

Aviation Investigation Final Report

Location:	Van Nuys, California	Accident Number:	LAX06FA238
Date & Time:	July 15, 2006, 16:30 Local	Registration:	N554CL
Aircraft:	Learjet 55	Aircraft Damage:	Substantial
Defining Event:		Injuries:	5 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

The airplane was about 500-600 feet above ground level (agl) on approach to landing when the emergency pressurization and right bleed air annunciator lights illuminated simultaneously. There was no change in the cabin pressurization, and the crew decided to continue and land. About 100-200 feet agl, the left bleed air light illuminated and the cabin pressure went to emergency. The crew switched the cabin air off. They landed, taxied quickly to their parking area, and turned the left and right bleed air switches off prior to engine shutdown. The flight line crew notified the flight crew that smoke was coming out of the ram air vent in the dorsal fin area. The pilot indicated that no smoke or smells entered the cabin or cockpit. He also pointed out that the air conditioner was blowing hot air and its operation appeared to be intermittent; the passengers had complained about the high temperature in the cabin. External visual examination revealed heat discoloration and wavy skin on the aft fuselage skin starting at station 512.39, frame 39, which extended aft to station 544.39, frame 41. Internal examination of the empennage in the tail cone access door revealed that frames 39, 39a, and 41 were scorched and sooty. In the aft E & E compartment in the tail cone, investigators observed fire damage to the windshield heat shutoff valve, left and right mixing valve control boxes and associated wiring, landing light/taxi light/auxiliary hydraulic pump relay box, upper side of the flow control valve, and the windshield heat shutoff valve and wiring. There was evidence of leakage and blow-by on the outflow flange of the windshield heat modulating valve; however, the observed damage was not as severe as would be expected if bleed air was the initiator of the fire. The evidence was inclusive for an electrical origin for the fire.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: An in-flight fire of undetermined origins.

Findings

Occurrence #1: FIRE Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

Findings
1. (C) REASON FOR OCCURRENCE UNDETERMINED

Factual Information

HISTORY OF FLIGHT

On July 15, 2006, about 1630 Pacific daylight time, a Lear 55, N554CL, had an in-flight fire on approach to Van Nuys, California. Clay Lacy Aviation was operating the airplane under the provisions of 14 Code of Federal Regulations (CFR) Part 135. The airline transport pilot licensed captain, first officer, and three passengers were not injured; the airplane sustained substantial damage. The cross-country flight departed Las Vegas, Nevada, about 1546, with a planned destination of Van Nuys. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan had been filed.

The pilot stated that the airplane was on approach to landing. About 500-600 feet above ground level (agl), the emergency pressurization and right bleed air annunciator lights illuminated simultaneously. There was no change in the cabin pressurization, and the crew decided to continue and land. About 100-200 feet agl, the left bleed air light illuminated, and pressure went to emergency. The crew switched the cabin air off. They landed, taxied quickly to their parking area, and turned the left and right bleed air switches off prior to engine shutdown.

The flight line crew notified the flight crew that smoke was coming out of the ram air vent in the dorsal fin area. Both the flight and ground crew expedited off-loading of the passengers, and stood by with fire extinguishers. The smoke subsided. The pilot indicated that no smoke or smells entered the cabin or cockpit. He also pointed out that the air conditioner was blowing hot air and operation appeared to be intermittent; the passengers had complained about the high temperature in the cabin.

PERSONNEL INFORMATION

Pilot

The operator reported that the pilot held an airline transport pilot certificate with ratings for airplane multiengine land. He held a commercial pilot certificate with ratings for single-engine land, glider, and instrument airplane. The pilot held a certified flight instructor (CFI) certificate with ratings for airplane single-engine land, multiengine land, glider, and instrument airplane.

The pilot had a first-class medical certificate issued on March 28, 2006. No limitations or waivers were listed.

The operator reported that the pilot had a total flight time of 3,798 hours with 395 hours in this make and model. The pilot logged 200 hours in the last 90 days, and 71 hours in the last 30

days. A biennial flight review was completed on April 16, 2006.

Copilot

The operator reported that the copilot held an airline transport pilot certificate with ratings for airplane multiengine land. The copilot held a commercial pilot certificate with ratings for single-engine land and instrument airplane.

The copilot held a first-class medical certificate issued on January 23, 2006. No limitations or waivers were listed.

The operator reported that the copilot had a total flight time of 3,000 hours with 150 hours in this make and model. The copilot logged 170 hours in the last 90 days, and 71 hours in the last 30 days. A biennial flight review was completed on October 24, 2006.

AIRCRAFT INFORMATION

The airplane was a Learjet 55, serial number 040. The operator reported that the airplane had a total airframe time of 10,343 hours at the time of the accident. The airplane was on a continuous airworthiness maintenance plan, and the last conditional inspection occurred on July 14, 2006.

The left engine was a Garrett TFE-731-2-2C, serial number P85184C. Total time recorded on the engine was 10,043 hours, and time since major overhaul was 3,468 hours.

The right engine was Garrett TFE-731-2-2C, serial number P85191. Total time recorded on the engine was 9,890 hours, and time since major overhaul was 2,458 hours.

COCKPIT VOICE RECORDER (CVR)

A Safety Board specialist prepared a summary report of information from the CVR. The report indicated that the copilot advised the captain about 25 minutes before landing that the cabin temperature gauge was pegged. Two minutes before landing, the copilot extended the landing gear, read the before landing checklist, and changed the air conditioner to fan. Shortly thereafter, the copilot made a comment about emergency pressurization; the pilot suggested that they make no changes right then. About 40 seconds before landing, the copilot made a comment about the bleed air, and the pilot commanded that cabin air be turned off.

Sixteen seconds after touchdown, the copilot suggested that they recycle a switch, but the pilot said not to. One minute and 50 seconds after touchdown, the pilot called for turning the air conditioning off. Fifteen seconds later, the crew shut the engines off. Ten seconds later, the pilot indicated that there was smoke in the cabin, and ordered the passengers to evacuate the airplane.

TESTS AND RESEARCH

The Safety Board investigator-in-charge (IIC) supervised examination of the airplane at Van Nuys, California, on July 19-20, 2006.

Visual Examination on Site

Examination of the cockpit revealed popped circuit breakers for the ECS (environmental control system) on the pilot's (left) side and the ECS on the copilot's (right) side, windshield heat, alcohol system, and right bleed air.

Investigators observed fire damage to the windshield heat shutoff valve, left and right mixing valve control boxes and associated wiring, landing light/taxi light/auxiliary hydraulic pump relay box, upper side of the flow control valve, and the windshield heat shutoff valve and wiring.

The steel braided low pressure air conditioning line burned from the compressor outlet to the aft cabin evaporator except for a 2-foot section in the middle of the line. This portion of the hose was the only section that did not have rubber hose wrapped around it.

Tests on Site

Maintenance personnel used a ground pressurization unit to apply 10 pounds per square inch (psi) air to the ground service port.

A slight air discharge from exhaust port was felt on the flow control valve. A larger air leak was detected from the cockpit air duct temperature sensor, which the Lear representative noted should not leak at all. Ten psi air pressure was applied, and no airflow was detected at the windshield heat duct outlets. Twenty-eight volt power was applied to the windshield heat shutoff valve, which opened the valve, and airflow was detected at the windshield heat duct outlets.

External visual examination revealed heat discoloration and wavy skin on the aft fuselage skin starting at station 512.39, frame 39, which extended aft to station 544.39, frame 41. Internal examination of the empennage in the tail cone access door revealed that frames 39, 39a, and 41 were scorched and sooty.

Windshield Flow Control Valve

The IIC supervised examination of the windshield flow control valve, Whitaker, part number 320335-3, serial number 507. It passed all parameters on a test bench with no anomalies noted.

The IIC supervised examination of the windshield anti-ice shutoff valve, Vickers, manufactured

second quarter 1992 (2Q92), part number 6600201-1, serial number 2135. It passed all parameters on a test bench with no anomalies noted.

Windshield Anti-ice Modulating Valve

The windshield heat modulating valve, part number 32-2867-003, serial number 05860077, was functionally tested at three separate facilities under supervision of either the IIC or FAA personnel. With the actuator correctly grounded, actuator operation was normal. No pre-existing condition, either mechanically or electrically, was identified with the heat modulating valve that would have interfered with normal operation.

August 28, 2008 Testing

A visual examination revealed soot on the external surfaces of the main valve body housing. As received, the valve was not fully closed. There was evidence of blow-by on the outflow flange of the valve.

With 80 psig pressure supplied to the inlet of the air valve, there was leakage between the actuator motor and the main valve housing, and between the inlet flange housing and the main valve housing. The internal leakage was 0.1234 lb/min, which exceeded the 0.05 lb/min test limit. With the valve direction reversed, internal leakage exceeded the 0.05 lb/min test limit (The actual value of the leakage in the reversed configuration was not recorded).

After test personnel functionally tested the air valve, they performed a limited teardown of the air valve. The actuator motor was first separated from the main valve housing, and the actuator motor cover was removed from the assembly. There was a witness mark on the heat shrink covering the actuator wires, and on the corresponding inner surface of the actuator motor cover.

Once the actuator motor was disassembled from the main valve housing, the butterfly valve assembly was free to rotate. Two of four bolts attaching the inlet housing to the main valve housing were loose. The packing between the inlet flange housing and the main valve housing was dry, pitted, and had flat spots.

Lear Evaluation

Lear engineers felt that more damage would be expected at the valve if bleed air had been the initiator. With the substantial damage to the wiring harnesses around and near the valve in question, they felt that it was equally plausible that the fire initiator could have been electrical in origin.

Pilot Information

Certificate:	Airline transport; Commercial	Age:	33,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Glider; Instrument airplane	Toxicology Performed:	No
Medical Certification:	Class 1 Without waivers/limitations	Last FAA Medical Exam:	March 1, 2006
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	April 1, 2006
Flight Time:	3798 hours (Total, all aircraft), 395 hours (Total, this make and model), 2785 hours (Pilot In Command, all aircraft), 200 hours (Last 90 days, all aircraft), 71 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Commercial	Age:	33,Female
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 Without waivers/limitations	Last FAA Medical Exam:	January 1, 2006
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	3000 hours (Total, all aircraft), 150 hours (Total, this make and model), 1900 hours (Pilot In Command, all aircraft), 170 hours (Last 90 days, all aircraft), 71 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Learjet	Registration:	N554CL
Model/Series:	55	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	040
Landing Gear Type:	Retractable - Tricycle	Seats:	9
Date/Type of Last Inspection:	July 1, 2006 Condition	Certified Max Gross Wt.:	21500 lbs
Time Since Last Inspection:		Engines:	2 Turbo fan
Airframe Total Time:	10343 Hrs at time of accident	Engine Manufacturer:	Garrett
ELT:	Installed, not activated	Engine Model/Series:	TFE731-2-2C
Registered Owner:	IMP, Inc.	Rated Power:	3700 Lbs thrust
Operator:	Clay Lacy Aviation	Operating Certificate(s) Held:	On-demand air taxi (135)
Operator Does Business As:		Operator Designator Code:	BKEM

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	VNY	Distance from Accident Site:	
Observation Time:	16:51 Local	Direction from Accident Site:	
Lowest Cloud Condition:	Few / 8000 ft AGL	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	10 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	290°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.84 inches Hg	Temperature/Dew Point:	38°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitat	tion	
Departure Point:	Las Vegas, NV (LAS)	Type of Flight Plan Filed:	IFR
Destination:	Van Nuys, CA (VNY)	Type of Clearance:	IFR
Departure Time:	15:45 Local	Type of Airspace:	

Airport Information

Airport:	Van Nuys Airport VNY	Runway Surface Type:	Asphalt
Airport Elevation:	802 ft msl	Runway Surface Condition:	Dry
Runway Used:	16R	IFR Approach:	Visual
Runway Length/Width:	8001 ft / 150 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	3 None	Aircraft Fire:	Both in-flight and on-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	5 None	Latitude, Longitude:	34.20972,-118.489997(est)

Administrative Information

Investigator In Charge (IIC):	Plagens, Howard
Additional Participating Persons:	Bruce Borden; Federal Aviation Administration FSDO; Van Nuys, CA John Ferdon; Clay Lacy Aviation; Van Nuys, CA Marlin Kruse; Honeywell; Phoenix, AZ Rex Williams; Bombardier Learjet; Wichita, KS
Original Publish Date:	June 22, 2009
Last Revision Date:	
Investigation Class:	<u>Class</u>
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=64150

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available <u>here</u>.