Aviation Investigation Final Report

Location:	EMIGRANT GAP, California	**Accident Number:**	LAX99LA287
Date & Time:	August 28, 1999, 13:10 Local	**Registration:**	N4201S
Aircraft:	Mooney M20J	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was at cruise altitude of 9,500 feet when he heard a loud metallic bang. The airframe began to shake violently and the engine started running rough immediately following the noise. The pilot turned toward a nearby airport and the engine suddenly quit. The pilot was able to glide to the airport and touched down on the 3,300-foot-long runway; however, he had carried extra speed on the approach to allow a maneuvering margin to miss a large ravine off the runway's approach end. The airplane ran off the end of the runway and subsequently struck scrub bush. Postaccident examination of the engine revealed that the number three cylinder had separated in half between the Nos. 9 and 10 cooling fins. Metallurgical examination disclosed that the fracture was due to a fatigue crack, which had emanated from a notch and groove on the outer radius of one cooling fin. The notch and groove were painted the same color as the engine. The engine was overhauled 16 hours prior to the accident with 3 new cylinders installed, including the failed one.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The fatigue failure and separation of the number three cylinder due to the cylinder overhaul facility's improper inspection and quality control processes.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: CRUISE

Findings
1. (C) ENGINE ASSEMBLY,CYLINDER - FATIGUE
2. (C) MAINTENANCE,OVERHAUL,MAJOR - IMPROPER - OTHER MAINTENANCE PERSONNEL
3. (C) INADEQUATE QUALITY CONTROL - OTHER MAINTENANCE PERSONNEL
4. (C) ENGINE ASSEMBLY,CYLINDER - SEPARATION

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Occurrence #3: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: LANDING - ROLL

Findings
5. OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On August 28, 1999, at 1310 hours Pacific daylight time, a Mooney M20J, N4201S, sustained a complete loss of power during cruise near Blue Canyon Airport, Emigrant Gap, California. During a subsequent forced landing at the airport, the airplane ran off the end of the runway and collided with scrub brush. The airplane, owned and operated by Resort Automation, Inc., sustained substantial damage. The private pilot, who is also the president of the company, and his passenger, received minor injuries. The airplane was on a personal flight, operating under the provisions of 14 CFR Part 91, en route to the Truckee, California, airport. Visual meteorological conditions prevailed. The pilot was receiving VFR flight following during the flight, and had departed from the Palmdale, California, airport at 1110.

The pilot stated that after departure the engine performed "flawlessly," with oil temperature, oil pressure, cylinder temperature, and fuel pressure all solidly in the green arc.

About 1305, the pilot heard a "loud, metallic bang." He said that this happened 6 miles east-southeast of the Blue Canyon Airport while they were at cruise flight at 9,500 feet. He said that immediately the airframe started shaking violently and the engine was running very rough. His attempts to remedy the rough running engine were unsuccessful, he turned toward the Blue Canyon Airport, and then the engine suddenly quit.

The pilot stated that as he declared an emergency with Oakland Center, he heard a second loud bang, approximately 30 seconds after the first one. He decided to turn off the master switch and ignition to minimize the possibility of a fire from the engine problem. He had sufficient altitude to make the airport and complete a power off approach to runway 15. There is a rather large ravine off the approach end of runway 15, so he deliberately carried some extra speed on the approach to allow for last minute maneuvering to miss the ravine. The airplane ran off the end of the 3,300-foot-long runway following the landing and collided with scrub brush.

ENGINE EXAMINATION

A Safety Board investigator examined the engine with technical assistance provided by Federal Aviation Administration (FAA) inspectors and the engine manufacturer, Textron Lycoming, on September 15, 1999. The inspection revealed that the No. 3 cylinder had separated in half between the Nos. 9 and 10 cooling fins of an 18-fin barrel cylinder. No internal damage was noted on the upper or lower parts of the separated cylinder. There did not appear to be any damage inside the engine case. There was a small amount of oil on the bottom of the oil dipstick, and a small amount of metal in the finger screen of the engine.

COMPONENT EXAMINATION

The cylinder pieces were sent to the Safety Board Materials Laboratory for examination. Fracture surfaces on the inboard and outboard portions of the cylinder barrel were examined. According to the metallurgist, one region of the fracture face on the outboard cylinder half was on a plane approximately 90 degrees relative to the barrel internal surface, and exhibited features characteristic of fatigue.

A crack extended completely through the 10th fin. The crack intersected the tip of a notch in the outer radius of the fin, and the plane of the crack extended approximately 1/3 of the way through the thickness of the barrel wall. According to the report, features of the fracture surface indicate that the fatigue cracking through the main portion of the barrel originated from where the crack in the fin intersected the barrel wall. The notch was 0.09 inches wide at the outer radius of the fin and extended 0.05 inches into the fin. The notch was associated with a groove that extended 0.02 inches into the fin. Both the notch and fin were painted the same color as the rest of the engine.

A portion of the cylinder barrel in the notch region was sectioned from the remainder of the barrel, including the 10th, 11th, and 12th fins. A cut was then made from the outboard side of the section to a point approximately half way between the 10th and 11th fins. The crack in the 10th fin was then separated and examined by optical microscopy and scanning electron microscopy (SEM). The fracture surface has a smooth, curving boundary, which is typical of fatigue. The crack arrest lines and the boundary indicate that the crack propagated from the fin into the wall.

MAINTENANCE RECORDS

A review of the airplane maintenance records revealed that on June 25, 1999, the airplane underwent an annual inspection at a total aircraft time in service of 4,869.0 hours.

On August 18, 1999, with a total time of 4,872.5 hours, the engine was disassembled and overhauled under work order number 51333 at Gill's Engines in Reno, Nevada. Three new cylinders were installed in the engine. The cylinders were purchased at Engine Components, Inc., (ECI), under invoice number 01125699. The cylinder that separated was stamped number 72665-03 near the intake. Additionally, the bottom of the cylinder had the following numbers etched on the surface: 99EC7274578 and 91CP82594.01.

The wreckage was released to the insurance company, representing the registered owner, on March 10, 2000 at the conclusion of the Materials Laboratory examination.

Pilot Information

Certificate:	Private	**Age:**	51,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	July 5, 1998
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	466 hours (Total, all aircraft), 264 hours (Total, this make and model), 399 hours (Pilot In Command, all aircraft), 20 hours (Last 90 days, all aircraft), 16 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Mooney	**Registration:**	N4201S
Model/Series:	M20J M20J	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	24-0573
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	June 25, 1999 Annual	**Certified Max Gross Wt.:**	2740 lbs
Time Since Last Inspection:	20 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4889 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-360-A3B6D
Registered Owner:	RESORT AUTOMATION, INC.	**Rated Power:**	200 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	BLU ,5284 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	12:52 Local	**Direction from Accident Site:**	330°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	240°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	23°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	PALMDALE , CA (KWGF)	**Type of Flight Plan Filed:**	None
Destination:	TRUCKEE , CA (KTRK)	**Type of Clearance:**	VFR on top
Departure Time:	11:10 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	BLUE CANYON AIRPORT KBLU	**Runway Surface Type:**	Asphalt
Airport Elevation:	5284 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	15	**IFR Approach:**	None
Runway Length/Width:	3300 ft / 50 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Minor	**Latitude, Longitude:**	39.249881,-120.689033(est)

Administrative Information

Investigator In Charge (IIC):	Childress, Deborah
Additional Participating Persons:	KEN KELLY; RENO , NV MARK PLATT; VAN NUYS , CA
Original Publish Date:	April 6, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=47187