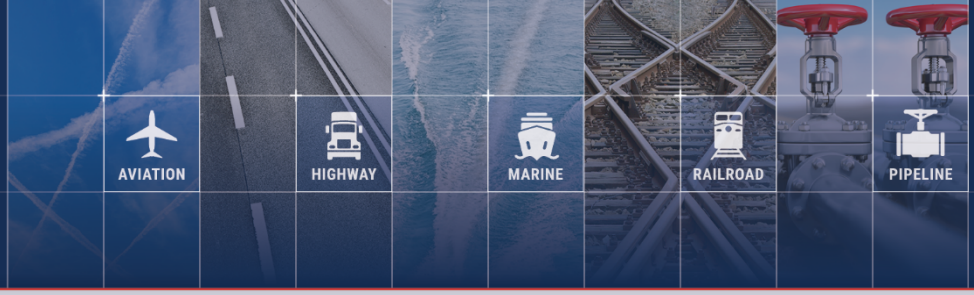

Aviation Investigation Final Report

Location:	Apex, North Carolina	**Accident Number:**	ERA14LA208
Date & Time:	April 27, 2014, 17:00 Local	**Registration:**	N6364V
Aircraft:	ALON A2	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	2 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot stated that, before the accident flight, the airplane had about 15 gallons of automotive gasoline in the fuel tanks. The taxi and initial takeoff were "normal"; however, when the airplane was about 100 ft above the trees that bordered the airport, the engine experienced a sudden total loss of power. The pilot then reduced the throttle and reapplied full throttle. Although the engine momentarily restarted, it then immediately lost power. The airplane subsequently impacted trees and came to rest inverted. Local authorities reported a strong fuel smell at the accident location, but the exact amount of spilled fuel could not be determined. Examination of the airframe and a subsequent test run of the engine revealed no mechanical anomalies that would have precluded normal operation.

Federal Aviation Administration guidance indicates that vapor lock is a problem that mostly affects gasoline-fueled internal combustion engines and can result in a transient or complete loss of power. The guidance further states that restarting the engine from this state may be difficult because fuel can be vaporized by engine heat. Given that the ambient air temperature, the fuel flow condition (takeoff), and the likely engine temperature were conducive to the occurrence of vapor lock, it is possible that the loss of engine power was due to vapor lock; however, insufficient evidence existed to determine whether vapor lock occurred during the accident flight. The weather conditions about the time of the accident were conducive to the accumulation of carburetor icing at cruise and glide power; however, given the pilot's statement that the engine operated "normally" until the sudden loss of power and that the airplane was climbing at a high power setting, it is not likely that the carburetor accumulated ice.

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 climb for reasons that could not be determined during postaccident examination and testing.

Findings

Not determined	(general) - Unknown/Not determined
Environmental issues	Tree(s) - Contributed to outcome

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 April 27, 2014, about 1700 eastern daylight time, an Alon A2, N6364V, experienced a total loss of engine power shortly after takeoff from Deck Airpark (NC11), Apex, North Carolina. The pilot subsequently made an off-airport forced landing into a forest. The private pilot sustained minor injuries, and the passenger was not injured. Visual meteorological conditions prevailed and no flight plan was filed for the local flight. The airplane was registered to and operated by a private individual under the provisions of Title 14 Code of Federal Regulations Part 91 as a personal flight.

The pilot reported that the taxi and initial takeoff were "normal;" however, when the airplane was about 100 feet above the trees that bordered the airport, the engine experienced a total loss of power. The pilot retarded the throttle and immediately reapplied full throttle. The engine subsequently restarted, but immediately lost power again. He then performed a forced landing into the trees, about 500 feet past the departure end of the runway. The pilot reported that he had about 15 gallons of autogas in the fuel tanks prior to departure.

Pilot Information

Certificate:	Private	**Age:**	74
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	August 20, 2013
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	August 6, 2013
Flight Time:	1525.5 hours (Total, all aircraft), 38.2 hours (Total, this make and model), 1471.5 hours (Pilot In Command, all aircraft), 3.2 hours (Last 90 days, all aircraft), 1 hours (Last 30 days, all aircraft)		

According to pilot provided information and Federal Aviation Administration (FAA) records, the pilot held a private pilot certificate with a rating for airplane single-engine land. He held a third-class medical certificate, which was issued on August 20, 2013. The pilot reported 1471.6 total flight hours, with 38.3 of those hours in the accident airplane make and model.

Aircraft and Owner/Operator Information

Aircraft Make:	ALON	**Registration:**	N6364V
Model/Series:	A2	**Aircraft Category:**	Airplane
Year of Manufacture:	1965	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	A-40
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	January 4, 2014 Annual	**Certified Max Gross Wt.:**	1450 lbs
Time Since Last Inspection:	7 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1878.89 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	C90-16F
Registered Owner:	On file	**Rated Power:**	90 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The accident airplane, an Alon A2 (serial number A-40), was manufactured in 1965. It was registered with the FAA on a standard airworthiness certificate for normal operations. The airplane had a total time of 1,872.36 hours as of the last annual inspection, which was completed on January 4, 2014. The airplane was powered by a Continental C90 series engine. As of the last annual inspection, the engine had accumulated a total of 1,661 hours, with 287 hours since last major overhaul.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KRDU,437 ft msl	**Distance from Accident Site:**	11 Nautical Miles
Observation Time:	16:51 Local	**Direction from Accident Site:**	37°
Lowest Cloud Condition:	Scattered / 25000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.92 inches Hg	**Temperature/Dew Point:**	28°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Apex, NC (NC11)	**Type of Flight Plan Filed:**	None
Destination:	Grays Creek, NC (2GC)	**Type of Clearance:**	None
Departure Time:	17:00 Local	**Type of Airspace:**	

The 1651 recorded weather observation at Raleigh-Durham International Airport (RDU), Raleigh, North Carolina, located approximately 10 miles to the northeast of the accident location, included wind from 210 degrees at 6 knots, 10 miles visibility, scattered clouds 25,000 feet above ground level, temperature 28.3 degrees C, dew point 8.9 degrees C; altimeter setting 29.92 inches of mercury

Airport Information

Airport:	DECK AIRPARK NC11	**Runway Surface Type:**	Grass/turf
Airport Elevation:	338 ft msl	**Runway Surface Condition:**	Dry;Vegetation
Runway Used:	22	**IFR Approach:**	None
Runway Length/Width:	1950 ft / 100 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Minor	**Latitude, Longitude:**	35.73611,-78.922775(est)

Initial examination of the aircraft by an FAA inspector revealed that the airplane impacted several trees and came to rest inverted between two trees, resulting in substantial damage to the wings and fuselage. Local authorities reported to the inspector that there was a strong fuel smell at the accident scene; however, the fuel tank selected at takeoff was not noted or provided to the NTSB.

Additional Information

A subsequent examination, of the engine at a storage facility, under NTSB oversight, revealed minimal external damage. The throttle, mixture, and carburetor heat controls remained attached to the engine and operated without anomalies. The engine remained attached to the airframe and was fitted with a 5 gallon fuel container, between the wing root and the carburetor, to facilitate an engine run. The wings were removed at the wing root to facilitate transport, and continuity was not confirmed from fuel tank to the separation point. The engine started and operated through various power settings with no abnormalities noted. No anomalies were noted from the 5 gallon fuel container through the fuel system.

FAA Guidance

According to an NTSB accident report (ERA12LA131), testing conducted at the FAA Technical Center revealed that vapor pressure of autogas can vary widely as formulations are changed seasonally, and according to local requirements. High vapor pressure can promote vapor lock in aircraft fuel systems causing engine power to be reduced or the engine to completely fail and testing by the FAA William J. Hughes Technical Center concluded that autogas with high vapor pressure can accelerate the formation of carburetor ice.

The Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A) defines vapor lock as "A problem that mostly affects gasoline-fuelled internal combustion engines. It occurs when liquid fuel changes state from liquid to gas while still in the fuel delivery system. This disrupts the operation of the fuel pump, causing loss of feed pressure to the carburetor or fuel injection system, resulting in transient loss of power or complete stalling. Restarting the engine from this state may be difficult. The fuel can

vaporize due to being heated by the engine, by the local climate, or due to a lower boiling point at high altitude."

DOT/FAA/CT-87/05 "Autogas in General Aviation Aircraft," states in part "The conditions which define the worst case for vapor lock testing (i.e., most likely to result in vapor lock) are as follows.
1. Takeoff fuel flow
2. Initial fuel temperature between 38 and 43 degrees Celsius (100 to 110 degrees Fahrenheit)
3. Ambient air temperature of 29 degrees Celsius or higher (85 degrees Fahrenheit).
4. Engine at operating temperatures typically found after a prolonged idling or a hot soak.
5. ASTM class E (winter grade) fuel if the testing is for autogas"

An FAA chart, titled "Conditions Favoring Carb Ice Formation," indicated that with the ambient temperature and dew point, "Icing at glide and cruise power" was probable.

Administrative Information

Investigator In Charge (IIC):	Etcher, Shawn
Additional Participating Persons:	Duane R Burns; FAA/FSDO; Greensboro, NC John Kent; CMI; Mobile, AL
Original Publish Date:	February 4, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89121