Uncontained engine failure, McDonnell Douglas MD-83, July 12, 2001

Micro-summary: This McDonnell Douglas MD-83 experienced an uncontained engine failure while in cruise.

Event Date: 2001-07-12 at 1824 CDT

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

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

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National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: CHI01IA211	Aircraft Registration Number: N9413T
Occurrence Date: 07/12/2001	Most Critical Injury: None
Occurrence Type: Incident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
Whiteman AFB	MO	65305	1824	CDT	

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

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
McDonnell Douglas	MD-83	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 July, 12, 2001, at 1824 central daylight time, a McDonnell Douglas MD-83, N9413T, operated by TWA Airlines LLC as flight 379 (TWA 379), made an emergency landing at Whiteman Air Force Base (SZL), Knob Noster, Missouri, following a fan blade and fan case separation of the left engine at flight level 310. Marginal visual meteorological conditions prevailed at the time of the emergency landing. The flight was operating under the provisions of Title 14 CFR Part 121 as a passenger flight. The 2 flight crewmembers, 4 flight attendants, and 132 passengers were uninjuried. The flight orignated from St. Louis International Airport, St. Louis, Missouri, at 1727, en route to San Jose Internatinal Airport, San Jose, Califiornia.

TWA 379 was approximately 45 nautical miles (nm) northeast of SZL and 96 nm east of Kansas City International Airport (MCI), Kansas City, Missouri, when the flight crew heard a "thud" come from the airplane. They noticed that the left engine pressure ratio and compressor and turbine speeds were surging with no indication of exhaust gas temperature. Within 2-3 seconds, the cockpit filled with smoke. Flight attendants reported hearing an explosion and the cabin filling with white smoke. The lead flight attendant came to the cockpit to report that smoke had filled the cabin. The captain told her to prepare for an emergency landing. The flight crew donned their oxygen masks, declared an emergency, and initiated an emergency decent. The left engine was still producing thrust; and the captain was reluctant to shut down the left engine due to multiple emergencies occurring at the time. The captain made an announcement over the airplane's public address system that they would be landing in about 10 minutes.

At 1809:00, TWA 379 contacted Kansas City Air Route Traffic Control Center (ZKC) and transmitted, "twa three seven nine emergency we have an engine failure we have smoke in the cockpit we are descending to kansas city vectors to the nearest runway."

At 1809:08, ZKC transmitted, "twa three seventy nine descend and maintain flight level two four zero heading two seven five for uh...well I'll tell you what you want to try to land at whiteman."

At 1809:18, TWA 379 transmitted, "the uh no no we want kansas city uh uh closest airport kansas city."

At 1809:22, ZKC transmitted, "twa three seventy nine heading two seven zero for kansas city."

At 1809:26, TWA 379 transmitted, "twa three seventy nine heading two seven zero kansas city would to have the ils - - - their closest runway given frequency please." Because of the airplane's position and request for descent, TWA 379 was transferred to the arrival and departure sector controller covering the area east of Kansas City. The transferring controller coordinated TWA 379's requests and advised of TWA 379's emergency to the arrival and departure controller.

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Narrative (Continued)

At 1810:16, TWA 379 transmitted, "we're descending out of twenty two six descending the aircraft for emergency landing in kansas city."

At 1810:21, ZKC transmitted, "twa three seventy nine rodger maintain at or above six thousand."

At 1811:00, ZKC transmitted, "twa three seventy nine uh what what assistance do you need at the airport."

At 1811:15, TWA 379 transmitted, "k twa three seventy nine we'll need emergency equipment standing by we had an engine failure there's smoke in the the ah cockpit and cabin."

At 1811:41, ZKC transmitted, "twa three seventy nine uh kansas city approach say us one right is going to be the uh runway of uh landing is that acceptable."

At 1811:49, TWA 379 transmitted, "twa three seventy nine one right is ah is ah acceptable yes."

At 1811:54, ZKC transmitted, "twa's uh three seventy nine rodger the ILS frequency is one one zero point seven five."

At 1811:59, TWA 379 transmitted, "nineteen seventy five rodger that.".

At 1814:28 and 1814:34, TWA 379 requested vectors to the nearest airport.

At 1814:37, ZKC transmitted, "twa three seventy nine rodger uh would whiteman work."

At 1814:40, TWA 379 transmitted, "could you give us the dme."

At 1814:42, ZKC transmitted, "ah twa three seventy nine whiteman airports off your left wing about eighteen miles."

At 1814:50, TWA 379 transmitted, "twa three seven nine thats correct uh give us vectors to the airport and the ils frequency please."

At 1815:03, ZKC transmitted, "twa three seventy nine left heading of ah one seven zero vect radar vectors to ah whiteman left head ah let's make it one eight zero one eight zero heading."

At 1815:29, TWA 379 transmitted, "one eight zero for twa one seventy nine three seventy nine."

At 1815:59, ZKC transmitted, "twa three seventy nine uh frequencies we're going to do the ils to one nine at whiteman the ils frequency one one zero point three." The instrument landing frequency for runway 19 at SZL was 108.5.

At 1816:08, TWA 379 transmitted, one zero point three twa three seventy nine. TWA 379 then asked for the inbound course and the ZKC responded "one eight seven" which was acknowledged. TWA 379 then asked for an altitude assignment, and was issued 3,000 feet along with a heading correction to 170 degrees to join the final approach course.

At 1816:51, ZKC told TWA 379 to turn further left to heading 160 to join the final approach course. TWA 379 responded, "one six zero for TWA - three seventy nine it looks like we are left of course at this time." The runway 01 localizer had to be manually shut down by the coordinator. During this period, both localizers were operational. ZKC then stated, "TWA's ah three seventy nine affirmative you are ah left of the localizer at this time ah left heading of one five zero." TWA 379 acknowledged, and then asked for the distance to the airport. ZKC responded, "TWA three seventy nine the airport's ah - twelve miles." TWA 379 then said, "OK - and the localizer

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Narrative (Continued)

frequency?" ZKC again issued frequency 110.3, to which the pilot replied, "OK very good", followed by "well nothing's up..." The controller then issued another heading change to 130 degrees.

At 1818:02, TWA 379 transmitted, "ok we got a local for TWA three seventy nine we're not picking up the localizer at this time we need a distance from the field and ah approximate location." Radar data shows that TWA 379 was at an altitude of 3,300 feet mean sea level (msl). This was ZKC's last radar contact with TWA 379 and all further radar derived position and heading information was being relayed by Whiteman approach controllers to ZKC who in turn provided it to TWA 379.

At 1818:09, ZKC transmitted, "TWA three seventy nine your currently ah one one miles north of the field and you're about a mile and a half make it a (unintelligible) mile and a half west of the localizer."

At 1818:24, TWA 379 transmitted, "any chance of us getting a little bit lower we're just skimming the cloud deck we probably need about ah two thousand feet down to two thousand feet if you can work." At this time ZKC was asking Whiteman how far they could let TWA 379 descend, and Whiteman approved 2,500 feet." The minimum safe altitude within a 25 nm radius of SZL was 3,100 feet msl. The minimum vectoring altitude (MVA) within a 30 nm radius from SZL was 2,500 feet msl. Within the 30 nm radius, there were two buffer areas due to obstructions with MVAs of 2,600 feet msl and 2,900 feet msl.

At 1818:31, ZKC transmitted, twa's two three seventy nine maintain two thousand five hundred twenty five hundred."

At 1818:34, TWA 379 transmitted, "alright twenty five hundred's not going to work it's going to put us in the cloud deck."

At 1818:38, ZKC transmitted, "ok ah twa three seventy nine maintain three thousand now and uh understand your above the clouds at this time."

At 1818:43, TWA 379 transmitted, "yeah three thousand we're above the clouds."

At 1818:45, ZKC transmitted, "alright maintain three thousand have you picked up the localizer yet."

At 1818:48, TWA 379 transmitted, "negative we have not picked up the localizer."

At 1818:48, TWA 379 transmitted, "we need vectors to the runway the aircraft is ah vibrating ah ex ex extremely ah a lot so we need a vectors to the runway now."

At 1819:23, ZKC transmitted, "twa three seventy nine right heading two two zero radar vector to the runway."

At 1819:26, TWA 379 transmitted, "two two zero vectors to the runway twa three seventy nine."

At 1819:30, ZKC transmitted, "twa's three seventy nine the ah field twelve o'clock and eight miles."

At 1819:38, ZKC transmitted, "twa three seventy nine maintain two thousand five hundred."

At 1819:40, TWA 379 transmitted, "alright well well we can't do two thousand five hundred we're descending at this time we're at one point eight for twa three seventy nine."

At 1820:02, ZKC transmitted, "twa three seventy nine right heading two four zero."

At 1820:07, TWA 379 transmitted, "distance from the field."

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Narrative (Continued)

At 1820:08, ZKC transmitted, "twa's three seventy nine they say now whiteman says two two five heading the fields twelve o'clock seven miles."

At 1820:13, TWA 379 transmitted, "two two five heading and twelve o'clock seven miles were looking for the field twa three seventy nine."

At 1820:18, ZKC transmitted, "and twa three seventy nine whiteman tower says they've got you in sight."

At 1820:23, TWA 379 transmitted, "ok we're still looking for the field."

At 1820:25, ZKC transmitted, "twa three seventy nine understand the field in sight."

At 1820:29, TWA 379 transmitted, "and the frequency for the tower twa three seventy nine we do not have the field in sight at this time."

At 1820:35, ZKC transmitted, "twa three seventy nine tower's one three two point four do you have the field in sight."

At 1820:39, TWA 379 transmitted, "negative we do not have the field in sight."

At 1820:44, TWA 379 transmitted, "is the field at twelve o'clock for twa three seventy nine."

At 1820:49, ZKC transmitted, "twelve o'clock and five miles."

At 1820:50, TWA 379, "alright we have the field in sight twa three seventy nine." ZKC then issues a visual approach to any runway at SZL and radar service was then terminated.

The captain performed an overweight landing, applied right side thrust reversers, and used "light braking" to slow and stop the aircraft. Once stopped, the captain applied brakes and initiated an evacuation from the right side of the airplane using the evacuation checklist. The captain, first officer, and flight attendants cleared all passengers from the aircraft and gathered them at a safe distance from the airplane.

At 1824:07, SZL approach control notified ZKC that the airplane landed safely.

PERSONNEL INFORMATION

The captain, age 39, held an airline transport pilot certificate with multiengine land, single engine land, and single engine sea ratings along with an instrument airplane rating. He held DC-9 and B767 type ratings. His first class medical certificate was issued on March 15, 2001, with no limitations or waivers. He accumulated a total flight time of 11,068 hours, of which 2,306 hours were in the MD-83.

The first officer, age 30, held an airline transport pilot certificate with multiengine land, single engine land, and single engine sea ratings along with an instrument airplane rating. His first class medical certificate was issued on June 14, 2001, with no waivers or limitations. The first officer accumulated a total flight time of 8,305 hours, of which 527 hours were in the MD-83.

AIRCRAFT INFORMATION

The McDonnell Douglas MD-83 airplane, serial number 53188, was certified as a transport category airplane with a maximum gross weight of 160,000 pounds. The airplane seats 3 flight crew members, 5 flight attendants, and 131 passengers. The maximum certificated landing weight for the MD-83 was

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139,500 pounds. The takeoff and landing distance card in the cockpit was open to the "148,000" pound overweight landing page.

The airplane was powered by two Pratt and Whitney JT8D-217C engines with a normal takeoff thrust rating of 20,000 pounds and a maximum takeoff thrust rating of 20,850 pounds. Both engines were flat-rated to 84 degrees Fahrenheit (The flat-rated temperature indicates that the engine will be capable of attaining the rated thrust level up to the specified inlet temperature). The engines were dual-spool, medium-bypass, axial-flow, fully-ducted turbofans that feature a single-stage fan, six-stage low pressure compressor, seven-stage high pressure compressor, nine-chamber can-annular combustor, single-stage high pressure turbine, three-stage low pressure turbine, and a mixer.

The left engine, serial number 717820, accumulated a total time since new (TTSN) of 36,593 hours and 18,358 cycles since new (CSN). It was installed on December 6, 1999, TTSN of 31,771 hours and 15,699 CSN. The engine operated for 4,824 hours and 2,659 cycles since its last maintenance.

METEOROLOGICAL CONDITIONS

Kansas City International Airport (MCI) automated surface observing system (ASOS) recorded, at 1823, the following: wind from 080 degrees at 10 knots; surface visibility 10 statue miles (sm); a scattered layer of clouds at 1,300 feet above ground level (agl) and an overcast layer of clouds at 4,100 feet agl; temperature 21 degrees Celsius (C); dew point 18 degrees C; altimeter setting 30.04 inches of Mercury (Hg).

The SZL ASOS recoded, at 1755, the following: wind from 050 degrees at 7 knots; surface visibility 7 sm; a broken layer of clouds at 1,400 feet agl and an overcast layer of clouds at 4,500 feet agl; temperature 22 degrees C; dew point 17 degrees C; altimeter setting of 30.02 inches of Hg.

AIRPORT INFORMATION

MCI is served by three runways and has an elevation of 1,026 feet msl. Runway 01L/19R is a 10,801 foot by 150 foot grooved concrete runway. Runway 01R/19L is a 9,500 foot by 150 foot grooved concrete runway. Runway 09/27 is a 9,500 foot by 150 foot grooved asphalt runway. All the runways are equipped with an instrument landing system (ILS).

SZL is served by one runway and has a field elevation of 871 feet msl. Runway 01/19 is a 12,400 foot by 200 foot wide concrete runway equipped with an ILS.

FLIGHT RECORDERS

The cockpit voice recorder (CVR) and flight data recorder (FDR) were removed for readout by the National Transportation Safety Board.

WRECKAGE AND IMPACT INFORMATION

The examination of the number one engine revealed the inlet cowl was hanging down at an approximate angle of 30 degrees. The aluminum fan exit case, part number 776319, was separated from the remainder of the engine case in an area forward of flange "E". (According to the MD80 Maintenance Manual, "E" is the fifth flange from the beginning of the inlet case). All but 6 inches of flange "E" remained attached to the fan case.

One fan blade was fractured 1/4 inch above the blade root platform. The fracture of the fan blade was consistent with fatigue.

No damage to the fuselage was noted.

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TEST AND RESEARCH

The TWA MD80 Flight Handbook lists, in part, the non-normal procedures for engine failure as:

1. THROTTLE, CLOSE - CLOSE
2. WHEN ENGINE AT STABILIZED IDLE, FUEL LEVER, OFF - OFF (This shuts off fuel at the engine fuel control and prevents igniter plug firing in all ignition selections except override.)
3. IF SEVERE DAMAGE SUSPECTED, FIRE CONTROL, PULL - PULL (Severe damage includes severe vibration, separation, or fuel leak.)
4. PNEUMATIC CROSSFEED, CLOSE - CLOSE (Close the pneumatic crossfeed for the failed engine; If the fire control handle has been pulled and the crossfeed lever is subsequently moved to open, it will move the fire control in.)
5. ESTABLISH SINGLE ENGINE DRIFTDOWN AIRSPEED, IF REQUIRED (Maintain altitude until airspeed reduces to single engine driftdown airspeed using FMS, PMS or speed cards. Increase remaining engine to maximum continuous thrust for optimum range driftdown. Refer to FMS, PMS or FHB 4.17 for driftdown performance information.)
6. IGNITION, ON - ON (Place ignition selector to A, B, or GND START/CONT to preclude the possibility of a flameout on the operative engine.)
7. ELECTRICAL POWER, CHECK - CHECK
8. ENGINE SYNC, OFF - OFF
9. AIR COND SHUTOFF, OVERRIDE - OVERRIDE
10. PRESSURIZATION CHECK - CHECK
11. HYDRAULIC PANEL, CHECK - CHECK
12. FUEL BALANCE, CHECK - CHECK
13. TRANSPONDER MODE, TA - TA
14. FOR LANDING, USE SINGLE ENGINE APPROACH PROCEDURE.

Postincident examination of the cockpit revealed that the left engine fire control handle was not in its extended position. According to the TWA MD80 Flight Handbook, "...pulling a fire handle closes the respective engine fuel, hydraulic, and pneumatic control relay; and silences aural fire warnings."

The TWA MD80 Flight Handbook lists, in part, the non-normal procedures for interior fire/smoke as:

"Any sign of smoke and/or fumes must be immediately investigated. If the source is not readily apparent proceed to the nearest suitable airport. Accomplish each checklist item until the problem is identified and isolated. If the source cannot be identified or eliminated, land at the nearest suitable airport."

According to a TWA Airlines LLC representative, flight crews are not provided with instrument approach charts for SZL and are given simulator training scenarios in which flight crews are offered diversions to SZL instead of a diversion to MCI.

There were several service bulletins (SBs) applicable to the fan exit case. SB 6102 introduces a newer case made of steel to replace the older aluminum case. SB 6100 installs stops to restrict the axial separation of the case in the event of case fracturing. Both SBs state that there have been 5 instances of full 360 degree fan exit case fracture, all due to fan blade fracture. They further state that when the case fractures, the front of the engine with the cowl shifts forward. The incident engine did not have the SB 6100 stops installed.

Airworthiness directive (AD) 99-10-1, relating to the incident engine, was issued on June 14, 1999, to prevent fan blade failure, which could result in damage to the aircraft. The AD requires an inspection of the fan blades and shrouds, unlock fan blade shrouds, lubricate fan blade shrouds, restore the fan blade's leading edges dimensions, and remove fan blades that had experienced multiple shroud lockups within 225 hours in accordance with Pratt & Whitney alert service bulletin

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A6241. AD 99-10-01 was last accomplished, in part, through a thumbnail inspection of the fan blade leading edge on June 30, 2001, at a TTSN of 36,472 hours.

ADDITIONAL INFORMATION

The FAA, the Airline Pilots Association, Boeing, Pratt & Whitney, and TWA Airlines LLC were parties to the investigation.

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Occurrence Type: Incident

Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
WHITEMAN AFB	SZL	871 Ft. MSL	19	12400	200

Runway Surface Type: Concrete

Runway Surface Condition: Unknown

Type Instrument Approach: Visual

VFR Approach/Landing: Full Stop; Precautionary Landing

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
McDonnell Douglas	MD-83	53188

Airworthiness Certificate(s): Transport

Landing Gear Type: Retractable - Tricycle

Homebuilt Aircraft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	139	160000 LBS	2

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Fan	Pratt & Whitney	JT8D-217C	20000 LBS

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
Continuous Airworthiness		Hours	Hours

- Emergency Locator Transmitter (ELT) Information

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

Owner/Operator Information

Registered Aircraft Owner	Street Address	City	State	Zip Code
Wilmington Trust	1100 N. Market St.	Wilmington	DE	19890

Operator of Aircraft	Street Address	City	State	Zip Code
Trans World Airlines, LLC	11495 Natural Bridge Road	Bridgeton	MO	63044

Operator Does Business As: Trans World Airlines

Operator Designator Code: ZWOA

- 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

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Occurrence Type: Incident

First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	39

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

Certificate(s): Airline Transport

Airplane Rating(s): Multi-engine Land; 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? 05/2001

Medical Cert.: Class 1 | Medical Cert. Status: Valid Medical--no waivers/lim. | Date of Last Medical Exam: 03/2001

- 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	11068	2306								
Pilot In Command(PIC)	2305	963								
Instructor										
Last 90 Days	111	111								
Last 30 Days	58	58								
Last 24 Hours	1	1								

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
Saint Louis	MO	STL	1727	CDT

Destination	State	Airport Identifier
San Jose	CA	SJC

Type of Clearance: IFR

Type of Airspace: Class D

Weather Information

Source of Briefing: Company

Method of Briefing: Unknown

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Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
SZL	1755	CDT	871 Ft. MSL	NM	Deg. Mag.

Sky/Lowest Cloud Condition: Clear Ft. AGL

Condition of Light: Dusk

Lowest Ceiling: Broken 1400 Ft. AGL

Visibility: 7 SM

Altimeter: 30.02 "Hg

Temperature: 22 °C

Dew Point: 17 °C

Wind Direction: 70

Density Altitude: Ft.

Wind Speed: 10

Gusts:

Weather Condtions at Accident Site: Visual Conditions

Visibility (RVR): Ft.

Visibility (RVV) SM

Intensity of Precipitation:

Restrictions to Visibility: None

Type of Precipitation: None

Accident Information

Aircraft Damage: Minor

Aircraft Fire: In-flight

Aircraft Explosion None

Classification: U.S. Registered/U.S. Soil

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot				2	2
Second Pilot					
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants				4	4
Other Crew					
Passengers				132	132
- TOTAL ABOARD -				138	138
Other Ground					
- GRAND TOTAL -				138	138

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Occurrence Type: Incident

Administrative Information

Investigator-In-Charge (IIC)

Mitchell F. Gallo

Additional Persons Participating in This Accident/Incident Investigation:

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