Aviation Investigation Final Report

Location:	Anchorage, Alaska	**Incident Number:**	ANC16IA013
Date & Time:	January 7, 2016, 11:00 Local	**Registration:**	N395CE
Aircraft:	ROBINSON HELICOPTER COMPANY R44 II	**Aircraft Damage:**	None
Defining Event:	Loss of engine power (total)	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The flight instructor reported that the purpose of the flight was to do a postmaintenance check flight after servicing and overhaul of the helicopter's fuel injection servo assembly. The instructor stated that, after an extensive preflight inspection was completed, the helicopter was moved outside the hangar. The helicopter's engine was started and allowed to warm up for about 10 minutes, and all ground run-up checks were satisfactory. While operating at 100 percent rotor rpm and while raising the collective to begin the takeoff, the engine abruptly experienced a total loss of power.The helicopter remained on the ground and did not sustain damage.

A detailed examination, which included disassembly of the fuel injection servo, revealed white contamination ranging in consistency from grease-like to solid throughout the entire fuel servo assembly. The lubricant was used in excess and in locations not approved by the manufacturer's maintenance manual. It is likely that the contamination throughout the fuel injection servo caused a disruption in fuel flow, which resulted in a total loss of engine power.

Probable Cause and Findings

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

The overhaul facility's improper and excessive use of an approved lubricant during overhaul of the fuel injection servo, which resulted in a disruption of fuel flow and a total loss of engine power.

Findings

Aircraft	Fuel distribution - Incorrect service/maintenance

Factual Information

History of Flight

Takeoff	Loss of engine power (total) (Defining event)

On January 7, 2016, about 1100 Alaska standard time, a Robinson R44 II helicopter, N395CE, sustained a total loss of engine power just prior to departure at the Anchorage International Airport, Anchorage, Alaska. The private pilot, who was the helicopter owner, and his flight instructor were not injured. The helicopter sustained no damage as a result of the incident. The helicopter was registered to, and operated by, Airglas, Inc., under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and no flight plan had been filed.

During an on-scene interview with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on January 7, the flight instructor reported that the purpose of the flight was to do a post maintenance check flight after servicing and overhaul of the helicopter's fuel injection servo assembly. The instructor stated that after an extensive preflight inspection was completed, the helicopter was moved outside of the hangar. The helicopter's engine was started and allowed to warm up for about 10 minutes, and all ground run-up checks were satisfactory. He said that while operating at 100 percent rotor rpm and while raising the collective to begin the takeoff, the engine abruptly lost all power.

The helicopter was equipped with a fuel injected, Lycoming IO-540 series engine.

A postincident inspection of the fuel servo assembly revealed a white, greasy substance within the venturi of the servo assembly.

The helicopter's maintenance records revealed that the fuel injection servo had been overhauled on December 14, 2015 by Alaskan Aircraft Engines, Inc., Anchorage, before being reinstalled on the accident helicopter.

On January 14, the NTSB IIC along with another NTSB investigator, and a representative from Precision Airmotive LLC, examined the fuel injection servo at the facilities of Precision Airmotive in Marysville, Washington. Due to excessive white grease like contamination behind the test port plugs the servo was not flow tested. Disassembly inspection revealed large amounts of white contamination ranging in consistency from grease like to solid. The contamination was present in the manual mixture control valve, idle valve plate, fuel section O-rings, and the fuel diaphragm with the bleed port almost completely blocked.

On January 19, the NTSB IIC along with another NTSB investigator, and two FAA aviation safety inspectors, visited the facilities of Alaska Aircraft Engines, Inc., in Anchorage, and disassembled a recently overhauled fuel injection servo. The inspection revealed excessive amounts of a white grease like substance throughout the fuel injection servo, consistent with the servo removed from the accident helicopter. A representative from Alaska Aircraft Engines stated that about 6 months prior they had switched assembly lubricants to Dupont Krytox an approved lubricant, but due to the investigation

realized it was not being used in accordance with the maintenance manual and ended in excessive and inappropriate application.

Dupont describes Krytox 240 series greases in part: as white, buttery greases based on perfluoropolyether (PFPE) oils. These synthetic fluorinated lubricants are used in extreme conditions such as continuous high temperatures up to 300°C (572°F) and higher temperatures for shorter periods, depending on product grade limits. Chemically inert and safe for use around hazardous chemicals, these lubricants are nonflammable and are safe for use in oxygen service.

A review of the Precision Airmotive Corporation Aircraft Fuel Injection Maintenance Manual for the RSA-10-AD1 Fuel Injection Servo Assembly lists three places where Krytox is to be used during assembly and states, in part:

"Apply Krytox or Braycote on mixture control lever assembly between lever stop and preformed packing.

NOTE: Remove excess Braycote or Krytox with Fluoroclean X-100.

Apply Krytox or Braycote on idle valve shaft outboard preformed packing

NOTE: Remove excess Braycote or Krytox with Fluoroclean X-100.

Place servo stem spring over stem of fuel diaphragm assembly Lubricate threaded portion of diaphragm with ASTM Number 5 or Vaseline. Apply a light film of Krytox or Braycote to the concave side of seal. Place servo stem seal over stem with flange and concave side up. Press seal down on diaphragm stem to engage it at the spring. Remove lubricant from stem."

In a conversation with the NTSB IIC, a representative from Precision Airmotive LLC stated that Krytox should be applied in a thin light coat, with all excess removed in only the locations specified in the maintenance manual.

On January 19, Alaska Aircraft Engines issued a Service Advisory that stated, in part: "Beginning in June of 2015 Alaskan Aircraft Engines purchased and began use of an approved assembly lube it had not used previously. This lube was used in excess and in locations not required by the manufacturer's service manual. We believe this has the potential to cause a fuel distribution problem."

Pilot Information

Certificate:	Private	**Age:**	47,Male
Airplane Rating(s):	Single-engine land; Single-engine sea	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	May 28, 2015
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 23, 2015
Flight Time:	1386.4 hours (Total, all aircraft), 162.6 hours (Total, this make and model), 1261.9 hours (Pilot In Command, all aircraft)		

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	58,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Helicopter; Instrument airplane; Instrument helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	March 10, 2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 23, 2015
Flight Time:	(Estimated) 5000 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER COMPANY	**Registration:**	N395CE
Model/Series:	R44 II	**Aircraft Category:**	Helicopter
Year of Manufacture:	2007	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	11647
Landing Gear Type:	N/A; Skid	**Seats:**	
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	LYCOMING
ELT:		**Engine Model/Series:**	IO-540-AE1A5
Registered Owner:	On file	**Rated Power:**	0 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:		**Distance from Accident Site:**	
Observation Time:	19:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Few / 6500 ft AGL	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	10°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.87 inches Hg	**Temperature/Dew Point:**	-7°C / -9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Anchorage, AK (ANC)	**Type of Flight Plan Filed:**	None
Destination:	Anchorage, AK (ANC)	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class B

Airport Information

Airport:	TED STEVENS ANCHORAGE INTL ANC	**Runway Surface Type:**	
Airport Elevation:	151 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	None
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	61.174167,-149.998062(est)

Administrative Information

Investigator In Charge (IIC):	Banning, David
Additional Participating Persons:	Danny Odom ; Federal Aviation Administration; Anchorage , AK Peter Nielson; Precision Airmotive LLC; Arlington, WA
Original Publish Date:	December 12, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=92562