Aviation Investigation Final Report

Location:	Butler, Pennsylvania	**Accident Number:**	ERA18LA163
Date & Time:	June 7, 2018, 11:00 Local	**Registration:**	N7765X
Aircraft:	Vans RV4	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Shortly after takeoff on an extended crosswind leg about 800 ft mean sea level, the engine lost total power. The private pilot continued ahead and landed the airplane in a field. During the landing, the airplane impacted a wire fence and brush, which resulted in substantial damage to the fuselage and wings.

During postaccident interviews, the pilot reported that this was the first flight after he had made maintenance repairs to the automobile-converted engine due to an engine failure 1 month before the accident. He stated that he installed an aftermarket engine control unit and modified the fuel delivery software, which resulted in the engine running too lean for flight and likely caused detonation and piston damage to occur. During the run-up before the accident flight, the pilot was aware that the engine was not producing power as it should. However, he decided to depart with a known engine problem, and his decision to do so led to the accident.

Probable Cause and Findings

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

The pilot's improper decision to fly the airplane with a known engine problem and his improper modification of the engine control unit fuel delivery software, which led to the engine running too lean and resulted in a total loss of engine power during climb.

Findings

Personnel issues	Decision making/judgment - Pilot
Personnel issues	Modification/alteration - Pilot
Aircraft	(general) - Incorrect service/maintenance
Aircraft	(general) - Incorrect service/maintenance
Aircraft	(general) - Failure
Environmental issues	Fence/fence post - Contributed to outcome
Environmental issues	Wire - Contributed to outcome

Factual Information

History of Flight

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

On June 7, 2018 about 1100 eastern standard time, an experimental amateur-built Vans Aircraft RV-4, N7765X, was substantially damaged during a forced landing shortly after takeoff from Pittsburgh/Butler Regional Airport (BTP), Butler, Pennsylvania. The private pilot sustained minor injuries. The personal flight was operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight.

According to the pilot, after takeoff from runway 26 at BTP, while flying on an extended crosswind traffic pattern leg about 800 ft mean sea level, the engine lost total power. He subsequently continued ahead, maintained best glide speed, and landed in a field. During the landing, the airplane impacted a wire fence and brush. The fuselage and wings sustained substantial damage.

The pilot further reported that that this was the first flight after maintenance repairs he had performed to the airplane's automobile-converted engine, due to a prior engine failure that occurred about one month earlier. During the repair, he replaced all four pistons on the engine. He also stated that he had installed an "aftermarket ECU [engine control unit]," and modified the fuel delivery software to lean the fuel to air mixture for improved engine starts. In discussing the engine failure that occurred during the accident flight, the pilot stated that the "cause of the engine failure was my entering a bad tune which caused the engine to run lean under high load. Detonation occurred and caused a piston to melt halting the engine."

According to a Federal Aviation Administration inspector, the pilot reported that he had previously "burnt through a piston" with this engine during flight. The pilot also reported that during the run-up on the day of the accident, the engine was "not as strong" as it should had been, but he decided to fly anyway.

The pilot held a private pilot certificate with a rating for airplane single-engine land. He also held a repairman experimental aircraft builder certificate, limited to inspection of the accident airplane. He reported total flight experience of 420 hours and 90 hours in the accident make and model airplane. His most recent Basic Medical requirements were completed in June 2017. His most recent flight review was in July 2017.

The two-seat, low-wing, fixed landing gear, single-engine airplane was manufactured in 2015. It was equipped with an automobile converted, fuel-injected, General Motors Ecotec L61, 142-horsepower engine.

The weather conditions reported at 1056 at BTP, included variable wind at 3 knots, visibility 10 statute miles, clear skies, temperature 17°C, and dew point 10°C.

Pilot Information

Certificate:	Private	**Age:**	73,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	BasicMed None	**Last FAA Medical Exam:**	June 6, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	July 15, 2017
Flight Time:	420 hours (Total, all aircraft), 90 hours (Total, this make and model), 420 hours (Pilot In Command, all aircraft), 1 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Vans	**Registration:**	N7765X
Model/Series:	RV4 UNDESIGNAT	**Aircraft Category:**	Airplane
Year of Manufacture:	2015	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	3890
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	October 25, 2017 Annual	**Certified Max Gross Wt.:**	1500 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	90 Hrs at time of accident	**Engine Manufacturer:**	General Motors
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	ECOTEC L61
Registered Owner:		**Rated Power:**	142 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:	BTP,1248 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	10:56 Local	**Direction from Accident Site:**	80°
Lowest Cloud Condition:	Clear	**Visibility**	
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.12 inches Hg	**Temperature/Dew Point:**	17°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Butler, PA (BTP)	**Type of Flight Plan Filed:**	None
Destination:	Butler, PA (BTP)	**Type of Clearance:**	None
Departure Time:	10:56 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	PITTSBURGH/BUTLER RGNL BTP	**Runway Surface Type:**	Asphalt
Airport Elevation:	1248 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	26	**IFR Approach:**	None
Runway Length/Width:	4801 ft / 100 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:**	40.756111,-79.950553(est)

Administrative Information

Investigator In Charge (IIC):	Gerhardt, Adam
Additional Participating Persons:	David S Shanahan; FAA/ FSDO; Pittsburgh, PA
Original Publish Date:	February 5, 2019
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97431