Aviation Investigation Final Report

Location:	Talkeetna, Alaska	**Accident Number:**	ANC14LA038
Date & Time:	June 5, 2014, 21:30 Local	**Registration:**	N1301H
Aircraft:	Aeronca 15AC	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was flying on a cross-country flight to check on his son who was participating in a mountaineering class. He had exhausted the fuel in the left fuel tank and was operating the airplane on the right fuel tank; he reported that he thought the airplane had about 12 gallons of fuel remaining. After circling the camp twice about 8,000 ft mean sea level, the engine lost all power. In an effort to restore engine power, he switched fuel tanks, applied carburetor heat, and pumped the throttle. However, the engine sputtered and then lost total power again. He turned the airplane toward the nearest airstrip and was able to restore intermittent engine power by continuing to pump the throttle and rocking the wings. While the pilot was performing an emergency landing, the engine sputtered and had a short burst of power, which resulted in the airplane overshooting the intended landing area and overrunning the departure end of the runway. The airplane nosed over and sustained substantial damage to the rudder and left lift strut. No fuel was found on the ground or vegetation at the accident site. About 8 gallons of fuel was removed from the right fuel tank, and the left fuel tank was empty. No preaccident engine anomalies were noted.

A review of the airplane's maintenance records revealed that its original bladder fuel tanks had been replaced with two 24-gallon aluminum-alloy fuel tanks and that this modification was approved by the Federal Aviation Administration (FAA) under its field approval process; this process required that the maintenance information meet the original type certification basis for major alterations to aircraft, engines, and propellers certificated under the Civil Air Regulations. However, no fuel flow tests, usable/unusable fuel quantities, placarding, or flight manual supplement was referenced in the description of work when the tanks were installed or when the alteration was approved by the FAA as was required to meet the original type certification basis for the aircraft.

Examination of the wing fuel tanks revealed that the left tank's internal baffle had half-moon lightening holes at the bottom of the fuel baffle, that the right tank's internal baffle had lightening holes that started about 1 inch from the bottom of the tank, and that the baffle fit tight against the bottom of the right fuel tank. Given the lack of lightening holes at the bottom of the right fuel tank's internal baffle it is likely

that the unusable fuel in the right tank would have been significantly greater than the unusable fuel in the left tank.

Each tank had a placard near the filler cap on the exterior of the wing indicating that the tank had 24 gallons of usable fuel. The fuel selector inside the cockpit had a placard indicating 36 gallons. However, postaccident calculations estimated that the total usable fuel was actually 22.5 gallons and that the unusable fuel was about 4 to 5 gallons per fuel tank.

Due to maintenance personnel's failure to conduct the required fuel system tests after the system was modified, the FAA's improper approval of the fuel tank modification, and the inconsistencies in the construction of the fuel tank baffles and in the fuel-related placarding, the pilot would have had no clear idea of how much usable or unusable fuel was available in each wing tank. Given the lack of mechanical deficiencies with the engine, it is likely that the engine lost power due to fuel starvation.

Probable Cause and Findings

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

Maintenance personnel's failure to perform required fuel system tests to ensure that the airplane met its original type certification basis after modifying the fuel system and the Federal Aviation Administration's improper approval of the fuel tank modification via the field approval process during which it did not ensure that the required fuel system tests were performed, which led to the pilot's inability to determine the airplane's actual amount of usable and unusable fuel and the subsequent loss of engine power due to fuel starvation.

Findings

Organizational issues	Oversight of maintenance - FAA/Regulator
Aircraft	Fuel distribution - Inadequate inspection
Aircraft	Fuel - Fluid level
Personnel issues	(general) - Maintenance personnel

Factual Information

History of Flight

Enroute-cruise	Loss of engine power (partial) (Defining event)
Emergency descent	Landing area overshoot
Landing-landing roll	Collision with terr/obj (non-CFIT)

On June 5, 2014, about 2130 Alaska daylight time, a tundra tire-equipped Aeronca 15AC Sedan airplane, N1301H, sustained substantial damage during an emergency landing, following a partial loss of engine power, at the Dollar Creek Airstrip, near Talkeetna, Alaska. The airplane was being operated by the pilot as a visual flight rules (VFR) cross-country personal flight under the provisions of Title 14, CFR Part 91, when the accident occurred. The certificated private pilot was not injured. Visual meteorological conditions prevailed, and no flight plan had been filed. The flight departed Lake Hood Airstrip, Anchorage, Alaska, about 2000, en route to Talkeetna, via Pika Glacier.

During a telephone conversation with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on June 6, the pilot stated that the purpose of the flight was to check on his son who was participating in a mountaineering class, and was camped on Pika Glacier. He said that he had exhausted the fuel out of the left fuel tank and was operating on the right fuel tank, with about 12 gallons remaining. After circling his son's camp twice at approximately 8,000 feet mean sea level (msl), he departed for Talkeetna when the engine lost all power. In an effort to restore engine power, he switched fuel tanks, applied carburetor heat, and pumped the throttle. The engine sputtered, followed by a total loss of engine power. He turned towards the nearest landing site; Dollar Creek airstrip, located approximately 15 miles southeast, at an elevation of about 800 feet, and was able to restore intermittent engine power by continuing to pump the throttle and rocking the wings. While performing an emergency landing to the Dollar Creek airstrip the engine sputtered, giving the airplane a short burst of power and he "overshot" the intended landing area. The airplane overran the departure end of the runway, and nosed over sustaining substantial damage to the rudder and left wing lift strut.

According to personnel who recovered the airplane from the accident site, the airplane came to rest inverted, and there did not appear to be any fuel on the ground or vegetation at the accident site. Approximately 8 gallons of aviation fuel was removed from the right fuel tank, and there was no fuel remaining in the left fuel tank.

A review of the airplane's maintenance records revealed that the fuel tanks had been modified in accordance with a Federal Aviation Administration (FAA) Form 337, (major repair and alteration) dated July 2, 1997. The FAA approved modification allowed the installation of two 24 gallon aluminum alloy fuel tanks that replaced the original bladder tanks. The FAA form 337, description of work accomplished, stated in part: "Installed 24 gallon aluminum alloy fuel tanks instead of original bladder tanks. Tanks manufactured in same manner as Monananis STC'd tank, except 55 inches long and made of thicker material, (.060), and baffle installed at center of tank. All other fuel system installation,

plumbing etc., remains as original and fuel management procedures remain unaltered except for quantities."

A detailed review of the FAA form 337 revealed that during the approval process there were no fuel flow tests, usable/unusable fuel quantity calculations, placarding or flight manual supplements referenced in the description of work when the tanks were installed. A copy of the FAA form 337 is available in the public docket for this accident.

On July 2, 1997 a FAA safety inspector from the Anchorage Flight Standards District Office (FSDO) approved the fuel tank modification stating "The alteration herein complies with the applicable airworthiness requirements and is approved for the above described aircraft, subject to conformity inspection by a person authorized in FAR Part 43".

The Aeronca 15AC Sedan was certificated under Civil Air Regulations (CAR) Part 03, effective Dec 15, 1946.

FAA Order 8300.16, Major Repair and Alteration Data Approval, Chapter 5, Section 5-2 Approval of Major Alterations under the Civil Air Regulations (CAR) states in part: "For field-approved major alterations to aircraft, engines, and propellers certificated under the CAR, the maintenance information must meet the original certification basis."

CAR 03.4220 Fuel flow rate, states in part: "The ability of the fuel system to provide the required fuel flow rate and pressure shall be demonstrated when the airplane is in the attitude which represents the most adverse condition from the standpoint of fuel feed and quantity of unusable fuel in the tank."

CAR 03.4221 Determination of unusable fuel supply and fuel system operation on low fuel, states in part: "The unusable fuel supply for each tank shall be established as not less than the quantity at which the first evidence of malfunctioning occurs under the conditions specified below." It goes on to state that: "In all such cases, information regarding the conditions under which the full amount of usable fuel in the tank can safely be used shall be made available to the operating personnel by means of a suitable placard or instructions in the Airplane Flight Manual."

CAR 03.423 Fuel tanks, states in part: "The unusable capacity shall be considered to be the minimum quantity of fuel which will permit compliance with the provisions of 03.4221."

CAR 03.4252 Fuel Strainer, states in part: "A fuel strainer shall be provided between the tank outlet and the carburetor inlet." It goes on to state that: "The strainer shall be accessible for drainage and cleaning, and the strainer screen shall be removable."

On June 12, 2014 the NTSB IIC, another NTSB investigator, along with two FAA safety inspectors from the Anchorage FSDO examined the engine at Lake Hood Airstrip after the airplane had been recovered. No preaccident engine anomalies were noted.

The airplane's fuel supply system was examined for anomalies as well. The fuel vent system had been modified to an under wing vent, and the original fuel selector that consisted of options for selecting on and off only, had been modified to include options for selecting both, or left and right tanks individually. The fuel drain, located at the bottom of the gascolator had been replaced with a brass plug. About three ounces of fuel was recovered from the gascolator. The fuel was light blue in color and appeared dirty.

The gascolator was contaminated with rust-like particulate matter; the fuel screen strainer was dirty but not blocked. No obstructions to the fuel supply system were noted from either fuel tank to the carburetor, and no obstruction of the fuel vent system was noted.

Examination of the airplane's wing fuel tanks on June 21, by the NTSB IIC, another NTSB investigator, and a representative of the airframe manufacturer revealed that the internal baffle on the left tank had half-moon lightening holes at the bottom of the fuel baffle. The right tanks internal baffle lightening holes started approximately 1 inch from the bottom of the tank, and the baffle fit tight against the bottom of the fuel tank. Each tank was placarded near the filler cap on the exterior of the wing "USABLE 24 GAL." The fuel selector inside the cockpit was placarded "36 GAL." No header tank was present in the fuel system, nor was one required.

An engineer from the FAA aircraft certification office (ACO) Anchorage, Alaska told the NTSB IIC that by measuring a supplemental type certificate approved (STC) metal tank, and extrapolating the measurements from the FAA form 337 he estimated the total fuel to be 22.5 gallons and the unusable fuel to be about four to five gallons per fuel tank.

The closest weather reporting facility is at the Talkeetna Airport, Talkeetna about 30 miles east of the accident site. About 23 minutes after the accident, at 2153, an aviation routine weather report (METAR) reported in part: wind from 210 degrees, at 5 knots, visibility, 10 statute miles; sky, clear; temperature, 59 degrees F; dew point 36, degrees F; altimeter, 30.04 inHg.

Pilot Information

Certificate:	Private	**Age:**	47
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	November 26, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	July 30, 2013
Flight Time:	432 hours (Total, all aircraft), 93 hours (Total, this make and model), 373 hours (Pilot In Command, all aircraft), 6 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Aeronca	**Registration:**	N1301H
Model/Series:	15AC	**Aircraft Category:**	Airplane
Year of Manufacture:	1949	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	15AC-325
Landing Gear Type:	Tailwheel	**Seats:**	4
Date/Type of Last Inspection:	July 1, 2014 Annual	**Certified Max Gross Wt.:**	2050 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	3676 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	O-360-A1A
Registered Owner:	On file	**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PATK	**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	15°C / 2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Anchorage, AK	**Type of Flight Plan Filed:**	None
Destination:	Talkeetna, AK (PVT)	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	Dollar Creek PVT	**Runway Surface Type:**	Dirt
Airport Elevation:	2000 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	62.517223,-150.945281(est)

Administrative Information

Investigator In Charge (IIC):	Banning, David
Additional Participating Persons:	Brandon Parker; Federal Aviation Administration; Anchorage, AK Dave Swartz; Federal Aviation Administration; Anchorage, AK Burl A Rogers; Burl's Aircraft LLC; Chugiak, AK
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Note:	
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