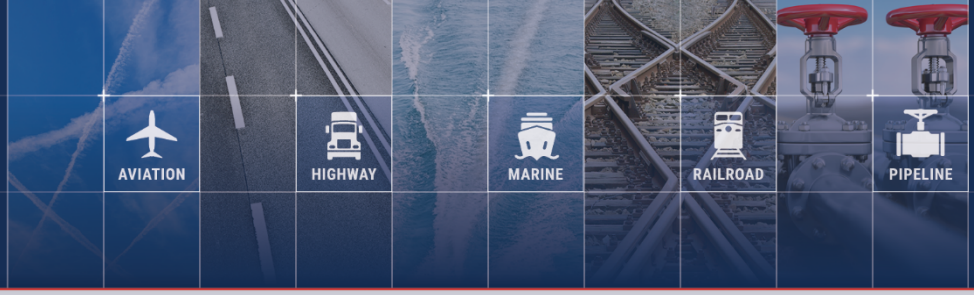

Aviation Investigation Factual Report

Location:	Monte Vista, Colorado	**Accident Number:**	CEN13LA443
Date & Time:	July 29, 2013, 07:35 Local	**Registration:**	N5324
Aircraft:	Grumman G-164A	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 None
Flight Conducted Under:	Part 137: Agricultural		

Factual Information

On July 29, 2013, at 0735 mountain daylight time, a Grumman model G-164A airplane, N5324, was substantially damaged during a forced landing following a loss of engine power near Monte Vista, Colorado. The airline transport pilot was not injured. The airplane was registered to and operated by Crop Care Inc., under the provisions of 14 Code of Federal Regulations Part 137, without a flight plan. Day visual meteorological conditions prevailed for the local aerial application flight that departed Monte Vista Municipal Airport (MVI), Monte Vista, Colorado, about 0730.

The pilot reported that the airplane experienced a partial loss of engine power while en route to the field to be sprayed. He jettisoned the airplane's chemical load following the loss of engine power, but the airplane was unable to maintain altitude and a forced landing was made in a pasture. During the forced landing, the right main landing gear separated from the fuselage after colliding with an irrigation ditch and the airplane subsequently nosed over. The airframe and wings sustained substantial damage during the forced landing.

The accident engine, a Pratt & Whitney model R-1340-AN-1, serial number ZP-102893, was last overhauled by Covington Aircraft Engines Inc. of Okmulgee, Oklahoma, on March 21, 2013. At the time of overhaul, the engine had accumulated about 10,125 hours since new. The overhauled engine was installed on the accident airplane on May 1, 2013, and had accumulated about 171 hours when the accident occurred.

A postaccident examination of the engine revealed a fracture of the No. 3 cylinder exhaust rocker housing. The entire cylinder was shipped to the National Transportation Safety Board (NTSB) Materials Laboratory for additional examination. The NTSB laboratory report indicated that the observed fracture extended from the rocker cap on the inside of the rocker housing to the rocker shaft, from the inner end of the rocker shaft around the housing to the outer end of the rocker shaft, and from the outer end of the rocker shaft to the rocker cap. The upper portion of the exhaust housing revealed two discolored zones on the inner surface of the outer side, consistent with a prolong exposure to the atmosphere. Additional examination of those discolored zones revealed arced edges that were consistent with fatigue.

The rocker assembly hardware from the No. 3 cylinder consisted of the shaft, the large castellated nut with a red O-ring seal, and the small castellated nut with a washer and black O-ring seal. The rocker assembly was consistent with the component breakdown found in the manufacturer's illustrated parts catalog. The rocker hardware was removed from the upper portion of the exhaust housing and the torque required to loosen the small nut (release torque) measured 250 inch-pounds (in-lbs).

A review of the manufacturer's overhaul instructions for the rocker assemblies indicated that the large castellated nut, including the red O-ring seal, is first installed on the shaft and rotated until the flats on the large end of the shaft are exposed enough for an open ended wrench to be engaged on them. The small end of the shaft is then inserted into the large bushing, through the rocker, and finally through the small bushing. The black O-ring seal, washer, and small castellated nut are then installed and the nut torqued to 200-250 in-lbs. The small nut is then further tightened to the next slot in the castellated nut.

The large nut, with the red O-ring seal, is tightened until it is snug against the shoulder of the bushing, and then further tightened to the next slot in the castellated nut. The final assembly is secured by inserting a cotterpin in each castellated nut. (An alternative assembly procedure is used when a copper-covered gasket is installed under the large castellated nut, followed by an oil seal against the shoulder of the bushing. The large castellated nut is initially torqued to 60-100 in-lbs when the alternative procedure is used.)

The cylinder inspection and assembly procedures used by the overhaul facility (Covington Aircraft Engines Inc.) were reviewed by a NTSB powerplant specialist. The overhaul facility's cylinder inspection procedures were in compliance with Pratt & Whitney Service Bulletin (SB) 1785 and Federal Aviation Administration (FAA) Airworthiness Directive (AD) 99-11-02. The observed rocker assembly differed from the manufacturer's overhaul instructions. The assembly procedure used by the overhaul facility was to first install the shaft, small end first, into the large bushing, through the rocker, and finally through the small bushing. The black O-ring seal, washer, and small castellated nut were then installed on the small end of the shaft. The small nut was torqued to 200 in-lbs before being further tightened to the next slot in the castellated nut. The red O-ring seal and large castellated nut were then installed on the opposite end of the shaft. The large nut was torqued to 80 in-lbs before being further tightened to the next slot in the castellated nut. The final assembly was secured by inserting a cotterpin in each castellated nut. (The observed assembly procedure included torque loading of the large castellated nut to 80 in-lbs; however, a red O-ring seal was installed under the large nut instead of the copper-covered gasket specified in the manufacturer's alternative assembly instructions.)

According to the manufacturer's illustrated part catalog, the same components were used for the intake and exhaust rocker assemblies. Additionally, the manufacturer's overhaul manual specified the same assembly procedure for both rocker assemblies. The release torque for the small nut was measured for the intake and exhaust rocker assemblies on the remaining cylinders of the accident engine. The recorded values ranged between 78 in-lbs and 546 in-lbs; however, a majority of the recorded values were in excess of 300 in-lbs.

The intake and exhaust rocker assemblies for cylinder Nos. 3 and 4 were reassembled in accordance with the assembly instructions contained in the overhaul manual. The small nut was torqued to 225 in-lbs (midway between the specified range of 200-250 in-lbs), and then further tightened to the next slot in the castellated nut. The large nut, with the red O-ring seal, was hand tightened until it was snug against the shoulder of the large bushing, and then further tightened to the next slot in the castellated nut. After assembly, the release torque was measured for each rocker assembly. The recorded values ranged between 175 in-lbs and 220 in-lbs.

A review of the maintenance records found no history of unresolved airworthiness issues with the engine since the last overhaul. Additionally, the airplane owner and the primary maintainer of the airplane stated that no maintenance had been performed on any of the rocker assemblies since the last engine overhaul.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	66
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	January 17, 2013
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 22, 2012
Flight Time:	(Estimated) 25256 hours (Total, all aircraft), 4500 hours (Total, this make and model), 20000 hours (Pilot In Command, all aircraft), 180 hours (Last 90 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Grumman	**Registration:**	N5324
Model/Series:	G-164A	**Aircraft Category:**	Airplane
Year of Manufacture:	1969	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	606
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	May 1, 2013 Annual	**Certified Max Gross Wt.:**	6075 lbs
Time Since Last Inspection:	171 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	11330.3 Hrs as of last inspection	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Not installed	**Engine Model/Series:**	R1340
Registered Owner:	Crop Care Inc.	**Rated Power:**	600 Horsepower
Operator:	Crop Care Inc.	**Operating Certificate(s) Held:**	Agricultural aircraft (137)
Operator Does Business As:		**Operator Designator Code:**	L36G

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	ALS,7539 ft msl	**Distance from Accident Site:**	12 Nautical Miles
Observation Time:	07:52 Local	**Direction from Accident Site:**	134°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.26 inches Hg	**Temperature/Dew Point:**	12°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Monte Vista, CO (MVI)	**Type of Flight Plan Filed:**	None
Destination:	Monte Vista, CO (MVI)	**Type of Clearance:**	None
Departure Time:	07:30 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	37.581665,-106.053054(est)

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Ronald Budnick; Federal Aviation Administration - Denver FSDO; Denver, CO
Report Date:	December 19, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87600