I had no concerns about flying the approach."

The first officer said that the captain switched to the localizer on his panel and finished the before landing checklist. At 1,000 feet, the captain announced "checklist complete." The first officer said they were stable on glide slope and localizer, but 20 knots fast. The speed was coming back. At 500 feet above the ground, the first officer said they were at "ref (approach speed) plus 10 or 15 knots." About 100 feet above decision height, the captain announced "approach lights in sight." The first officer said he looked up and saw the approach lights and threshold lights. He said that at one point he saw side rail bars on the approach system. He said he had good visual cues to continue in. The first officer said that at decision height he said "landing." He said that his attention was really focused outside. The approach looked good. He said that at some point, they got a glide slope warning on GPWS (Ground Proximity Warning System). He said, "We got two call outs on that I believe." The captain said, "You're low, pull up." The first officer said he thought he was pulling up, but it was not enough. The first officer said that after touchdown, both he and the captain saw they were short. He said they didn't experience any noises, jolts, or adverse yawing.

Air traffic control data showed that at 1031:05, the TRACON instructed American 1115 to fly a 320 degree heading to intercept the localizer to runway 35L.

At 1031:42, TRACON instructed American 1115 to maintain 9,000 until established on the localizer, and cleared the airplane for the ILS approach.

At 1035:37, TRACON instructed American 1115 to contact the tower. American 1115 responded, " ...

National Transportation Safety Board

FACTUAL REPORT
AVIATION

NTSB ID: DEN05IA027

Occurrence Date: 11/21/2004

Occurrence Type: Incident

Narrative (Continued)

we haven't intercepted the, ah, localizer yet. Can we have lower?" The TRACON controller instructed, " ... maintain 7,000 till established", and then said, "I'm sorry." Then the controller queried American 1115, "Are you going to be able to get down okay or do I need to bring you around again?" American 1115 responded, "We['re] okay."

Denver Approach Control radar showed American 1115 intercepted the localizer at 1036:21 at an altitude of 8,200 feet.

PERSONNEL INFORMATION

The captain held an Airline Transport Pilot's certificate with ratings for single and multiengine land instrument airplanes. He was type-rated in the MD-9-82 airplane. The captain's last recorded checkride was on July 23, 2004. At the time of the incident, the captain reported having 12,705 total flying hours and 8,483 hours in MD-9-82 airplanes. The captain held a first class medical certificate dated November 2, 2004. The medical certificate listed limitations "Correct for Near Vision, Holder Shall Possess Glasses."

The first officer held an Airline Transport Pilot's certificate with ratings for single and multiengine land instrument airplanes. He was type-rated in the MD-9-82 airplane. The first officer's last recorded checkride was on September 19, 2003. At the time of the incident, the first officer reported having 20,000 total flying hours and 1,000 hours in MD-9-82 airplanes. The first officer held a second class medical certificate dated August 12, 2004. The medical certificate listed no limitations.

METEOROLOGICAL INFORMATION

At 1046, the weather at DEN was 100 broken, 1/2 mile visibility with freezing fog, temperature was 27 degrees Fahrenheit (F), dew point 28 degrees F, winds 320 degrees at 8 knots, altimeter 30.13 inches, and remarks "surface visibility 1/2 mile, visibility north through east 2 mile, ceiling 100 feet broken varies overcast."

AERODROME AND GROUND FACILITIES

The ILS Approach to Runway 35L at the Denver International Airport is a Category 1 straight-in approach. The approach requires both radar and ILS equipment to fly. Radar is used to define distances. The weather minimums for the approach are a runway visual range (RVR) of 1,800 feet or 1/2 mile with all runway touchdown zone lighting functioning. The minimum safe altitude for the area is 9,200 feet .

According to the approach chart valid at the time of the accident, the approach began at an initial approach fix designated as CRUUP, located 19.8 nautical miles from the runway threshold at an altitude of 11,000 feet msl on a 170-degree radial. At CRUUP, a crew flying the complete approach would intercept a 350-degree final approach course and begin a descent to 10,000 feet msl or an altitude as assigned by Air Traffic Control (ATC). At 16.6 nautical miles, the crew would descend to 9,000 feet or 7,000 feet when assigned by ATC. Glide slope intercept could be at either altitude. The final approach fix designated as DYMON, 6.8 nautical miles from the runway threshold, is where the crew would have had to have intercepted the glide slope for the approach. Decision height for the approach is 5,631 feet, 200 feet above ground level.

Runway 35L is equipped with ALSF - II approach light system with sequencing flashers. The runway is also equipped with PAPI (Precision Approach Path Indicator).

On November 22, 2004, the Federal Aviation Administration Airways Facilities Division conducted a flight test of the ILS approach. The test showed no anomalies with the approach course or glide slope.

National Transportation Safety Board

FACTUAL REPORT
AVIATION

NTSB ID: DEN05IA027

Occurrence Date: 11/21/2004

Occurrence Type: Incident

Narrative (Continued)

FLIGHT RECORDERS

The Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR) were received at the National Transportation Safety Board (NTSB) Vehicle Performance Laboratory, Washington, DC on November 23, 2004. The recorders were in good condition and the data was extracted normally from the recorder.

The FDR plots show the airplane captured the ILS glide slope 38 seconds prior to touchdown at a radio altitude of 734 feet. The FDR pitch, recorded 4 seconds later, indicated the airplane was tracking the glide slope and at a radio altitude of 617 feet. At 5 seconds prior to touchdown, the glide slope showed a 2 dots fly up deviation. The airplane was at a radio altitude of 114 feet. The glide slope warning was on. The glide slope continued to increase reaching 4.3 dots fly up at touchdown. The airplane's airspeed at touchdown was 133.5 knots. Vertical acceleration was 1.7 g's followed by 0.7 g's approximately 1/2 second later. Lateral acceleration was -0.15 g's. The right outboard spoiler began to deploy at touchdown plus 2.5 seconds. The hydraulic pressure low lights (left and right) remained in an "off" state throughout the incident sequence.

The CVR recording consisted of four channels of background sounds consistent with an aircraft parking at the gate, deplaning passengers and crew, and sitting empty.

WRECKAGE AND IMPACT INFORMATION

The National Transportation Safety Board arrived on scene at 1300.

An examination of runway 35L showed one approach light, 19 feet from the beginning of the paved overrun, broken forward at its base. Approximately 49 feet from the start of the paved overrun surface, the beginning of two pairs of parallel-running tire marks were observed. The left pair of tire marks ran through three sets of center approach lights in the overrun, two runway threshold lights, a distance of 354 feet, and continued down runway 35L for approximately 700 feet. Light stanchions, broken lens pieces, and bulb debris were observed extending down the runway along the tire marks.

An examination of the airplane showed damage to the left main landing gear tire and brake lines, dents and scraped in the bottom left aft fuselage, chips in the aft bottom radio antennae, and cracks and puncture damage to the bottom of the left engine cowling. There was puncture damage to the inside of the left engine cowling, just forward of the stator vanes to the engine's compressor section. Several of the engine's compressor blades showed dents and scrapes. A ground check of the airplane's avionic system revealed no anomalies.

TESTS AND RESEARCH

According to the company, all proficiency checks are done in the simulators at the American Airlines facility in Fort Worth, Texas. Pilots at American Airlines receive a simulator check every 9 months. The FAA conducts the check every 18 months, or every other simulator check. The company's representative stated that most of the FAA simulator checks are conducted by FAA-designated check airmen. These check airmen are check pilots for, and employees of, American Airlines. The time between checks is established by agreement between the company and the company's FAA Certificate Management Office. The company representative mentioned that other airlines go as long as 12 months between simulator checks.

No flight checks are conducted with the exception of line checks. Pilots at American Airlines receive a line check in the airplane once every 2 years. It is no-notice and given by a company check airman.

The captain stated, "It's a normal flight. The check airman sits in the jump seat. Whoever's leg

National Transportation Safety Board

FACTUAL REPORT

AVIATION

NTSB ID:	DEN05IA027
Occurrence Date:	11/21/2004
Occurrence Type:	Incident

Narrative (Continued)

it is flies. The check airman makes comments afterward. It usually encompasses one leg of a trip."

The simulator checks follow a training plan published by the company. The training scenarios cover event items as rejected takeoffs, single engine climbs, single engine approaches, non-precision approaches, NDB (non-directional beacon) approaches, GPS (Global Positioning System), localizer, and Category II ILS approaches.

In his interview, the captain stated that you receive a simulator check for proficiency every 9 months, unless you are out for more than 90 days and you lose your landing currency. He said, "About 1-1/2 to 3 years ago, I broke my wrist. When I came back, I took a requalification ride in the simulator. I had to perform 3 landings and approaches, non-precision, Category III, rejected takeoff - took about an hour. Also, if you are upgrading or qualifying on a new airplane, you'll get checked on instrument procedures." When asked how many precision approaches he had actually flown down to minimums in his time as a captain with American Airlines, the captain responded, "I guess I've done one to two per year. Like we did with the weather at minimums, in the last four years, 4 to 5 or 6. One of them being a Cat III."

When the first officer was asked the same question, his response was, "[I] Can't recall. [The] Last ones were in the simulator."

ADDITIONAL INFORMATION

Parties to the investigation were the Denver Flight Standards District Office, American Airlines, Incorporated, the Boeing Aircraft Company, and the Allied Pilots Association. The vehicle recorders were returned to the operator.

National Transportation Safety Board

FACTUAL REPORT AVIATION

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Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
Denver International Airport	DEN	5431 Ft. MSL	35L	12000	150

Runway Surface Type: Concrete

Runway Surface Condition: Dry

Type Instrument Approach: ILS-complete

VFR Approach/Landing: None

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
McDonnell Douglas	DC-9-82	49181

Airworthiness Certificate(s): Transport

Landing Gear Type: Retractable - Tricycle

Homebuilt Aircraft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	108	150000 LBS	2

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Fan	Pratt & Whitney	JT8-217C	20000 LBS

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
Continuous Airworthiness	11/2004	2.9 Hours	64213.4 Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?
No	No	No

Owner/Operator Information

Registered Aircraft Owner	Street Address	City	State	Zip Code
CIT Leasing Corp.	1211 Avenue of the Americas	New York	NY	10036

Operator of Aircraft	Street Address	City	State	Zip Code
American Airlines, Incorporated	4333 Amon Carter Blvd.	Ft. Worth	TX	75067

Operator Does Business As: American Airlines

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; Domestic; Passenger Only

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: DEN05IA027

Occurrence Date: 11/21/2004

Occurrence Type: Incident

First Pilot Information

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

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

Certificate(s): Airline Transport; Commercial; 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? 07/2004

Medical Cert.: Class 1 | Medical Cert. Status: Valid Medical--w/ waivers/lim. | Date of Last Medical Exam: 11/2004

- 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	12705	8483	74	12631						
Pilot In Command(PIC)	4291	2424	60	4291						
Instructor										
Last 90 Days	181	181		181						
Last 30 Days	78	78		78						
Last 24 Hours	6	6		6						

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 Worth	TX	DFW	1004	CST

Destination	State	Airport Identifier
Same as Accident/Incident Location		DEN

Type of Clearance: IFR

Type of Airspace: Class B

Weather Information

Source of Briefing: Company

Method of Briefing: Aircraft Radio

National Transportation Safety Board

FACTUAL REPORT AVIATION

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Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
DEN	1046	MST	5431 Ft. MSL	1 NM	340 Deg. Mag.

Sky/Lowest Cloud Condition: Ft. AGL

Condition of Light: Day

Lowest Ceiling: Broken 100 Ft. AGL

Visibility: 0.25 SM

Altimeter: 30.13 "Hg

Temperature: -3 °C

Dew Point: -4 °C

Wind Direction: 320

Density Altitude: 4503 Ft.

Wind Speed: 8

Gusts:

Weather Condtions at Accident Site: Instrument Conditions

Visibility (RVR): Ft.

Visibility (RVV) SM

Intensity of Precipitation: Moderate

Restrictions to Visibility: Fog

Type of Precipitation: Freezing Rain

Accident Information

Aircraft Damage: Minor

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				3	3
Other Crew					
Passengers				101	101
- TOTAL ABOARD -				106	106
Other Ground					
- GRAND TOTAL -				106	106

National Transportation Safety Board

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Administrative Information

Investigator-In-Charge (IIC)

David C. Bowling

Additional Persons Participating in This Accident/Incident Investigation:

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