



**Turbines Incorporated
Terre Haute, In**

Repair Station *FAA CRS#UTBR513L*

Engine Failure Report

PT6A-34AG, S/N PCE-50188

TSN: 10,791.5 hrs.



**Customer
Williams Ag
Location
Turbines Inc.**

**Job Number
T5566**

Prepared by: Jim Peleck



Introduction

PT6A-34AG, PCE 50188 was received from Williams Ag Corp as part of an engine overhaul evaluation. At the request of the customer the accessories were sent to Kansas Aviation for a functional check in an effort to determine if they had been contaminated with an agricultural chemical.

It was reported some weeks earlier that the customer (Williams AG) while operating N3633C in the course of agricultural spraying that on May 13, 2014 the aircraft suffered a loss of power and subsequently impacted a berm off the end of the runway. The engine was subsequently sent to Turbines Inc. for evaluation for potential repair of this engine. The date of induction at Turbines was June 24, 2014.

Turbines Inc. was informed by the customer that there had been an incident with this aircraft and he requested that the accessories be functionally checked.

Accessory Evaluation

All fuel related accessories were sent to Kansas Aviation for functional evaluation. It was then reported by Williams AG maintenance personnel that the engine in question had been contaminated with liquid spray chemicals and that the operator had an engine shut down on the next day for the same reason. Kansas Aviation reported all testing of the accessories were found to be in the normal range for a time continued accessory and that they were not contaminated.

Engine Evaluation, Visual Inspection Results,

The engine was then split at the C flange and the power section of the engine was removed for disassembly. It was noted that the exhaust duct was wrinkled due to impact and that the prop shaft would not turn indicating the exhaust duct and power turbine was miss-aligned. The Hot section area was damaged also due to the impact. The customer was notified. The engine was now fully dismantled in order to provide an estimate for overhaul of this unit, at the request of Williams Ag. The estimate for overhaul was forwarded to the customer on September 26, 2014 and the engine was placed on hold, awaiting customer instructions

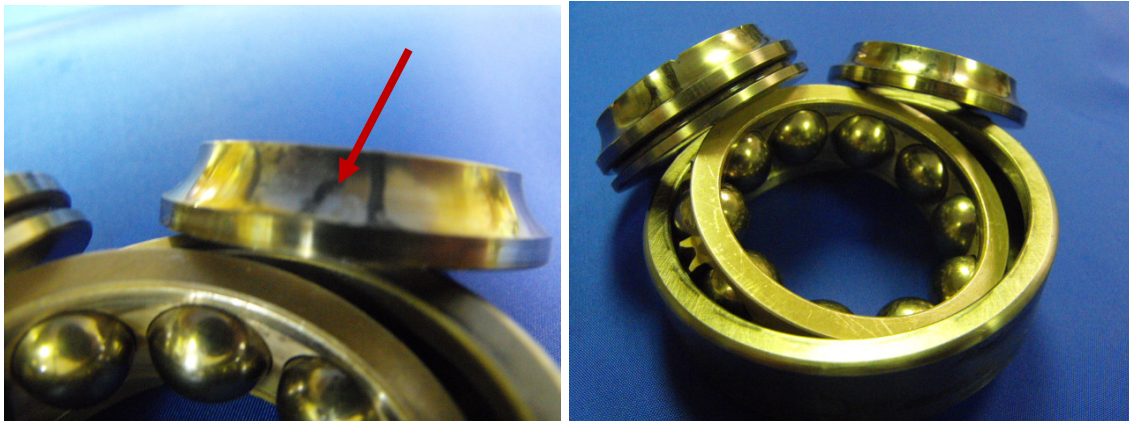
Turbines Inc. received a call requesting information on this engine from **Zoë Keliher** from the National Transportation Safety Board Air Safety Division who is

an Investigator / Aviation Accident Investigator. The information concerning the accessories was sent. It was not until March 25, 2015 that another email was received from the NTSB concerning the engine failure report on this engine. Neither the customer nor his insurance company ever requested a failure report for this engine, so one was never sent. This engine was however evaluated for its condition during the original dismantling for overhaul and the cause of the engine shutdown was determined at that time but Turbines was never contracted to perform this service.

Engine Failure Investigation, Visual Inspection Results,

The engine was fully dismantled for overhaul at the request of the customer (Williams Ag) and in the course of performing work on this engine the following was noted.

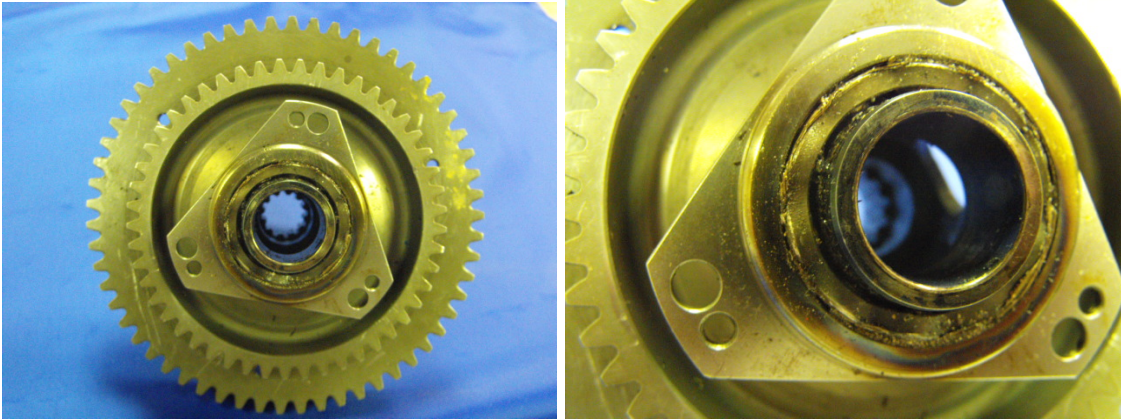
- Power Section was damaged due to impact only.
- The hot section was damaged due to impact
- The compressor was damaged due to impact, with an imminent # 1 brg failure noted due to condition of the bearing



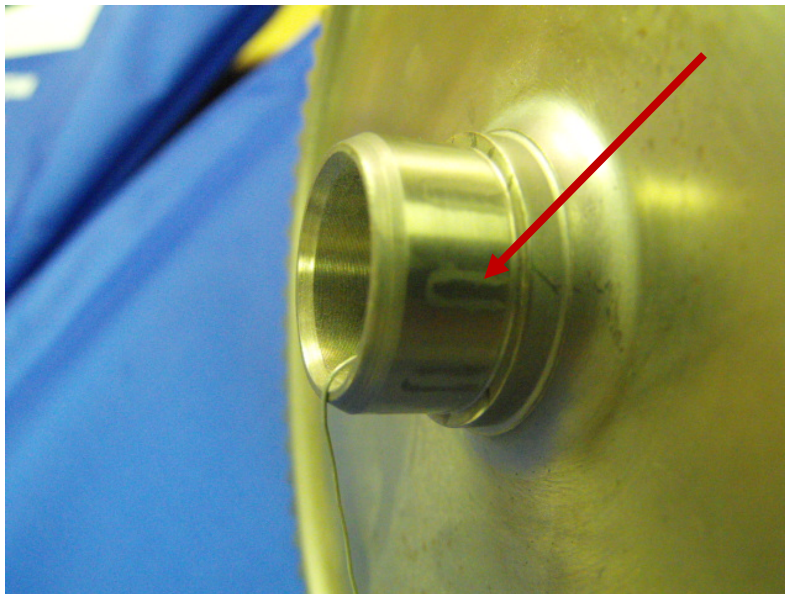
- The Accessory Gearbox was found to be heavily corroded
- Accessory Gearbox was damaged and corroded due to improper storage.

Conclusion:

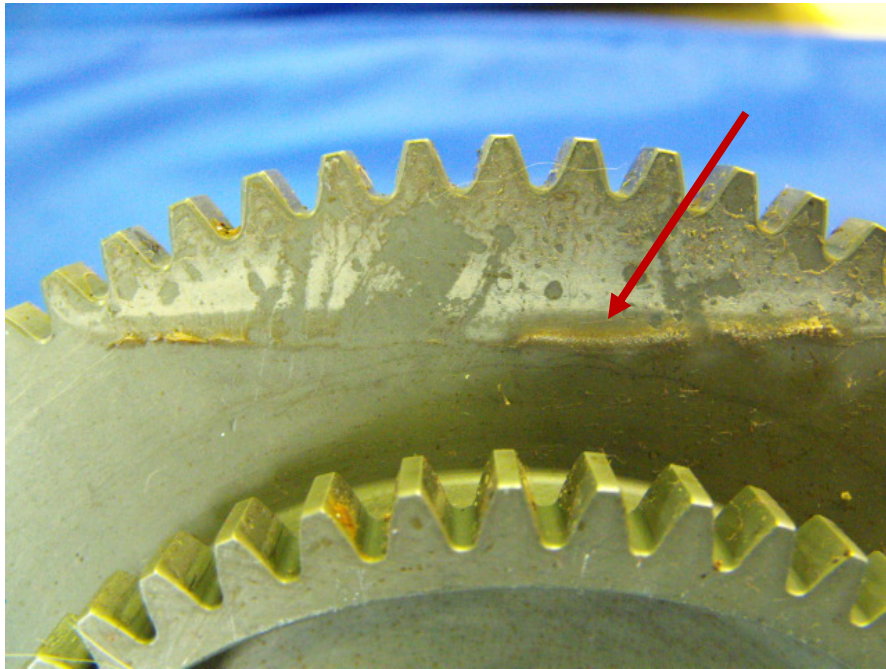
Based on the information provided and the physical review of the engine we can conclude that the engine failure was a direct result of a bearing failure caused by the engine not being stored properly and the accessory gearbox being contaminated. This resulted in a drive train failure that caused the engine to shut off.



As the bearing failed the compressor speed was dragged down until the engine stopped due to a lack of fuel. The starter generator gear is directly connected to the Fuel Pump drive gear and would have resulted in the gear stopping thus shutting off the fuel and the engine shutting down. Further investigation in the gearbox area showed more evidence of storage contamination/corrosion.



Corrosion Marks Due to Contamination



Gearbox Contamination

A PT6 engine, in general terms, is essentially two separate engines. The power section which houses the gearbox and propeller drive unit, and the gas generator, accessory gearbox area. Each runs independent of each other, that is to say there is no mechanical connection between the front and rear halves of the engine. If the engine suffers a bearing failure in any section of the gas generator side of the engine, the fuel will be shut off by two discrete systems. As the compressor slows down due to the bearing failure the fuel pump slows down with it and quickly falls below an RPM that will pump fuel. The second system is the Fuel Control Unit which receives its signal to produce fuel by reading the compressor P3 pressure. As a bearing fails and the NG (compressor speed) starts to fall the P3 pressure decreases and the FCU will reduce the fuel to a minimum level, usually down to about 40% NG Speed. The engine is designed to keep running unless the pump is shut off. From all indication this engine failed due to a bearing failure, shutting off the fuel supply to the engine. All parts have been retained for evaluation. Please contact me if you require any further information.