Uncontained engine failure, Boeing 747-251B, January 5, 1996

Micro-summary: **This Boeing 747-251B experienced an uncontained engine failure of the #4 engine during climb.**

Event Date: **1996-01-05 at 1230 PST**

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: LAX96IA087	Aircraft Registration Number: N628US
Occurrence Date: 01/05/1996	Most Critical Injury: None
Occurrence Type: Incident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
LOS ANGELES	CA	90045	1230	PST	

Airport Proximity: Off Airport/Airstrip	Distance From Landing Facility:	Direction From Airport:

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
Boeing	747-251B	Airplane

Sightseeing Flight: No

Air Medical Transport Flight: No

Narrative

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

On January 5, 1996, about 1200 hours Pacific standard time, a Boeing 747-251B, N628US, sustained an uncontained failure of the number 2 engine turbine section during the en route climb phase of flight near Los Angeles, California. The aircraft was operated by Northwest Airlines, Inc., as their flight number 1, a regularly scheduled non-stop international passenger flight from Los Angeles to Narita Airport, Tokyo, Japan. Visual meteorological conditions prevailed at the time and an IFR flight plan was filed for the flight. The aircraft sustained minor damage to the numbers 1 and 2 engine cowls, and the fan stage of the number 1 engine. None of the 366 passengers and 19 crew onboard were injured. The flight originated from Los Angeles International Airport about 1145 on the morning of the accident.

The captain reported that while climbing through 11,500 feet msl the airplane began to shake and the low rotor (N1) rpm on the number 2 engine surged to 90 percent, then dropped to 40 percent, as the exhaust gas temperature rose to the redline limit. The glareshield red fire warning light illuminated and the fire bell sounded; however, the red light in the number 2 fire handle did not illuminate. The second officer noticed that the number 2 engine nacelle temperature indication also reached its upper limit. The engine was secured in accordance with the "Engine fire, Severe Damage, or Separation Checklist" and the fire bottle was discharged. Following engine shutdown, the number 2 nacelle temperature decreased. The crew dumped 147,000 pounds of fuel and returned to Los Angeles, where an uneventful landing was made at 1300. The crew did not declare an emergency and no attempt was made to restart the number 2 engine.

Postaccident inspection of the aircraft revealed a 2-foot hole in the number 2 engine cowl turbine area at the 9 o'clock position. No evidence of fire outside the engine case was observed. Minor dents were noted on the number 1 engine cowl, pylon, and the underside of the left wing. Several fan blades from the number 1 engine were found with nicks and leading edge damage.

The engine was removed from the aircraft and shipped to Northwest's engine overhaul facility where a disassembly and inspection was conducted on January 16 under the supervision of a Safety Board Powerplant specialist. The complete Powerplant Group Chairman's report is appended to this document.

Disassembly of the engine revealed that the oil pressure line to the number 4 bearing had fractured, with evidence of oil spray and fire signatures on the 6th stage low pressure turbine disk. Measurements of the 6th stage disk revealed disk growth about 1.06 inches over blueprint maximum. No 6th stage blades, including roots, were found in the disk.

The fractured oil pressure tube was removed from the engine and submitted to the Safety Board's Materials Laboratory for metallurgical analysis. The complete metallurgical report is appended to this document. According to the report, fatigue striations were found indicative of multiple fatigue crack planes from multiple origins along the inside diameter of the tube, with propagation

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Narrative (Continued)

mainly through the thickness of the tube wall. Spiral scratches and crazed cracking were found on the tube's inside wall. The fatigue fracture planes observed followed the scratches and crazed cracking lines in the central fatigue initiation region.

Northwest Airlines and Pratt & Whitney maintenance/overhaul documents relating to the overhaul and cleaning of the number 4 bearing internal pressure tube assembly were examined. Cautionary notes state that wire brushes or reamers are not to be used for internal cleaning of the tubes. The referenced documents are appended to this report and list the approved cleaning methods.

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: LAX96IA087

Occurrence Date: 01/05/1996

Occurrence Type: Incident

Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation Ft. MSL	Runway Used	Runway Length	Runway Width
			0		

Runway Surface Type:

Runway Surface Condition:

Type Instrument Approach:

VFR Approach/Landing: None

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
Boeing	747-251B	22389

Airworthiness Certificate(s): Transport

Landing Gear Type: Retractable - Tricycle

Homebuilt Aircraft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	373	833000 LBS	4

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Fan	P&W	JT9D-7Q	53000 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		

Owner/Operator Information

Registered Aircraft Owner	Street Address		
NORTHWEST AIRLINES, INC.	5101 NORTHWEST DRIVE		
	City: ST PAUL	State: MN	Zip Code: 55111

Operator of Aircraft	Street Address		
Same as Reg'd Aircraft Owner	Same as Reg'd Aircraft Owner		
	City	State	Zip Code

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; International; Passenger Only

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: LAX96IA087

Occurrence Date: 01/05/1996

Occurrence Type: Incident

First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	59

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--w/ waivers/lim. | Date of Last Medical Exam: 11/1995

- 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	12000									
Pilot In Command(PIC)										
Instructor										
Last 90 Days										
Last 30 Days										
Last 24 Hours										

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
Same as Accident/Incident Location		LAX	1145	PST

Destination	State	Airport Identifier
TOKYO	OF	RJAA

Type of Clearance: IFR

Type of Airspace: Class A

Weather Information

Source of Briefing: Company

Method of Briefing:

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: LAX96IA087

Occurrence Date: 01/05/1996

Occurrence Type: Incident

Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
	0000		0 Ft. MSL	0 NM	0 Deg. Mag.

Sky/Lowest Cloud Condition: Clear 0 Ft. AGL

Condition of Light: Day

Lowest Ceiling: None 0 Ft. AGL

Visibility: 100 SM

Altimeter: "Hg

Temperature: °C

Dew Point: °C

Wind Direction:

Density Altitude: Ft.

Wind Speed:

Gusts:

Weather Condtions at Accident Site: Visual Conditions

Visibility (RVR): 0 Ft.

Visibility (RVV) 0 SM

Intensity of Precipitation: Unknown

Restrictions to Visibility: None

Type of Precipitation: None

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				2	2
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer				2	2
Cabin Attendants				14	14
Other Crew					
Passengers				366	366
- TOTAL ABOARD -				385	385
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	385	385

National Transportation Safety Board

FACTUAL REPORT
AVIATION

NTSB ID: LAX96IA087

Occurrence Date: 01/05/1996

Occurrence Type: Incident

Administrative Information

Investigator-In-Charge (IIC)

JEFF RICH

Additional Persons Participating in This Accident/Incident Investigation:

DON SKUNBERG
FAA WP-FSDO-LAX
LOS ANGELES, CA 90048