# National Transportation Safety Board
# Aviation Accident Final Report

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| **Location:** | Fayetteville, NC | **Accident Number:** | ERA16LA066 |
| **Date & Time:** | 12/11/2015, 1931 EST | **Registration:** | N3241N |
| **Aircraft:** | RAYTHEON AIRCRAFT COMPANY A36 | **Aircraft Damage:** | Substantial |
| **Defining Event:** | Powerplant sys/comp malf/fail | **Injuries:** | 1 Serious, 3 Minor |
| **Flight Conducted Under:** | Part 91: General Aviation - Personal | | |

## Analysis

During a cross-country flight at night, the airplane experienced a total loss of engine power. The private pilot's attempts to restart the engine were unsuccessful. The pilot attempted to glide the airplane to a diversionary airport, but when he realized the airplane would not reach the airport, he conducted a forced landing into wooded terrain.

Teardown examination of the engine revealed that the No. 1 cylinder and No. 3 connecting rod had fractured. Metallurgical examination revealed that there was a gray rubbery substance on the case halves, through bolts, and main bearing saddle faces, which could have restricted oil flow. The engine manufacturer's overhaul manual and a service bulletin and service information letter (SIL) listed only one approved sealant for use between case halves, which was similar in color and texture to grape jelly not to the rubbery gray sealant found in the engine, which was not an approved sealant. Further, the SIL stated that the use of an incorrect sealant "on mating threads and between mating surfaces can cause incorrect torque application and subsequent engine damage or failure."

Further, the No. 3 connecting rod journal exhibited heat damage and deformation, and the No. 3 connecting rod fracture was consistent with a lack of lubrication. Additionally, the No. 4 main bearing saddle boss exhibited fretting damage, consistent with bearing shift due to lack of torque on the through bolts and blockage of its oil port, which also would have restricted oil flow.

Review of maintenance records revealed that the engine was overhauled about 20 months before the accident. The engine had been operated for about 300 hours during that time. It is likely that maintenance personnel applied the unapproved sealant to the engine case halves during the engine overhaul, which ultimately resulted in the total loss of engine power.

## Probable Cause and Findings

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

Maintenance personnel's application of an unapproved sealant to the engine case halves during engine overhaul, contrary to manufacturer's instructions, which resulted in lubrication restriction due to a bearing shift and the subsequent internal failure of the engine due to the loss of case through-bolt torque.

### Findings

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| **Aircraft** | Maintenance/inspections - Incorrect service/maintenance (Cause) |
| | Oil - Fluid level (Cause) |
| **Personnel issues** | Unauthorized maint/repair - Maintenance personnel (Cause) |
| | Use of policy/procedure - Maintenance personnel (Cause) |

## Factual Information

On December 11, 2015, at 1931 eastern standard time, a Beechcraft A36, N3241N, was substantially damaged during a forced landing to a wooded area after a total loss of engine power near Fayetteville, North Carolina. The private pilot and two passengers received minor injuries, and one passenger received serious injuries. Nighttime visual meteorological conditions prevailed and an instrument flight rules flight plan was filed. The personal flight departed Bay Bridge Airport (W29), Stevensville, Maryland about 1730 destined for Charleston Executive Airport (JZI), Charleston, South Carolina. The airplane was operated by the private pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91.

According to the pilot, about 2 hours after takeoff the airplane was in cruise flight at 8,000 feet when the engine suddenly lost power. Engine power was restored for a few seconds, and then the airplane lost engine power again as the propeller "windmilled." The pilot turned the airplane toward Fayetteville Regional Airport (FAY) for a forced landing, and the propeller stopped turning during the descent. Attempts to restart the engine were unsuccessful. As the airplane approached FAY, the pilot determined that he was below the visual approach slope indicator lighting glidepath and that the airplane would not reach the airport and performed a forced landing to wooded terrain.

Examination of the wreckage at the accident site by a Federal Aviation Administration (FAA) inspector revealed that the airplane came to rest upright on the floor of a pine forest area. The engine and mounts separated from the firewall. The left wing was crushed and curled upward from about mid-span to the wing tip. A portion of the right wing was separated outboard of the flap and was located in the debris path about 25 yards prior to the main wreckage. The landing gear and flaps were found in the retracted position.

The airframe and engine were subsequently examined at a recovery facility under the supervision of a National Transportation Safety Board (NTSB) investigator. Fuel was present in both main tanks and both tip tanks, the fuel selector valve functioned normally, and the auxiliary pump switch was in the on position. Teardown examination of the engine revealed metal fragments from the No. 1 cylinder in the oil sump and internal damage including one connecting rod separated from the crankshaft, and two other connecting rods exhibiting discoloration consistent with heat damage. Additionally, a gray colored rubbery substance was observed on the mating surfaces of the crankcase halves. Engine components were forwarded to the NTSB Materials Laboratory, Washington, DC, for further examination. Metallurgical examination revealed beads of gray sealant on the through bolts and on the main bearing saddle faces, which can restrict oil flow. The No. 3 connecting rod journal exhibited heat damage and deformation and the No. 3 connecting rod was fractured, consistent with a lack of lubrication. Additionally, the No. 4 main bearing saddle boss exhibited fretting damage, consistent with bearing shift and blockage of its oil port, restricting oil flow.

Review of maintenance records revealed that the airplane's most recent annual inspection was completed on October 15, 2015. At that time, the engine had accumulated 300.6 hours since major overhaul. The engine was overhauled by Aero Engines of Winchester, Inc. on April 21, 2014.

Teledyne Continental Motors (TCM) Service Information Letter (SIL)99-2B, published October 17, 2005, related to current authorized sealants, lubricants, and adhesives. The SIL did not list any sealant on the mating surfaces of the crankcase halves except Gasket Maker P/N 646942 – or Loctite 515 Gasket Eliminator Sealant (or its predecessor, Permatex Aviation Grade 3D). Additionally, review of the overhaul manual revealed instructions to apply only TCM Sealant P/N 654663, which was Loctite 515, and silk thread P/N 641543 to the crankcase halves.

According to the Manager of Air Safety at Continental Motors Inc., the gray rubber sealant found in the engine was not consistent with Loctite 515, which appears in color and texture like grape jelly.

Additionally, review of TCM Service Bulletin (SB)96-7C, published February 8, 2005, which related to torque values for fasteners on all TCM engines, stated: "WARNING THE USE OF SEALANTS OR LUBRICANTS OTHER THAN THOSE SPECIFIED BY TCM ON MATING THREADS AND BETWEEN MATING SURFACES CAN CAUSE INCORRECT TORQUE APPLICATION AND SUBSEQUENT ENGINE DAMAGE OR FAILURE."

The FAA Subsequently published Special Airworthiness Information Bulletin (SAIB) NE-16-13, "Powerplant – Prohibited use of sealant" on March 8, 2016. According to the FAA principle maintenance inspector of Aero Engines LLC. (formerly Aero Engines of Winchester, Inc.), he performed a compliance action after the accident for Aero Engines to use only the specific sealant part number and product name (not MIL-SPEC [military standard]) specified by the engine manufacturer when overhauling their respective make and model engine. Additionally, Aero Engines reviewed all their overhauls for unapproved sealants and did not find any other subsequent cases. As of the publication of this report, there have been no further similar engine failures that were overhauled by Aero Engines. There was one previous case (NTSB ID No. ERA14FA313) of a similar failure of an engine overhauled by Aero Engines.

## History of Flight

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| **Enroute-cruise** | Powerplant sys/comp malf/fail (Defining event) |
| | Loss of engine power (total) |
| | Attempted remediation/recovery |
| **Emergency descent** | Off-field or emergency landing |

## Pilot Information

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| **Certificate:** | Private | **Age:** | 46, Male |
| **Airplane Rating(s):** | Single-engine Land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | 3-point |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 3 Without Waivers/Limitations | **Last FAA Medical Exam:** | 12/04/2013 |
| **Occupational Pilot:** | No | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | 538 hours (Total, all aircraft), 245 hours (Total, this make and model), 502 hours (Pilot In Command, all aircraft), 20 hours (Last 90 days, all aircraft), 7 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | RAYTHEON AIRCRAFT COMPANY | **Registration:** | N3241N |
| **Model/Series:** | A36 | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | 1999 | **Amateur Built:** | No |
| **Airworthiness Certificate:** | Utility | **Serial Number:** | E-3241 |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | 6 |
| **Date/Type of Last Inspection:** | 10/15/2015, 100 Hour | **Certified Max Gross Wt.:** | 3651 lbs |
| **Time Since Last Inspection:** | 39 Hours | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | 1736 Hours at time of accident | **Engine Manufacturer:** | Continental |
| **ELT:** | C126 installed, activated, did not aid in locating accident | **Engine Model/Series:** | IO-550-B |
| **Registered Owner:** | ACES AVIATION LLC | **Rated Power:** | 300 hp |
| **Operator:** | On file | **Operating Certificate(s) Held:** | None |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual Conditions | **Condition of Light:** | Night |
| **Observation Facility, Elevation:** | FAY, 189 ft msl | **Distance from Accident Site:** | 3 Nautical Miles |
| **Observation Time:** | 1953 EST | **Direction from Accident Site:** | 270° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 Miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 6 knots / | **Turbulence Type Forecast/Actual:** | / None |
| **Wind Direction:** | 220° | **Turbulence Severity Forecast/Actual:** | / N/A |
| **Altimeter Setting:** | 30.09 inches Hg | **Temperature/Dew Point:** | 16°C / 14°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | STEVENSVILLE, MD (W29) | **Type of Flight Plan Filed:** | IFR |
| **Destination:** | CHARLESTON, SC (JZI) | **Type of Clearance:** | IFR |
| **Departure Time:** | 1730 EST | **Type of Airspace:** | Class C; Class E |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Minor | **Aircraft Damage:** | Substantial |
| **Passenger Injuries:** | 1 Serious, 2 Minor | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 1 Serious, 3 Minor | **Latitude, Longitude:** | 34.990000, -78.829722 (est) |

## Administrative Information

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| **Investigator In Charge (IIC):** | Douglass P Brazy | **Report Date:** | 11/15/2018 |
| **Additional Participating Persons:** | Jonathan Turner; Federal Aviation Administration; Greensboro, NC<br>John Kent; Continental Motors Inc.; Mobile, AL | | |
| **Publish Date:** | 11/15/2018 | | |
| **Note:** | The NTSB did not travel to the scene of this accident. | | |
| **Investigation Docket:** | http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=92437 | | |