Aviation Investigation Final Report

Location:	Santa Barbara, California	**Accident Number:**	WPR16LA066
Date & Time:	February 8, 2016, 17:41 Local	**Registration:**	N113TM
Aircraft:	Beech B36TC	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airline transport pilot was conducting a test flight following a recent replacement of the turbo wastegate controller, at which time the mechanic also tightened the intercooler hose. The pilot reported that, during the ground roll and initial climb, the engine tone was continuous, and both the manifold pressure and rpm indications were normal. As the airplane reached about 300 ft mean sea level, the engine lost power. The pilot attempted to restore engine power by switching the fuel tanks and cycling both the "low" and "high" settings of the fuel boost pump but was unsuccessful. He leveled the wings and extended the flaps to prepare for a forced landing, and a few seconds later, the airplane impacted a slough about 1/2 mile southeast of the departure end of the runway.

A postaccident examination of the fuel system did not reveal any anomalies or obstructions. Further, examination of the engine did not reveal any mechanical malfunctions, except for the separation of the intercooler from its mounts, which had resulted from the accident. During a test run, the engine was not able to produce rated horsepower until the intercooler was removed; however, the engine was still able to produce normally aspirated engine power with the intercooler installed.

The Pilot's Operating Handbook warned against using the "high" fuel boost pump position when the engine-driven fuel pump is operating because it can result in an excessively rich fuel/air mixture and engine failure. Thus, the pilot's attempt to restart the engine with the fuel boost pump at the "high" setting may have prevented engine power from being restored; however, even if engine power had been restored, given the airplane's low altitude when the engine lost power, it is unlikely that the pilot would have had sufficient time to complete a successful engine restart and continue safe flight. The investigation could not determine the reason for the total loss of engine power during initial climbout.

Probable Cause and Findings

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

A total loss of engine power during initial climbout for reasons that could not be determined because postaccident examination and testing of the engine did not reveal any mechanical anomalies that would have precluded normal operation.

Findings

Not determined	(general) - Unknown/Not determined

Factual Information

History of Flight

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

On February 8, 2016, about 1741 Pacific standard time, a Beechcraft B36TC airplane, N113TM, completed a forced landing near Santa Barbara Municipal Airport (SBA), Santa Barbara, California, following a total loss of engine power during takeoff. The airline transport pilot, and sole occupant, received minor injuries. The airplane was owned and operated by a private individual as a 14 Code of Federal Regulations Part 91 personal flight. Visual meteorological conditions prevailed and no flight plan was filed for the local flight that departed SBA at 1740. The airplane was originating at the time of the accident.

The pilot reported that he planned to fly to 7,000 feet mean sea level (msl) to verify the turbocharger was functioning normally, as it had been recently serviced for a minor power issue. After an uneventful preflight inspection and engine run-up, the pilot departed runway 25. During his takeoff roll, the pilot noted the engine tachometer and manifold pressure instruments displayed normal readings and the engine tone was continuous. When the airplane reached 300 feet msl the engine lost power. After the pilot executed a tight left turn to return to the airport, he switched fuel tanks and cycled the "low" and "high" modes of the fuel boost pump, but was unsuccessful in restoring power to the engine. An air traffic controller approved the pilot to land on taxiway A, but the pilot decided to land in a nearby field. He leveled the wings, extended flaps, and moments later the airplane impacted a slough about one-half mile southeast of the departure end of runway 25. Photographs furnished by the Federal Aviation Administration (FAA) revealed substantial damage to the leading edge of the left wing and the forward fuselage.

According to archived air traffic control (ATC) information, the pilot was instructed to depart runway 25 and turn right 20 degrees for traffic. Moments after his departure, the pilot reported to the controller that he was going to return to the airport. The controller cleared the pilot to land on any taxiway, but the pilot communicated that he would not be able to reach the airport.

During a postaccident examination of the airplane, an FAA inspector observed the fuel selector in the right fuel tank position. Power was applied to the airplane a few days after the accident by representatives of the airport with oversight from an FAA airworthiness inspector. Initially, the left fuel gauge indicated a total fuel quantity of about one-quarter tank, and the right fuel gauge needle was positioned in the yellow arc, but indicated that the tank's fuel quantity was less than one-quarter. When the avionics switch was re-cycled, the left fuel gauge displayed a fuel quantity above three-eighths and the right fuel gauge showed a quantity of about three-eighths. The inspector reported that 24 gallons of 100LL aviation grade gasoline were drained from the right wing fuel tank, and about 9 gallons were drained from the left wing fuel tank.

Pilot Information

Certificate:	Airline transport	**Age:**	59,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	January 14, 2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	August 27, 2015
Flight Time:	26000 hours (Total, all aircraft), 200 hours (Total, this make and model), 25500 hours (Pilot In Command, all aircraft), 100 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N113TM
Model/Series:	B36TC	**Aircraft Category:**	Airplane
Year of Manufacture:	1983	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	EA-386
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	November 11, 2015 Annual	**Certified Max Gross Wt.:**	3850 lbs
Time Since Last Inspection:	10 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1565.77 Hrs at time of accident	**Engine Manufacturer:**	Continental Motors Inc.
ELT:	C91 installed, not activated	**Engine Model/Series:**	TSIO-520-UB
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

According to FAA records, the airplane was manufactured in 1983 and registered to the pilot on August 25, 2014. The pilot reported that he purchased the airplane from a bank following a repossession and without the airplane's maintenance records. A review of the airplane's registration file revealed that it was registered to its previous owner in 1999 under the name Tango Mike Enterprises. The previous owner reported that she operated the airplane for approximately 200 hours in the 15 years it was under her ownership, but was unable to locate the airplane's maintenance records after the airplane was repossessed.

The airplane was powered by a Continental TSIO-520-UB, direct drive, air cooled, 300 hp engine. A review of the airplane's maintenance records revealed that the engine was removed on July 1, 2015 at 1,555 total flight hours for an engine overhaul, which was completed on August 19, 2015. The engine was subsequently reinstalled on December 15, 2015. The logbook records indicate that a mechanic completed an annual inspection of the airframe and propeller on November 11, 2015, while the engine was away. Two records in the aircraft logbook showed that the vacuum pump was replaced on January 28, 2016, and an intake intercooler hose was tightened on February 8, 2016, the day of the accident flight. According to the airplane's tachometer, the engine had accumulated a total of 1,565 total flight hours at the time of the accident.

According to the pilot, the airplane was delivered by a maintenance facility about 2 weeks before the accident following the engine overhaul. The mechanic who reinstalled the overhauled engine reported that he completed several maintenance flights to "break in" the engine before he delivered it to the accident pilot in Van Nuys, California. At the time of the delivery the pilot was informed that the instrument pressure pump failed during the flight and would need to be replaced. The pump was replaced the following day. The pilot subsequently completed a short flight in the accident airplane, during which time he observed slightly low manifold pressure. The pilot then asked a mechanic to replace the waste gate and controller, as they had not been overhauled during the airplane's recent maintenance work. Subsequent to the work being completed, the mechanic reported to the pilot that the engine ran normally after he tightened a loose intercooler hose.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Dusk
Observation Facility, Elevation:	SBA,13 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	17:53 Local	**Direction from Accident Site:**	144°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	270°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.06 inches Hg	**Temperature/Dew Point:**	25°C / 1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	SANTA BARBARA, CA (SBA)	**Type of Flight Plan Filed:**	None
Destination:	SANTA BARBARA, CA (SBA)	**Type of Clearance:**	VFR
Departure Time:	17:40 Local	**Type of Airspace:**	Class C

Airport Information

Airport:	SANTA BARBARA MUNI SBA	**Runway Surface Type:**	Asphalt
Airport Elevation:	13 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	25	**IFR Approach:**	None
Runway Length/Width:	6052 ft / 150 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor	**Latitude, Longitude:**	34.421112,-119.842498(est)

Tests and Research

Fuel System

The pilot reported that he used both a combination of the fuel gauges and his onboard fuel totalizer to monitor fuel quantity during flight.

The fuel system had a total fuel capacity of 108 gallons and was comprised of two interconnected bladder-type fuel cells in each wing; a 14 gallon outboard cell and an inboard 40 gallon cell. The tanks were filled utilizing a single filler neck located on the outboard wing fuel cell. Fuel is directed from the inboard tank through a fuel return line to a fuel selector and downstream to a dual pressure electric boost pump before the fuel reaches the engine driven pump. Total fuel quantity for each wing is measured by two float-operated fuel sensors located in each fuel cell. The sensors are electric and connected in series to a fuel quantity indicator gauge on the cockpit instrument panel.

The airplane was examined by representatives of the airframe and engine manufacturers under the supervision of the NTSB IIC in Santa Barbara, California.

An inspection of the fuel system revealed that both floats from the right and left fuel quantity indicators displayed normal wear, and the gauges exhibited normal measurements when the float arms were rotated. The inboard and outboard fuel sensors were tested for each wing, and the output signals to the instrument panel fuel quantity gauges were observed when the airplane's battery power was applied.

Both the right and left wing instrument fuel gauges displayed empty and full indications when the inboard and outboard fuel sensors were at the lower and upper stops, respectively. The right and left fuel tank gauges also displayed half-tank indications when one sensor was in the up position and the second sensor set in the low position. Resistance measurements taken for each sensor were within the prescribed limitations of the manufacturer, with the exception of the right wing outboard fuel tank sensor, which displayed an open circuit in the full position. Fuel was observed in the fuel strainer bowl, and the fuel strainer screen was free of contaminants.

A subsequent examination of the outboard fuel tank sensor was completed at the airplane manufacturer's facility with oversight from the FAA. The results revealed that the sensor displayed 0.06 ohms in both the empty and full positions, indicative of an empty fuel tank. An inspection of the sensor showed arc damage on the outer surface of the sensor at the point of contact between the rod and the pin. Additionally, the internal contact appeared off-center on the internal resistor, with most of the contact movement taking place on the un-wound portion of the internal resistor.

Both the low and high settings of the fuel boost pump were tested with power applied to the airplane; a plastic bag was used to collect samples of fuel at the fuel transducer. An audible sound was heard when the boost pump motor was tested in both the low and high modes.

Engine Examination

The engine crankshaft was manually rotated by hand at the propeller, and rotational continuity was established throughout the engine to the drive shaft of the instrument pressure pump at the accessory housing. Thumb compression and suction were obtained on all six cylinders. The cylinder combustion chambers and barrels were examined with a borescope, and no evidence of foreign object ingestion or detonation were observed. The combustion chambers displayed color signatures consistent with normal operation.

The top Tempest URHB-32E model spark plugs were removed for inspection. Each spark plug exhibited signatures consistent with normal wear, but were slightly dark and sooty.

Both magnetos remained attached to the engine case. The port holes to both magnetos were removed to observe the movement of the distributor gear. Both rotated normally when the propeller was operated by hand.

A Merlyn Products, Inc. induction air intercooler system had been installed in the airplane on July 30, 1987 at a tachometer time of 354.3 flight hours, and completed in accordance with supplemental type certificate numbers SA 3654NM and SE 3653NM. A postaccident inspection of the intercooler system showed that the induction hose from the intercooler to the induction system had separated from the unit, and the induction hose from the intercooler to the turbo compressor had also separated from the intercooler unit.

The engine was shipped to the engine manufacturer's facility in Mobile, Alabama. A subsequent engine examination and test run was completed by the engine manufacturer, with oversight provided by the NTSB IIC. The engine condition was considered optimal for testing and did not require any replacement of parts. Initial test results revealed that the engine manifold pressure did not exceed about 31 in Hg and

2,544 rpm when the throttle was advanced to full power. An induction leak was subsequently discovered at the intercooler's machined mounting holes. After the turbo discharged routing was returned to its standard configuration, the engine achieved rated horsepower, about 37 in Hg of manifold pressure at 2,756 rpm.

Additional Information

The only purposes for the Aux Fuel Pump HI position are:

1) To prime the engine prior to starting.
2) To provide an alternate source of fuel pressure if the engine-driven fuel pump fails.

The Emergency Procedures section of the Pilot's Operating Handbook warns operators against use of the high boost pump when the engine-drive pump is operating, as the fuel/air mixture could become excessively rich, which may lead to engine failure.

Administrative Information

Investigator In Charge (IIC):	Stein, Stephen
Additional Participating Persons:	Frank Motter; FEDERAL AVIATION ADMINISTRATION; Van Nuys, CA Mike Council; Continental Motors, Inc.; Mobile, AL Peter Basile; Textron Aviation; Wichita, KS
Original Publish Date:	September 6, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=92698