Aviation Investigation Final Report

Location:	Blythe, California	**Accident Number:**	WPR10FA029
Date & Time:	October 22, 2009, 20:20 Local	**Registration:**	N119AH
Aircraft:	Agusta A119	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	5 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Air Medical (Medical emergency)		

Analysis

During the emergency medical service (EMS) flight, while enroute at 4,500 feet mean sea level, the pilot heard a change in the sound of the main rotor system, followed by a vibration in the cyclic. He applied aft cyclic to slow the helicopter and noticed the rotor rpm starting to decay. After he lowered the collective in an attempt to regain rotor rpm everything appeared to stabilize. The pilot then increased the collective to see if he could re-establish cruise power, but the increase in collective resulted in the low rotor aural warning activating. When the pilot lowered the collective, the warning went out, and when he tried to maintain rotor rpm by using the throttle in the manual mode there was no change, which resulted in the warning system activating again. The pilot then lowered the collective, returned the throttle to the normal position and began a descent, touching down in soft dirt and sliding forward before coming to rest upright. The helicopter was substantially damaged as a result of the hard landing, which separated the tail section. During the postaccident examination, the engine was tested in the gas generator and the power turbine modes, as well as the electronic engine control (EEC) and mechanical engine control (MEC) modes. The engine was observed to run normally to all inputs in gas generator, EEC and MEC control modes, with manual override also observed to function normally. During a subsequent engine test a reduction in gas generator speed of 8 percent occurred, with the engine fully recovering power in about 5 seconds. Additional testing could not replicate the power reduction as previously observed, and the reason for the reported loss of engine power could not be definitively determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The loss of engine power during cruise flight for undetermined reasons.

Findings

Not determined	(general) - Unknown/Not determined
Aircraft	Fuel controlling system - Malfunction

Factual Information

History of Flight

Enroute	Loss of engine power (partial) (Defining event)
Emergency descent	Off-field or emergency landing
Autorotation	Hard landing

HISTORY OF FLIGHT

On October 22, 2009, about 2020 Pacific daylight time, an Agusta A119 helicopter, N119AH, sustained substantial damage following a loss of power and subsequent forced landing near Blythe, California. The airline transport pilot, a flight nurse, two flight medics and the sole patient were not injured. The helicopter was operated by Tri state CareFlight LLC of Bullhead City, Arizona. The aero medical flight was being operated in accordance with Title 14 Code of Federal Regulations Part 135, and a company flight plan was filed and activated at the time of the accident. Visual meteorological conditions prevailed for the cross-country flight, which had departed the Blythe Airport (BLH) about 1959, and was destined for a local hospital in Palm Springs, California.

In a report submitted to the National Transportation Safety Board (NTSB)investigator-in-charge (IIC), the pilot reported that while en route and after having climbed to 4,500 feet and established in level flight for about 5 to 7 minutes, he heard a change in [the] sound of the rotor system. The pilot stated that he then felt an unusual vibration in the cyclic. The pilot added that he then began to apply aft cyclic to slow the helicopter down and scanned the gauge[s], [when] he noticed that the rotor RPM was starting to decay. The pilot reported that he continued to reduce [airspeed] to about 90 knot[s] and lowered collective to regain rotor RPM. The pilot further reported that after things appeared to stabilize, he slowly pulled collective to see if he could re-establish cruise power. The pilot stated that when he pulled collective the low rotor warning system went off and the rotor tachometer confirmed [the] indication. The pilot revealed that he then lowered the collective again and the warning went out. The pilot added that he tried once more using the throttle in manual mode trying to maintain RPM, [but] there was no change in [the] results and the warning system went off a second time. The pilot reported that at that point he lowered collective, returned [the] throttle to [the] normal position and started a descent, pointing the helicopter towards the highway (Interstate Highway I-10) to get as close as he could for emergency help. The pilot revealed that with the aid of night vision goggles (NVGs) he made out a landing area, turned on the landing lights/night sun and proceeded to monitor his rotor RPM. The pilot stated that at about 200 feet (being read from the radar altimeter), he turned off his night sun, left the landing lights on and began to flare the helicopter. The pilot reported that the helicopter touched down with little forward speed and slid about 6 to 8 feet in soft dirt before coming to rest in an upright position. The pilot added that he attempted to shut the engine down but it continued to run for about 5 to 7 minutes

before he was finally able to get it to stop.

In an addendum to the pilot's original statement, the pilot reported, "I did not go all the way through the 'dead ban.' I raised the collective and I also rolled on throttle past the normal position." The pilot stated that there seemed to be a small delay in response of throttle in this configuration, and it was his opinion that he received the second low rotor RPM indication before the throttle had a chance to fully engage.

An on-site post accident examination revealed that the helicopter had come to rest in an upright position oriented on a westerly heading. The helicopter was intact with the exception of the tail section, which had been separated as a result of the hard landing. Each of the four main rotor blades remained attached at the rotor hub. There was no post crash fire. The helicopter was subsequently recovered to a secured salvage facility located in Phoenix, Arizona, for further examination.

PERSONNEL INFOMRATION

The pilot, age 45, held an airline transport pilot certificate with ratings for rotorcraft helicopter, instructor rotorcraft, as well as instrument helicopter and airplane single-engine land. His most recent Federal Aviation Administration (FAA) second-class medical certificate was issued on September 22, 2009. The pilot reported 3,866 total hours of flight experience, 3,162 hours of which were in rotorcraft, and 278 hours of which were in the Agusta A119. The pilot reported 99 hours, 24 hours, and 1 hour of flight time in the most recent 90 days, 30 days, and 24 hours respectively. The pilot's most recent flight review was conducted on July 21, 2009.

AIRCRAFT INFORMATION

According to the National Transportation Safety Board Form 6120.1 (Pilot/Operator Aircraft Accident/Incident Report Form), the helicopter had accrued 4,122 total aircraft hours at the time of the accident. According to the company's Director of Maintenance, the helicopter was on a progressive manufacturer's inspection program, and its most recent inspection was completed on October 5, 2009.

METEOROLOGICAL INFORMATION

At 2052, the BLH Automated Surface Observing System (ASOS), reported wind calm, visibility 10 miles, sky clear, temperature 23 degrees Celsius, dew point minus 2 degrees Celsius, and an altimeter setting of 29.82 inches of Mercury.

TESTS AND RESEARCH

At the request of the NTSB investigator-in-charge, and under the supervision of the Transportation Safety Board (TSB) of Canada, the engine, a Pratt & Whitney Canada (P&WC) PT6B-37A, serial number PU0001, underwent functional testing, which was performed from

November 10 through November 12, 2009, at the P&WC Longueuil Test Facility, Montreal, Canada.

According to the Pratt & Whitney report, the engine was tested in the Gas Generator Mode and the Power Turbine Governing Mode, and both the electronic engine control (EEC) and mechanical engine control (MEC) modes. The engine was observed to behave normally to all inputs in Gas Generator and Power Turbine Governing, in EEC, and MEC control modes. Manual override was also functioned normally.

The Pratt & Whitney report further stated that subsequent test data revealed an anomaly during one Power Lever Angle (PLA) acceleration maneuver with the dynamometer in Gas Generator (speed mode). A reduction in gas generator (NG) speed of 8% occurred during one of three accelerations with the same target condition. The engine fully recovered on its own within 5.2 seconds. Additional engine tests were carried out at a later time for further investigation, but could not replicate the previous observed event. It was reported that at no point in time during the extensive testing performed did the engine show a non-recoverable loss of power under steady state conditions as reported by the pilot. During the engine removal process after the second engine test, the pressure regulator (Pr) assembly on the fuel control unit (FCU), model DP-F2, serial number C68105, was observed to rotate relative to the FCU housing.

Fuel Control Unit (FCU)

Additionally, the Pratt & Whitney report revealed that FCU bench tests confirmed that the FCU met the accepted test procedure (ATP) requirements, but showed a fuel flow instability on the rig. The observed instability, however, occurred at a low p3-pressure (tested at 50 psia), which corresponds to a sub-flight idle condition and would not have affected the engine during the event as reported. The reported loss of power during the flight occurred at a much higher p3-pressure at an estimated 88 psia and for a more prolonged duration. The FCU bench tests showed in this region no signs of fuel flow instability, nor did the pilot report engine instability.

The FCU was bench tested at the supplier, Honeywell, and included a leak check on the Pr regulator; no leak was observed and no anomalies were noted. Manual manipulation of the Pr regulator assembly, however, resulted in an air leak and a temporary drop in fuel flow. It was observed that two of the three screws holding the housing to the FCU cover were loose (inadequate torque). The three screws were re-torqued to the required specifications and the FCU was re-tested with no anomalies noted.

The FCU was stripped and fine black powder was evident in the override section of the FCU. The source of the powder, which consisted of chromium and iron oxide particles, is unknown. Examination of the components in this section revealed no evidence of abnormal wear. The manual override function of the control was repeatedly verified during bench testing and no discrepancies were noted.

As a result of the examination and testing of the engine and the fuel control unit, the reason for the reported loss of engine power could not be determined.

Tristate CareFlight, reported to the IIC that two fuel control units, p/n 3244893, serial numbers C68103 and C68169, had both been returned to Honeywell in 2009 for evaluation following removal from their respective engines; the reason for their removal was indicated as NR droop. Honeywell reported that subsequent to both components being tested, disassembled, and inspected, it was determined that no fault was found with either fuel control unit that would have resulted in NR droop.

Electronic Engine Control (EEC)

At the request of the NTSB IIC and under the supervision of a FAA aviation safety inspector, the aircraft's Electronic Engine Control (EEC), serial number 01043897, model EEC37-1, was downloaded to recover engine fault data and any corresponding engine data at the facilities of Hamilton Sundstrand Repair Facility, Windsor Locks, Connecticut. The only process performed was a download of the fault data and corresponding engine data. No functional test of the unit was performed.

Electronic N2 Governor Unit (EGU)

At the request of the NTSB IIC and under the supervision of a FAA aviation safety inspector, the aircraft's Electronic N2 Governor Unit (EGU), serial number WDA4787, was tested and disassembled at the facilities of Woodward Governor Company, of Rockford, Illinois. The Woodward report revealed that the unit passed all test points during the acceptance test procedure (ATP) and that no discrepancies were found with the unit.

Rotary and Linear Variable Differential Transformers (RVDT & LVDT)

Under the supervision of a FAA aviation safety inspector and at the request of the NTSB IIC, the helicopter's Rotary Variable Differential Transformer (RVDT), serial number 1226, and Linear Variable Differential Transformer (LVDT), serial number 1744, were examined and bench tested at the facilities of Kavlico Corporation of Moorpark, California. The results of the examinations revealed that the RVDT was undamaged, while the LVDT armature was bent .008. Subsequently, Kavlico proceeded to test the LVDT in accordance with the acceptance test procedure. It was noted that when tested with the armature bent .008, the LVDT met the manufacturers' acceptance test parameters. The RVDT was also tested in accordance with the ATP and no discrepancies were noted.

Pilot Information

Certificate:	Airline transport	**Age:**	45,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter; Instrument helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	September 22, 2009
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	July 21, 2009
Flight Time:	3866 hours (Total, all aircraft), 278 hours (Total, this make and model), 3747 hours (Pilot In Command, all aircraft), 99 hours (Last 90 days, all aircraft), 24 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Agusta	**Registration:**	N119AH
Model/Series:	A119	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	14022
Landing Gear Type:	Skid	**Seats:**	4
Date/Type of Last Inspection:	October 5, 2009 Continuous airworthiness	**Certified Max Gross Wt.:**	5997 lbs
Time Since Last Inspection:	22 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	4122 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	Installed, not activated	**Engine Model/Series:**	PT6B-37A
Registered Owner:	TriState CareFlight LLC	**Rated Power:**	750 Horsepower
Operator:	TriState CareFlight LLC	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	IFJA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night/dark
Observation Facility, Elevation:	BLH,399 ft msl	**Distance from Accident Site:**	15 Nautical Miles
Observation Time:	20:52 Local	**Direction from Accident Site:**	90°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	350°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.84 inches Hg	**Temperature/Dew Point:**	21°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Blythe, CA (BLH)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Palm Springs, CA (7CA4)	**Type of Clearance:**	None
Departure Time:	19:59 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	4 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	5 None	**Latitude, Longitude:**	33.621944,-114.866668(est)

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	Dennis L Parr; Federal Aviation Administration; Riverside, CA Elaine Summers; Transport Safety Board of Canada Doug Hardy; Pratt and Whitney Canada Corp.; Longueuil, Quebec Sid Essex; TriState CareFlight; Bullhead City, AZ Wissam Eldib; AgustaWestland Company; Philidelphia, PA Lee Fisher; Honeywell; South Bend, IN
Original Publish Date:	March 20, 2012
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=74946