



Aviation Investigation Final Report

Location:	Santa Fe, New Mexico	Accident Number:	WPR23FA275
Date & Time:	July 18, 2023, 09:04 Local	Registration:	N5251C
Aircraft:	Cessna T310R	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (total)	Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Shortly after takeoff in the multi-engine airplane, the pilot reported to the tower controller that he had an engine failure. The controller cleared the pilot to land on any runway, and the pilot stated that he was going to try to gain altitude before returning for landing. There were no other transmissions from the pilot.

ADS-B data indicated that the airplane lifted off from the runway and generally maintained the runway heading. The airplane climbed to a maximum altitude of about 200 ft above ground level (agl) at a ground speed about 100 knots (kts).

The airplane continued south for about 2.5 miles over a sparsely populated area without climbing. The airplane then began a descending, slowly decelerating left turn toward a frontage road and an interstate highway; however, it is possible that the pilot chose not to use either location as a forced landing site due to powerlines located immediately north of the frontage road and traffic on the interstate. The pilot continued the left turn and aligned the airplane with an alley located in a neighborhood. A witness stated that the airplane's left wing dropped just before the airplane impacted a house, consistent with a loss of control in the final moments of the flight.

Examination of the left engine revealed significant internal damage. Multiple fragments of engine components were found in the oil sump, including separated crankshaft counterweight components. Further examination revealed that the aft-facing crankshaft counterweight retaining rings were installed incorrectly, with the retaining ring ears facing away from the crankshaft centerline, some of them with the sharp edge incorrectly facing inward, and with incorrect spacing of the ring ear gap. This improper installation allowed two of the counterweights to separate, and one to partially separate, from the crankshaft, which resulted

in the total loss of power to the left engine. Examination of the right engine revealed the same incorrect installation of the aft-facing counterweight retaining rings; however, the crankshaft counterweights remained intact. There were no other mechanical malfunctions or failures with the right engine that would have precluded normal operations. Examination of the airframe revealed extensive thermal damage, but no anomalies that would have precluded normal operation. The landing gear were found in the retracted position, and the position of the wing flaps could not be determined.

A review of maintenance records revealed that all the counterweights from both engines were removed and reinstalled about 24 years before the accident in accordance with a mandatory service bulletin which, in part, called for the removal and reinstallation of all the counterweights. The removal criteria specifically called for removing and replacing the aft-facing retaining rings as part of the counterweight removal process. Records indicated that this was the last time the rings would have been removed/replaced.

Based on the airplane's estimated weight and balance and the atmospheric conditions present at the time of the accident, performance charts in the pilot operating handbook indicated that the airplane should have been able to climb at a rate of about 300 ft per minute with one engine inoperative, but obtaining this performance would have been dependent on the pilot establishing the proper airplane configuration and single-engine best rate of climb speed (Vyse). Examination of the airplane revealed that the landing gear was retracted and that the left propeller was feathered consistent with published single-engine inoperative procedures; however, ADS-B information indicated that the airplane's ground speed was about 100 kts; the airplane's published Vyse was 106 kts indicated airspeed. Additionally, the procedures stated that the airplane should be banked 5° into the operating engine, and the pilot was turning the airplane left (into the inoperative engine) before the accident occurred. Based on the available information, it is likely that the pilot did not maintain adequate airspeed while maneuvering following the loss of left engine power, which resulted in the airplane's inability to climb and a subsequent loss of control and impact with terrain.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

A total loss of left engine power as a result of improper installation of the aft-facing crankshaft counterweight retaining rings. Also causal was the pilot's failure to maintain adequate airspeed following the loss of left engine power, which resulted in the airplane's inability to climb and subsequent loss of control.

Findings

Aircraft	Recip engine power section - Incorrect service/maintenance
Aircraft	Airspeed - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Personnel issues	Installation - Maintenance personnel

Factual Information

History of Flight

Initial climb	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Emergency descent	Collision with terr/obj (non-CFIT)

On July 18, 2023, about 0904 mountain daylight time, a Cessna T310R, N5251C, was destroyed when it was involved in an accident near Santa Fe, New Mexico. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

Air traffic control tower communications information revealed that the tower controller cleared the pilot for takeoff from runway 20 and reported that the wind was calm. The pilot acknowledged the clearance. ADS-B data showed that the airplane began the takeoff roll about 0901. About 0903, the pilot reported, "51C's got an engine failure." The tower controller asked the pilot to "say again," and the pilot re-stated, "51C's got an engine failure." The tower controller cleared the pilot to make a left turn to runway 33, and the pilot acknowledged. About seven seconds later, the controller told the pilot that he was, cleared to land on any runway, to which the pilot stated that he was "going to get some altitude." The controller acknowledged and asked the pilot to "confirm one engine." The pilot replied, "one engine;" there were no other transmissions from the pilot.

ADS-B data revealed that after takeoff, the airplane drifted from over the runway to the left but generally maintained the runway heading. Most of the flight was over a neighborhood. Upon departure, the airplane generally maintained the runway heading for about 1 mile and climbed to a maximum altitude of about 6,425 ft mean sea level (msl), or about 200 ft above ground level (agl). After about 1 mile, the airplane turned slightly to the left and continued south for about 1 mile. The airplane maintained 6,425 ft until 0902:37, when it began a slow descent and maintained about 101 to 102 knots ground speed. Around 0902:56, the airplane began a left turn while descending at a greater rate. (See figure 1.)

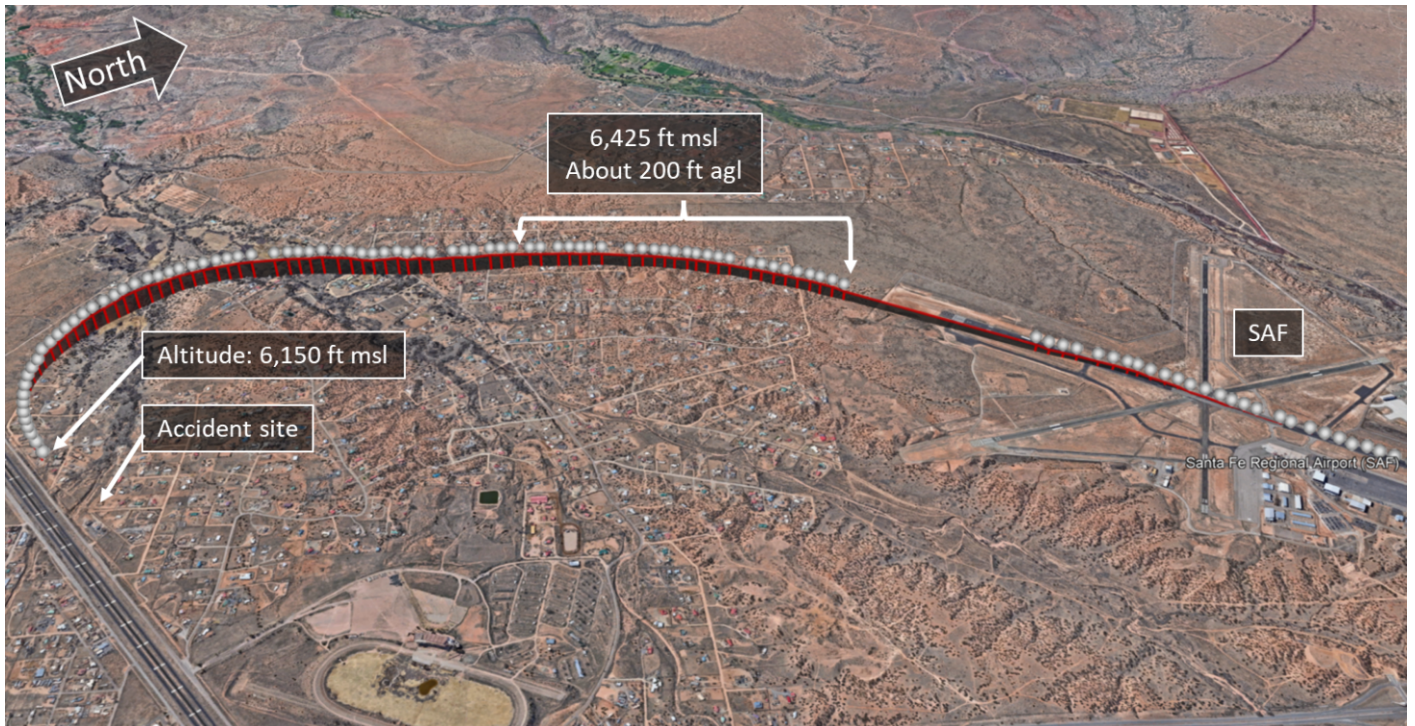


Figure 1. Google Earth image showing the accident airplane's flight path and altitude.

The last ADS-B data point, recorded at 0903:37, captured the airplane over a gully at an undetermined altitude, at 86 knots, on a track of 044°, and about 150 ft southwest of the accident site. The airplane was aligned with an alley that was oriented 044° magnetic, as shown in figure 2.



Figure 2. Google Earth image showing the estimated last ADS-B data point location of the airplane (blue arrow) on the recorded magnetic heading of 044°, and the alley in front of the airplane. A gully is outlined by dashed white lines, and power distribution lines are identified with a yellow dashed line.

Witnesses who were travelling in a car going westbound on Interstate 25, reported watching the airplane flying eastbound with a nose-up attitude, at a low altitude, with the left propeller not rotating and the landing gear up. The driver pulled over and stopped as the airplane passed the car. The witnesses reported that the airplane was in a left bank, then the wings leveled as it cleared a ravine. The left wing impacted a house and the airplane spun around. Another witness in the car reported there was a set of power distribution lines next to the frontage road, and that there was traffic on the freeway.

One witness, located next door to the house that the airplane impacted, stated that the airplane's left wing and tail dropped but not more than 45° before the airplane struck the south side of the house.

A dashcam video, taken less than one half mile from the accident site, supported the ADS-B data and witness statements of the accident airplane at a low altitude, descending in a nose-high attitude heading south toward Interstate 25 and a frontage road, then turning about 90° to the left. The airplane's wings leveled before exiting the view of the camera at an extremely low altitude.

Pilot Information

Certificate:	Airline transport	Age:	72, Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land; Multi-engine sea	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider; Helicopter	Restraint Used:	
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Helicopter	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	March 1, 2023
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 5000 hours (Total, all aircraft), 1000 hours (Total, this make and model), 5000 hours (Pilot In Command, all aircraft)		

The pilot's personal logbooks were not recovered, and no details of his recent and past experience were available. Friends of the pilot described him as having excellent knowledge and experience with multi-engine airplanes including war birds, float planes, and helicopters. One friend described his management of the [airplane] engines as fantastic. Another described the accident pilot as one of the most qualified pilots that he has ever known.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N5251C
Model/Series:	T310R	Aircraft Category:	Airplane
Year of Manufacture:	1978	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	310R1526
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	July 13, 2023 Annual	Certified Max Gross Wt.:	5500 lbs
Time Since Last Inspection:	270.3 Hrs	Engines:	2 Reciprocating
Airframe Total Time:	2735.4 Hrs as of last inspection	Engine Manufacturer:	CONT MOTOR
ELT:	Installed, not activated	Engine Model/Series:	TSIO-520-BB23B
Registered Owner:	On file	Rated Power:	300 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

On the day of the accident, the pilot requested that the airplane's four tanks be topped off and purchased 60.6 gallons of 100 low lead fuel at SAF. The airplane had the optional 63-gallon auxiliary fuel tanks installed. All weight and balance information was reported to be in the airplane and lost in the postaccident fire.

Aircraft performance calculations revealed that, given the environmental conditions at the time of the accident, an empty weight of 3,942.8 lbs, 978 lbs of fuel (63-gallon auxiliary tanks), a 200-lb pilot, and 10 lbs of baggage, the airplane had a predicted one-engine inoperative climb rate of about 300 ft per minute at a gross weight of 5,130.8 lbs.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KSAF, 6287 ft msl	Distance from Accident Site:	2 Nautical Miles
Observation Time:	08:53 Local	Direction from Accident Site:	345°
Lowest Cloud Condition:	Clear	Visibility:	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	None / None
Wind Direction:		Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.3 inches Hg	Temperature/Dew Point:	26°C / 4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Santa Fe, NM (SAF)	Type of Flight Plan Filed:	None
Destination:	Santa Monica, CA (SMO)	Type of Clearance:	VFR
Departure Time:	09:00 Local	Type of Airspace:	Class D

The SAF automated weather observation recorded about the time of the accident included variable wind, 10 statute miles visibility, clear sky conditions, temperature 26°C, dew point temperature 4°C, and a barometric pressure of 30.30 inches of mercury. The airport elevation was 6,349 ft msl. Density altitude was calculated to be 8,769 ft msl.

Airport Information

Airport:	Santa Fe Regional Airport SAF	Runway Surface Type:	Asphalt
Airport Elevation:	6349 ft msl	Runway Surface Condition:	Dry
Runway Used:	20	IFR Approach:	None
Runway Length/Width:	8366 ft / 150 ft	VFR Approach/Landing:	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	On-ground
Ground Injuries:		Aircraft Explosion:	On-ground
Total Injuries:	1 Fatal	Latitude, Longitude:	35.577454,-106.08489

The fuselage came to rest upright on the parking area of a private residence. The first point of impact was likely the southwest corner of a modular house, located at an elevation of 6,301 ft msl. Thermal damage to the house prevented determining the exact initial impact point. Most of the fuselage, including the cockpit, was consumed by a postaccident fire. The left side of the fuselage was intact up to about the middle of the fuselage. A visual examination of the left engine revealed multiple breaches to the engine case. The left propeller remained attached to the engine. Two of the blades appeared to be in the feather position and exhibited aft bending. The third blade appeared straight. The landing gear was found in the retracted position.

Examination of the left engine, model number TSIO-520-BB23B, serial number 287610-R, revealed a counterweight jammed next to cylinder No. 1. The oil sump was removed, and a significant amount of metal debris was observed in the sump. Among the debris were pieces of crankshaft counterweights, counterweight retaining rings, retainer plates, bushings, and a connecting rod cap, as shown in figure 3.

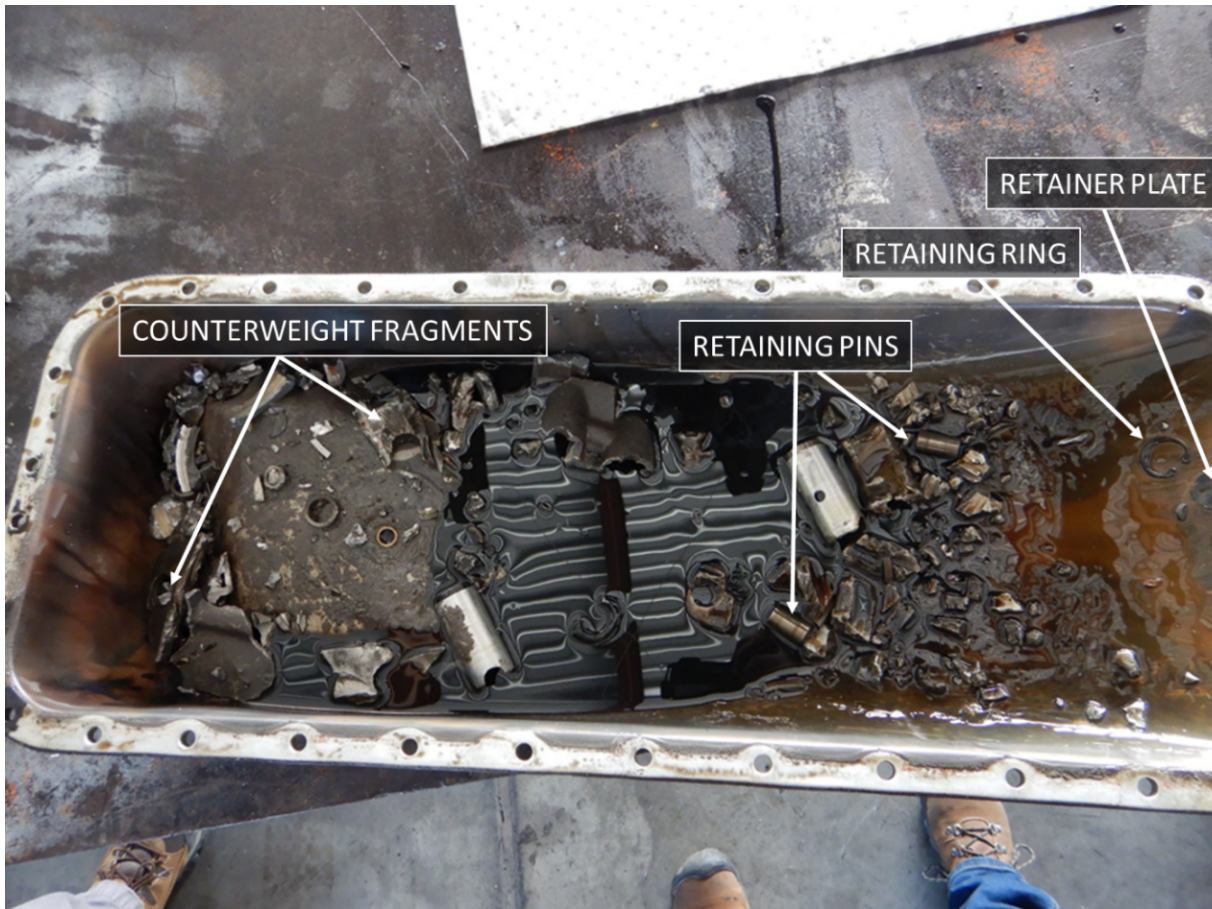


Figure 3. Photo of the oil sump with counterweight components identified.

The cylinders and the crankcase bolts were removed and the crankcase was split open. The two counterweight assemblies located between cylinder Nos. 3 and 4 were found separated from the crankshaft attachment flanges or "cheeks." . One counterweight assembly, located between cylinder Nos. 1 and 2, remained attached; the other was partially separated from the crankshaft flange and was wedged against the crankcase between the crankshaft flange and valve lifters. (See figure 4.)

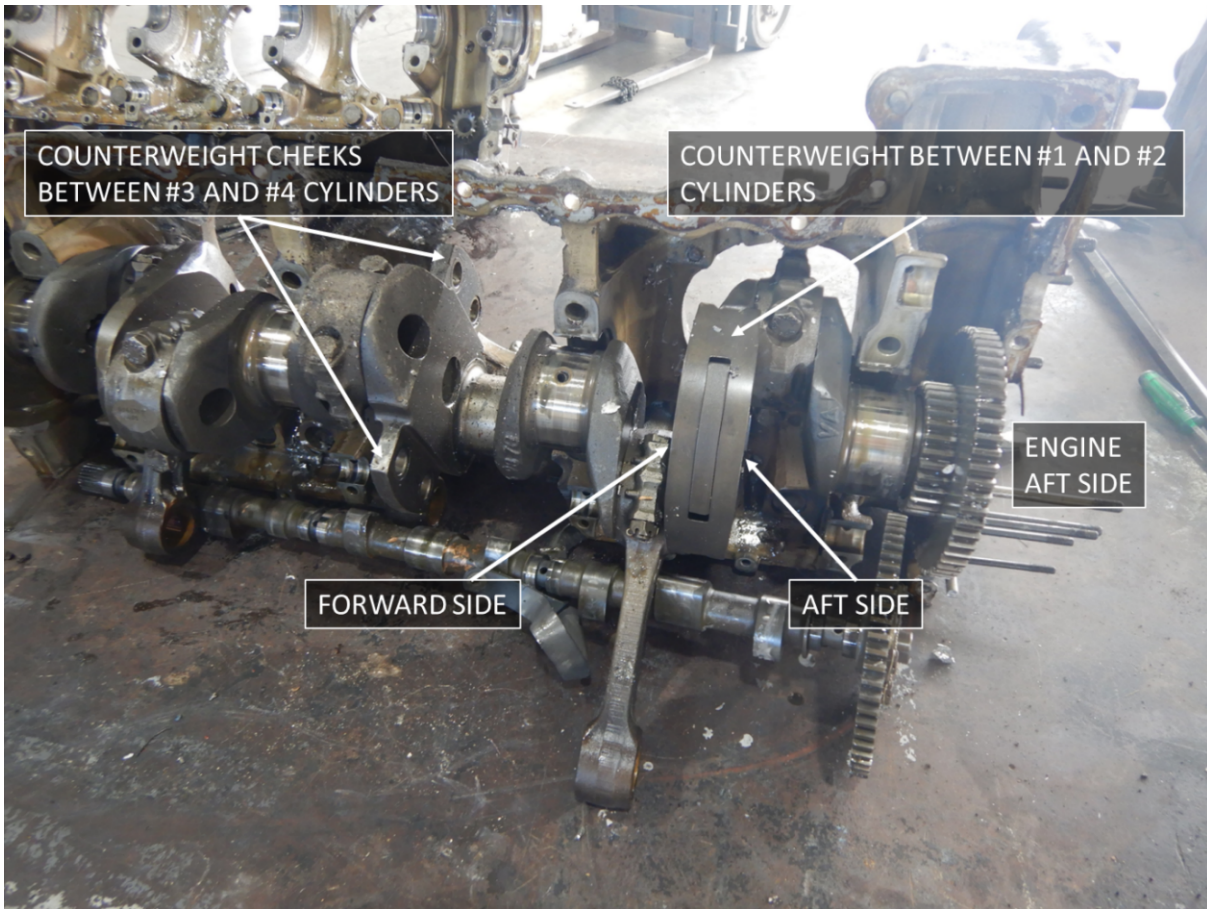


Figure 4. Left engine showing the counterweight cheeks, and the one attached counterweight.

Visual examination of the counterweight that remained attached to the crankshaft flange showed that the retaining ring ears on the aft side were facing approximately 180° from the crankshaft centerline, while the retaining rings on the forward-facing side were oriented toward the crankshaft centerline. (See figure 5).

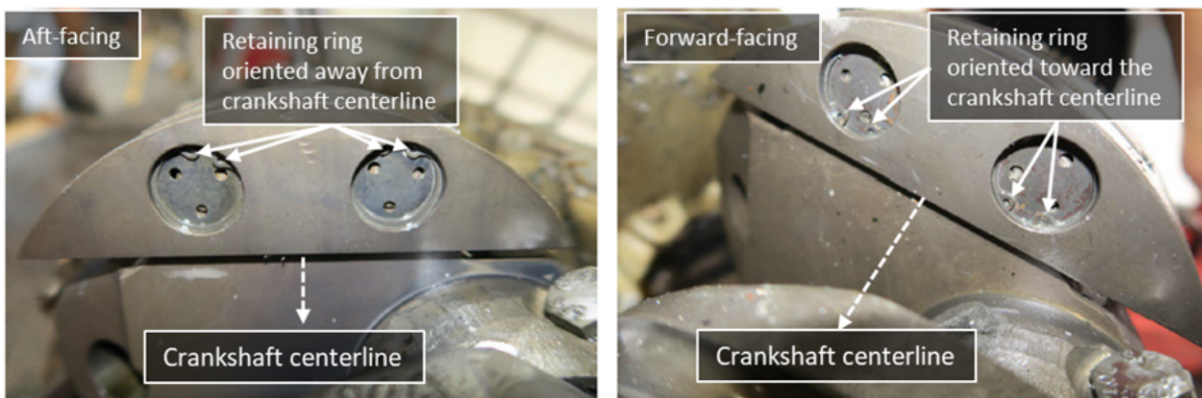


Figure 5. Left engine counterweight showing the retaining rings on the aft-facing side (left photo) and the retaining rings on the forward-facing side (right photo).

One of the aft retaining rings was found installed with the sharp edge outboard, while the other was incorrectly installed “flipped over,” with the sharp edge facing inboard.

The retaining ring ear gaps were measured with a digital micrometer. The table below details the retainer ring ears’ gap measurements.

Table 1 . Left engine counterweight retaining clip gap measurements.

Aft Counterweight Measurements (Installed)	Leading Edge	Trailing Edge
Forward Facing	0.207”	0.204”
Aft Facing	0.128”	0.113”
Aft Counterweight Measurements (Separated)	Leading Edge	Trailing Edge
Forward Facing	0.224”	0.197”
Aft Facing	-	-

The right engine, model number TS10-520-BB24B, serial number 287609-R, was examined and the Nos. 1 and 3 cylinders were removed. Examination of the counterweights revealed that the aft facing retaining rings were oriented facing 180° from the crankshaft centerline, and the forward-facing retaining rings were oriented facing toward the crankshaft centerline, as shown in figure 6. Examination of the right engine revealed no mechanical malfunctions or failures that would have precluded normal operation.

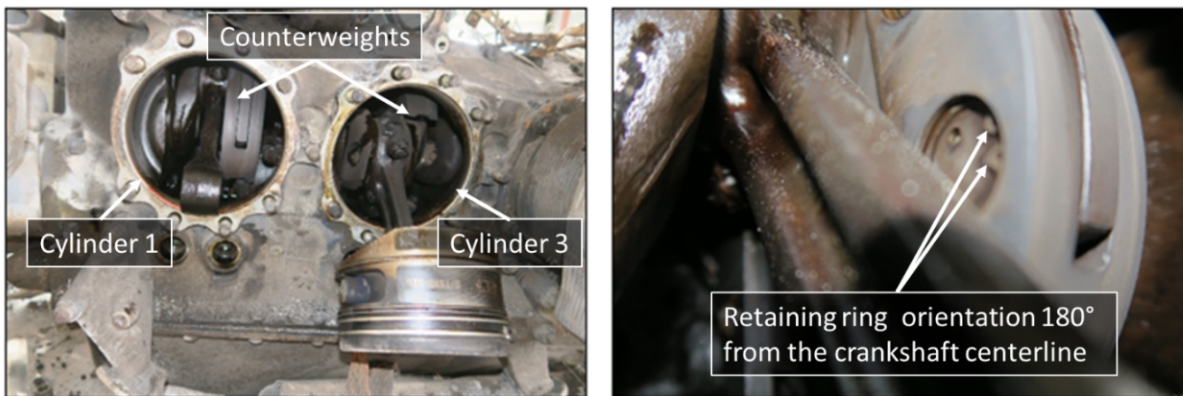


Figure 6. The right engine, showing the removal of the Nos. 1 and No. 3 cylinders, and the aft-facing retaining ring of one counterweight.

A review of engine maintenance logbooks revealed that both engines were overhauled in October 1998, and installed into the airplane on April 29, 1999. Logbook entries dated May 27, 1999, for both engines, indicated that, 1.1 hours since the major overhaul, the Nos. 1 and 3 cylinders were removed, and the dampers (counterweights) were removed to comply with Teledyne Continental Motors (TCM) AD 99-09-17, which was superseded by AD 99-19-01, dated September 15, 1999. On October 1, 2009, both engines underwent top overhauls that included the replacement of all cylinders, at 665.2 hours since the major overhaul. The time from the AD 99-09-17 maintenance to the last annual inspection, performed on July 13, 2023, was calculated to be 1,162.3 hours. Damage to the instruments precluded further calculations of the total engine hours beyond the last annual inspection.

Injuries to Persons

An autopsy of the pilot was conducted by the Office of the Medical Investigator, University of New Mexico, Albuquerque, New Mexico. The cause of death was listed as blunt force injuries.

Additional Information

Mandatory Service Bulletin MSB 99-3C, revised on July 27, 1999, issued by TCM, now Continental Aerospace Technologies, called for the removal of two cylinders, two connecting rods, and all counterweights to facilitate the visual and ultrasonic inspection of the Nos. 2 and 5 crankshaft cheeks. MSB 99-3C identified the accident engines, by serial number, as applicable to the MSB.

MSB 99-3C stated in part, *"INSTALL SNAP RINGS TOWARD THE CRANKSHAFT CENTERLINE AS SHOWN."* and *"INSTALL SNAP RINGS WITH SHARP EDGE (FLAT SURFACE) FACING OUTBOARD."* and *"MINIMUM GAP BETWEEN SNAP RING EARS = 0.179 INCH."* (See figure 7.)

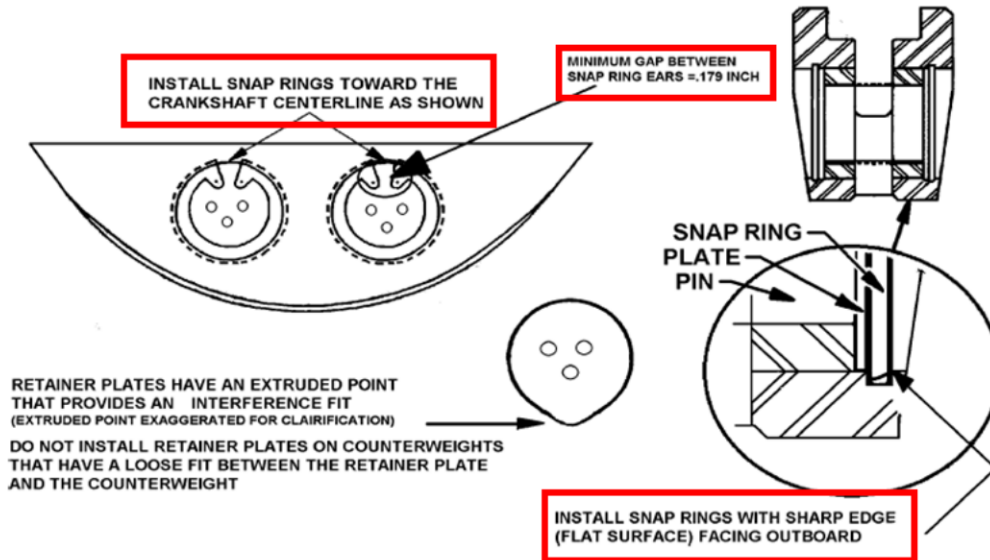


FIGURE 12
COUNTERWEIGHT INSTALLATION

Note: Use an inspection mirror and flashlight to verify that the entire circumference of each snap ring is fully seated in the counterweight snap ring groove.

ISSUED			REVISED			 TELEDYNE CONTINENTAL MOTORS <small>An Allegheny Teledyne Company P.O. Box 90 Mobile Alabama 36601</small>	PAGE NO	REVISION
MO	DAY	YEAR	MO	DAY	YEAR		23 of 26 MSB99-3	C
04	19	99	07	27	99			

Figure 7. Excerpt from MSB 99-3C.

MSB 99-3C stated, in part,

10. Position the crankshaft so that the rearward [aft-facing] retaining rings and plates of a counterweight on the number two crankshaft cheek can be removed.

12. Using the procedure in steps 10 and 11 remove the remaining counterweight on the number two crankshaft cheek and remove the two counterweights on the number five crank cheek.

The FAA Airplane Flying Handbook (FAA-H-8083-3C) stated, in part,

The critical engine is the engine whose failure has the most adverse effect on directional control. On twins with each engine rotating in conventional, clockwise rotation as viewed from the pilot's seat, the critical engine will be the left engine.

Administrative Information

Investigator In Charge (IIC):	Salazar, Fabian
Additional Participating Persons:	Vernon Rockett; FAA; Albuquerque, NM Peter Basile; Textron Aviation; Wichita, KS
Original Publish Date:	February 20, 2025
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=192652

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