Aviation Investigation Final Report

Location:	MOBILE, Arizona	**Accident Number:**	LAX00LA074
Date & Time:	January 11, 2000, 07:25 Local	**Registration:**	N1565A
Aircraft:	Beech F-33A	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	3 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

During climb out the engine began shaking, rattling, and losing power. The flight instructor took the controls and performed an emergency off-airport landing. While on rollout the aircraft sustained substantial damage to the leading edges and lower surfaces of both wings. The engine had been previously inspected IAW TCM 99-3, which required the removal of the No. 1 and 3 cylinders. Upon reassembly of the cylinders, it was necessary to reinstall three snap rings on the crankshaft counterweights at the No. 2 and 5 cheeks. An inspection of he No. 5 cheek revealed that these three snap rings were not fully seated. The signatures on the crankshaft and counterweight were consistent with a counterweight striking the crankshaft. This can only happen if the counterweight pin is not in place. A revision to TCM mandatory service bulletin 99-3C, published on July 27, 1999, now requires that the gap between the snap ring ears be measured to insure that they are properly seated during reassembly.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the manufacturer representative's improper reinstallation of the crankshaft counterweight snap rings which subsequently separated, allowing the crankshaft counterweight to contact the crankshaft resulting in a total power loss of engine power.

Findings

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

Findings
1. (C) ENG ASSEMBLY,CRANKSHAFT COUNTERWEIGHTS/VIB DAMPER - FRACTURED
2. (C) MAINTENANCE,INSTALLATION - IMPROPER - MANUFACTURER

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

Findings
3. EMERGENCY PROCEDURE - PERFORMED - PILOT IN COMMAND(CFI)

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

Findings
4. OBJECT - TREE(S)

Factual Information

On January 11, 2000, at 0725 hours mountain standard time, a Beech F-33A, N1565A, lost power and made an off-airport forced landing after conducting a touch-and-go takeoff and landing near Mobile, Arizona. The airplane sustained substantial damage; however, neither the certified flight instructor nor his two private pilot certificated student pilots were injured. The aircraft was being operated as an instructional flight by Airline Training Center Arizona under 14 CFR Part 91 when the accident occurred. The flight had departed Mobile airport (private) about 0723 on the morning of the accident. Visual meteorological conditions prevailed at the time and no flight plan was filed.

The instructor reported that the aircraft was on a crosswind climb out after a touch-and-go on runway 09. As the aircraft reached 2,700 feet msl with an airspeed of 120 knots, the engine began shaking, rattling, and losing power. He made a 180-degree turn back toward the airport but realized that they did not have sufficient altitude to reach the runway. He then began looking for an open area in which he could attempt an off-airport landing.

After selecting a landing site, the instructor asked the student seated in the left front seat to lower the landing gear, set the flaps, and then to squawk 7700. After touching down, the aircraft rolled about 1,020 feet on a heading of 215 degrees before coming to a stop at 33 degrees 04.85 minutes north latitude and 112 degrees 14.42 minutes west longitude.

Federal Aviation Administration (FAA) inspectors found the gear down and locked and the flaps set at 15 degrees with substantial damage to the leading edges and lower surfaces of both wings. They also reported that the engine case was fractured and that a counterweight had separated from the crankshaft.

The engine was removed and transported by registered carrier to manufacturer's facility in Mobile, Alabama, arriving on February 14, 2000. On February 22, 2000, the engine was uncrated and disassembled and examined by representatives of the manufacturer under the supervision of an FAA maintenance inspector. A concurrent review of the engine's maintenance records revealed that it had been rebuilt at the manufacturer's facility on May 27, 1998, tested on May 28, 1998, and shipped on May 30, 1998. The engine had accumulated a total of 1,632 hours since being returned to service.

On May 4, 1999, the No. 1 and 3 cylinders were removed for inspection in accordance with Teledyne Continental Motors (TCM) mandatory service bulletin (MSB)99-3. An ultrasonic inspection was conducted by a representative of the manufacturer on the same day. The maintenance records also showed the removal of the No. 1 and 3 cylinders on May 11, 1999. The engine had operated an additional 729 hours since the inspection.

Upon disassembly, debris consisting of the following items was found: Two A105 counterweight pins; two snap rings; three counterweight plates; counterweight bushing fragments; fragment of a counterweight; fragment of a connecting rod; two connecting rod bearing segments; two pieces of connecting rod bolt; one connecting rod nut; section of counterweight; camshaft gear with rear section of camshaft; one piece of camshaft with the No. 1 exhaust lobe; fragments of crankcase; and two lifters and crankcase lifter bore sections.

The oil pump gears and the associated cavities exhibited scratches. The oil pressure relief valve seat contained metal fragments. The No. 1 and 2 cylinder barrel lower skirts were damaged. The No. 1 connecting rod was separated from the crankshaft. The No. 1 piston lower skirt was damaged. The crankcase was damaged in the area of the rear cylinder bays.

The crankshaft counterweight at the No. 2 cheek was broken at the aft trailing section. Both counterweight pins, plates, and two snap rings were found in the oil sump. The third snap ring was not located.

According to the manufacturer's representatives, the signatures on the crankshaft and counterweight are consistent with a counterweight striking the crankshaft. They stated that this could only happen if the counterweight pin was not installed. The remainder of the damage they attributed to flying debris that occurred after the counterweight separated.

An inspection of the No. 5 cheek revealed that the three snap rings were not fully seated.

A revision to TCM mandatory service bulletin 99-3C, published on July 27, 1999, now requires that the gap between the snap ring ears be measured to insure that they are properly seated.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	40,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	January 25, 1999
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	5800 hours (Total, all aircraft), 1000 hours (Total, this make and model), 200 hours (Last 90 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N1565A
Model/Series:	F-33A F-33A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	CE-1331
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	December 21, 1999 Continuous airworthiness	**Certified Max Gross Wt.:**	3400 lbs
Time Since Last Inspection:	32 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	11922 Hrs	**Engine Manufacturer:**	Continental
ELT:	Installed, not activated	**Engine Model/Series:**	IO-520-BB
Registered Owner:	AIRLINE TRAINING CENTER ARIZON	**Rated Power:**	285 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:	AIRLINE TRAINING CENTER ARIZON	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PHX ,1135 ft msl	**Distance from Accident Site:**	24 Nautical Miles
Observation Time:	13:56 Local	**Direction from Accident Site:**	16°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	66°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	, AZ (1AZ0)	**Type of Flight Plan Filed:**	None
Destination:	GOODYEAR , AZ (GYR)	**Type of Clearance:**	None
Departure Time:	07:23 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	MOBILE 1AZ0	**Runway Surface Type:**	
Airport Elevation:	1261 ft msl	**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	Crispin, Robert
Additional Participating Persons:	DEAN HENNIES; SCOTTSDALE , AZ
Original Publish Date:	January 2, 2002
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=48576