
Rapid decompression, Lockheed L-1011, August 23, 1995

Micro-summary: This Lockheed L-1011-385-1 experienced a rapid decompression at altitude.

Event Date: 1995-08-23 at 2013 PDT

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

Investigative Body's Web Site: <http://www.nts.gov/>

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		NTSB ID: LAX95FA303		Aircraft Registration Number: N781DL	
		Occurrence Date: 08/23/1995		Most Critical Injury: None	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place PACIFIC OCEAN		State PO	Zip Code	Local Time 2013	Time Zone PDT
Airport Proximity: Off Airport/Airstrip		Distance From Landing Facility:		Direction From Airport:	
Aircraft Information Summary					
Aircraft Manufacturer LOCKHEED		Model/Series L-1011-385-1		Type of Aircraft Airplane	
Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:					
<p>HISTORY OF FLIGHT</p> <p>On August 23, 1995, at 2013 hours Pacific daylight time, a Lockheed L-1011-385-1, N781DL, operated by Delta Airlines as Flight 157, sustained substantial damage followed by a rapid decompression over the Pacific Ocean while in cruise flight at 33,000 feet mean sea level (msl). The flight crew reported hearing a loud bang immediately prior to the decompression event. The pilot initiated an emergency descent to 14,000 feet msl, and returned to Los Angeles, California, for an uneventful landing at 2217 hours.</p> <p>The crew reported that they were unable to regain control of the pressurization; however, the cabin was eventually stabilized at 7,000 feet when the aircraft leveled off at 14,000 feet msl. Other than reports of ear discomfort, there were no injuries to the 226 passengers and crew of 10. Three passengers were taken to a local hospital for a brief check then released. Flight number 157, a regularly scheduled domestic flight, departed Los Angeles International Airport at 1810 en route to Honolulu, Hawaii. The flight was approximately 450 miles west of Los Angeles at the time of the depressurization.</p> <p>AIRCRAFT INFORMATION</p> <p>Postaccident examination of the aircraft revealed that around fuselage station 1800, 20 stringer end fittings were severed, allowing the aft pressure bulkhead to separate from the fuselage crown. The separation was over a length of about 12 feet of the pressure bulkhead circumference. Also, at fuselage station 1809, the "Z" frame was found bent and torn. No external fuselage damage was found. The crack extended from stringer 10 through 0 (top center) to stringer 55.</p> <p>According to information provided by Lockheed, seven of the stringer end fittings had failed on the L-1011 fatigue test aircraft. This led to the issuance of service bulletin 093-53-105, which recommended the inspection/replacement of the stringer end fittings on serial numbers 193A-1002 through 1012. The accident aircraft is the third production aircraft, serial number 1003. A review of the Lockheed records revealed that no operators have complied with SB 093-53-105 as of this date.</p> <p>Although the redesigned fittings were installed on serial number 1013 and up, Lockheed has received several reports of the redesigned fittings cracking on aircraft with serial numbers later than 1012.</p> <p>The area of the failure is not covered on an inspection work card during routine inspections; however, the exterior of the aircraft is inspected. On July 23, 1995, a "C" check inspection had been performed on the accident aircraft. At that time, the aircraft had accumulated 51,951 hours and 25,691 cycles. At the time of the accident, the aircraft had 52,210 hours and 25,813 cycles.</p>					
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National Transportation Safety Board

FACTUAL REPORT

AVIATION

NTSB ID: LAX95FA303

Occurrence Date: 08/23/1995

Occurrence Type: Accident

Narrative (Continued)

As a result of this accident, on August 29, 1995, the FAA issued a telegraphic airworthiness directive (T95-18-52 amended with AD95-18-52 on September 28, 1995, and superseded by AD95-26-11) was issued to all operators of Lockheed model L-1011-385 series airplanes certificated in any category. The AD mandated the compliance/inspection called out in the text within a certain time frame. On August 24, 1995, Lockheed Aeronautical Systems Support Company notified all foreign operators of the rapid decompression during flight and referenced S/B 093-53-105.

According to Lockheed, there are about 250 L-1011's in service. As of February 24, 1996, as a result of Lockheed's notification to operators, there have been 29 reports of aircraft having various cracks to the end fittings and 97 reports of no cracks. The cycles of these aircraft ranged from a high of 33,375 to a low of 21,657.

METALLURGICAL ANALYSIS

According to the report, during the manufacturing process, stringer end fittings were predrilled. During the assembly process not all of the predrilled holes aligned. The unused holes were then plugged/filled by the original manufacturer. Plugged holes oriented in the direction of maximum tension stress near the aft most fastener hole resulted in increased stress levels at crack initiation sites.

Short fastener edge distance on some of the stringer end fittings contributed to increased stress levels at crack initiation sites. (Ref.: FAA AC 43.13-1A, paragraph 99, figure 2.18.)

Fitting eccentricity also contributed to high stress levels at crack initiation sites. For more detailed information, refer to the attached Structure Technology Group Engineering Report (February 5, 1996).

ADDITIONAL INFORMATION

Due to the cost of repairs, Delta Airlines subsequently retired the aircraft. The aircraft was purchased by Lockheed Aircraft for aging aircraft testing. On October 11, 1995, the aircraft was ferried to Dobbins AFB, Marietta, Georgia. Prior to releasing the aircraft to Lockheed, Delta Airlines personnel removed the failed aft pressure dome components for metallurgical analysis.

 National Transportation Safety Board FACTUAL REPORT AVIATION		NTSB ID: LAX95FA303			
		Occurrence Date: 08/23/1995			
		Occurrence Type: Accident			
Landing Facility/Approach Information					
Airport Name	Airport ID:	Airport Elevation Ft. MSL	Runway Used 0	Runway Length	Runway Width
Runway Surface Type:					
Runway Surface Condition:					
Type Instrument Approach: NONE					
VFR Approach/Landing: None					
Aircraft Information					
Aircraft Manufacturer LOCKHEED		Model/Series L-1011-385-1		Serial Number 1003	
Airworthiness Certificate(s): Normal					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 236	Certified Max Gross Wt.	465000 LBS	Number of Engines: 3	
Engine Type: Turbo Fan	Engine Manufacturer: Rolls-Royce	Model/Series: RB211-22B02	Rated Power: 42000 LBS		
- Aircraft Inspection Information					
Type of Last Inspection Continuous Airworthiness	Date of Last Inspection 06/1995	Time Since Last Inspection 259 Hours	Airframe Total Time 52210 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?			
Owner/Operator Information					
Registered Aircraft Owner DELTA AIR LINES, INC.		Street Address 1030 DELTA BLVD.			
		City ATLANTA	State GA	Zip Code 30320	
Operator of Aircraft Same as Reg'd Aircraft Owner		Street Address Same as Reg'd Aircraft Owner			
		City	State	Zip Code	
Operator Does Business As:			Operator Designator Code: DALA		
- 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					

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>	NTSB ID: LAX95FA303
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	Occurrence Type: Accident

First Pilot Information

Name On File	City On File	State On File	Date of Birth On File	Age 55
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Sex: M	Seat Occupied: Left	Principal Profession: Civilian Pilot	Certificate Number: On File
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Certificate(s): Airline Transport

Airplane Rating(s): Multi-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?
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Medical Cert.: Class 1	Medical Cert. Status: Valid Medical--w/ waivers/lim.	Date of Last Medical Exam: 03/1995
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- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Multi-Engine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time	22330	2000								
Pilot In Command(PIC)		2000								
Instructor										
Last 90 Days		340								
Last 30 Days		110								
Last 24 Hours		5								

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed? No	Second Pilot? Yes
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Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point LOS ANGELES	State CA	Airport Identifier LAX	Departure Time 1830	Time Zone PDT
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Destination HONOLULU	State HI	Airport Identifier HNL	
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Type of Clearance: IFR

Type of Airspace: Class B

Weather Information

Source of Briefing: Company

Method of Briefing:

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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: Dusk

Lowest Ceiling: None 0 Ft. AGL Visibility: 0 SM Altimeter: "Hg

Temperature: °C Dew Point: °C Wind Direction: Density Altitude: Ft.

Wind Speed: Gusts: Weather Conditions at Accident Site: Visual Conditions

Visibility (RVR): 0 Ft. Visibility (RVV) 0 SM Intensity of Precipitation: Unknown

Restrictions to Visibility:

Type of Precipitation:

Accident Information

Aircraft Damage: Substantial 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				1	1
Cabin Attendants				7	7
Other Crew					
Passengers				226	226
- TOTAL ABOARD -				236	236
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	236	236

National Transportation Safety Board

FACTUAL REPORT

AVIATION



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Occurrence Date: 08/23/1995

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

GEORGE E. PETTERSON

Additional Persons Participating in This Accident/Incident Investigation:

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