AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9854		
Aircraft Registration	**ZS-IRW**	**Date of Accident**	20 January 2020		**Time of Accident**	1600Z	
Type of Aircraft	Grumman G-164A		**Type of Operation**		Agricultural (Part 137)		
Pilot-in-command Licence Type	Commercial Pilot Licence		**Age**	26	**Licence Valid**	Yes	
Pilot-in-command Flying Experience	Total Flying Hours		1757.3		Hours on Type	238	
Last Point of Departure	Middelburg Aerodrome (FAMB): Mpumalanga Province						
Next point of Intended Landing	Middelburg Aerodrome (FAMB): Mpumalanga Province						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Farm land, approximately 7.2 nautical miles (NM), NNE of Middelburg Airport (FAMB) next to N11 highway							
Meteorological Information	Wind direction: 140˚, Wind speed: 3kts, Visibility: >10km, Temperature: 21˚C						
Number of People On-board	1+0	**No. of People Injured**	0	**No. of People Killed**	0		
Synopsis							

The pilot on-board a Grumman G-164A aircraft with registration ZS-IRW took off from Middelburg Aerodrome (FAMB) on a crop spraying exercise over a farm in Doornkop area. Two full loads of chemicals were uplifted and sprayed over the farm without incident; thereafter, the aircraft returned to base to uplift the third load. After uplifting the third load, the aircraft took off to the Doornkop farm again. The first and second crop spraying patterns were uneventful, but during the initiation of a climb for the third spray pattern at about 50 feet above ground level (AGL), the engine lost power and stopped.

The pilot instantly dumped the remaining chemical load to lighten the aircraft's weight and initiated a forced landing on an open field. The aircraft landed on a soft muddy terrain on an open field, and it flipped over. The aircraft was substantially damaged during the landing sequence; however, the pilot was not injured.

The investigation revealed that the engine stopped because of the failed impeller bearing and broken impeller gear which caused the supercharger to malfunction.

SRP Date	8 September 2020	Publication Date	9 September 2020

ABBREVIATION	DESCRIPTION
AIID	Accident and Incident Investigations Division
AME	Aircraft Maintenance Engineer
AMO	Aircraft Maintenance Organisation
AOC	Air Operating Certificate
°C	Degrees Celsius
CPL	Commercial Pilot Licence
CVR	Cockpit Voice Recorder
FAMB	Middelburg Airport
FDR	Flight Data Recorder
Ft	Feet
Kts	Knots
M	Metre
MPI	Mandatory Periodic Inspection
N/A	Not Applicable
NNE	North North-East
NM	Nautical Miles
SACAA	South African Civil Aviation Authority
VFR	Visual Flight Rules

Reference Number	**:** CA18/2/3/9854
Name of Owner/Operator	**:** Platorand Lugbespuiting
Manufacturer	**:** Grumman Aerospace Corporation
Model	**:** G-164A
Nationality	**:** South African
Registration Marks	**:** ZS-IRW
Place	**:** Farm land, approximately 7.2nm, NNE of Middelburg Airport (FAMB) near the N11 Highway
Date	**:** 20 January 2020
Time	**:** 1600Z

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (CAR) 2011, this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to apportion blame or liability****.*

Investigations process:

The accident was notified to the Accident and Incident Investigations Division (AIID) on 20 January 2020 at about 1620Z. The AIID appointed an investigator-in-charge. The investigator did not dispatch to the accident site. The investigator co-ordinated with all authorities on site by initiating the accident investigation process according to CAR Part 12 and investigation procedures. Notifications were sent to the State of Registry, State of Operator and State of Manufacture and Design. The State of Manufacture and Design did not assign an accredited representative to the investigation. The AIID of the South African Civil Aviation Authority (SACAA) is leading the investigation as the Republic of South Africa is the State of Occurrence.

Notes:

1. Whenever the following words are mentioned in this report, they shall mean the following:

- *Accident – this investigated accident*
- *Aircraft – the Grumman G-164A involved in this accident*
- *Investigation – the investigation into the circumstances of this accident*
- *Pilot – the pilot involved in this accident*
- *Report – this accident report*

2. Photos and figures used in this report were taken from different sources and may be adjusted from the original for the sole purpose of improve clarity of the report. Modifications to images used in this Report were limited to cropping, magnification, file compression; or enhancement of colour, brightness, contrast; or addition of text boxes, arrows or lines.

Disclaimer:

1. FACTUAL INFORMATION

1.1. History of Flight

1.1.1 On 20 January 2020, the pilot on-board a Grumman G-164A aircraft with registration ZS-IRW took off from Middelburg Aerodrome (FAMB) on a crop-spraying exercise over a farm situated in Doornkop area with the intention to land back at FAMB. The flight was conducted under Visual Flight Rules (VFR). The pilot reported that the first two chemical loads uplifted were sprayed without incident. The pilot returned to the aerodrome where he uplifted the third chemical load, whereafter, he took off again and headed to the farm in Doornkop. The first and second spraying patterns were uneventful, but during a climb for the third spraying pattern at about 50 feet above ground level (AGL), the engine experienced a partial loss of power and stopped. The pilot instantly dumped the remaining chemical load and elected to execute an emergency landing on an open field. During the emergency landing on the selected field, the main landing gear got stuck on the soft ground (sand) causing the aircraft to nose over before it came to rest in an inverted position.

1.1.2 The aircraft was substantially damaged during the accident sequence; however, the pilot was not injured.

1.1.3 The accident occurred during daylight on an open field around Doornkop area at Global Positioning System (GPS) determined to be S25°34'49.17" E029°30'28.15" at an elevation of 4 939 feet (ft) above mean sea level (AMSL).

Figure 1: The location of the accident site, which is 7.17nm NE of FAMB. (Source: Google Earth Map).

1.2. Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	-
None	1	-	-	-

1.3. Damage to Aircraft

1.3.1 The aircraft was substantially damaged during the accident sequence.

Figure 2: The aircraft in an inverted position post-accident.

1.4. Other Damage

1.4.1 None.

1.5. Personnel Information

Nationality	South African	Gender	Male	Age	26
Licence Number	0272356247	Licence Type		Commercial Pilot Licence (CPL)	
Licence Valid	Yes	Type Endorsed		Yes	
Ratings	Night rating, agricultural rating				
Medical Expiry Date	31 March 2020				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	1757.3
Total Past 90 Days	208
Total on Type Past 90 Days	202.2
Total on Type	238

1.5.1 The pilot was issued a Class 1 medical certificate on 20 March 2019 with an expiry date of 31 March 2020. The pilot did his revalidation skills test on 27 March 2019 and was reissued a CPL with an expiry date of 31 March 2020.

1.5.2 The aircraft maintenance engineer (AME) who certified the aircraft was in possession of a valid AME licence number 02720100067, reissued on 23 April 2018 with an expiry date of 9 July 2020. The AME's licence had Pratt & Whitney Radial engines series endorsed on it.

1.6. Aircraft Information

Figure 3: Grumman G-164A aircraft.

1.6.1 The Grumman G-164 Ag-Cat is a single-engine single-seat agricultural biplane aircraft developed by the US-American manufacturer Grumman Aircraft Engineering Corporation and powered by Pratt & Whitney R-1340-AN-1 Wasp. The recommended Time Between Overhaul (TBO) is 1000 to 1400 hours.

Airframe:

Type	G-164A	
Serial Number	984	
Manufacturer	Grumman American Aviation Corporation	
Date of Manufacture	1972	
Total Airframe Hours (At time of Accident)	9345.4	
Last MPI (Date & Hours)	09 January 2020	9313.7
Hours since Last MPI	31.7	
C of A (Issue Date)	13 January 2018	
C of A (Expiry Date)	31 January 2020	
C of R (Issue Date) (Present owner)	25 January 2019	
Operating Categories	Restricted (Part 137)	

1.6.2 The last maintenance on the aircraft was carried out by an aircraft maintenance organisation (AMO) 1310, completed on 9 January 2020 at 9313.7 total flying hours. The aircraft was due for another inspection on 9 January 2021 or at 9413.7 hours, whichever occurs first. All work was carried out in accordance with AG-CAT Maintenance Manual. The aircraft was issued a certificate of release to service (CRS) on 10 January 2020 with an expiry date of 9 January 2021.

Engine:

Type	Pratt & Whitney R1340-AN1
Serial Number	ZP 103488
Hours Since New	Unknown
Hours Since Overhaul	555.4

1.6.3 According to available information issued by the AMO 1310, the engine was last overhauled on 25 May 2001. The engine had been subjected to continuous detailed inspections since the last overhaul. On 6 January 2020, the engine oil was drained to replace cylinder number 4 which was unserviceable. The engine was refilled using 20W50 oil. There were no recorded anomalies of oil consumption. This inspection was carried out at 523.7 hours since its last overhaul. At the time of the accident, the engine had flown a total of 31.7 hours since its last inspection. The AMO stated that the engine was maintained in accordance with AG-CAT maintenance manual (see inspection procedure below). There were no recorded defects in the flight folio or the logbooks. The AMO stated that the engine hours since new could not be established as the logbooks could not be traced or found.

(Source: AG-CAT Maintenance Manual, page 3-6)

Inspection (Procedure)

Oil system

1. *Drain oil from system, remove sump plugs, scavenge oil screen, and main oil screen. Examine oil, oil screens, and sump plugs for presence of metal and foreign materials. If metal particles are found, further investigation is required to discover source of material.*

2. *Inspect oil screens for broken wires, and condition. Clean and install oil screens, oil shut off valve, and sump plugs. Check for proper seating of oil shut off valve "O" ring seal.*
3. *Refill oil tank with approved grade of oil.*

Propeller:

Type	Hamilton STD 12D40/6101A
Serial Number	89162
Hours since New	Unknown
Hours since Overhaul	293.8

1.6.4 According to the current logbooks issued by the AMO 1310, the propeller was last overhauled on 31 August 2006. On 8 August 2018, the propeller and the engine front case were removed so as to access and replace the cam ring which was damaged. Cam ring and 7 cam followers were replaced with serviceable parts. Ground runs were carried out and found satisfactory. There were no recorded defects in the flight folio or the logbooks. The hours since new could not be established as the logbooks could not be traced (found).

1.7. Meteorological Information

1.7.1 The following meteorological information was obtained from the pilot questionnaire.

Wind direction	140˚	Wind speed	3kts	Visibility	>10km
Temperature	21˚C	Cloud cover	None	Cloud base	None
Dew point	Unknown	QNH	Unknown		

1.8. Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as approved by the Regulator (SACAA) for the aircraft type. There were no defects reported with the navigational equipment prior to the flight.

1.9. Communication

1.9.1 The aircraft was equipped with standard communication equipment as approved by the Regulator (SACAA) for the aircraft type. There were no defects reported with the communication equipment prior to the flight.

1.10. Aerodrome Information

Aerodrome Location	Middelburg	
Aerodrome Co-ordinates	S25°41.14' E29°26.43'	
Aerodrome Elevation	4886ft above mean sea level (AMSL)	
Runway Designations and Dimension	14/32	1800m x 25m
Runway Designations and Dimension	02/20	1345m x 25m
Runway Used	Not Applicable	
Runway Surface	Gravel & Asphalt	
Approach Facilities	Nil	
Aerodrome Status	Licensed	

1.10.1 The accident occurred on an open field around Doornkop area, which is about 7.2 NM, NNE of FAMB, next to the N11 Highway and at GPS position determined to be S25°34'49.17" E029°30'28.15" at an elevation of 4 939ft.

1.11. Flight Recorders

1.11.1 The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), and none of the recorders were required by the relevant aviation regulations.

1.12 Wreckage and Impact Information

1.12.1 The aircraft landed and rolled approximately 60 metres (m) on soft soil before it flipped over, coming to rest in an inverted position. Damage to the aircraft was limited to the wings, the ailerons, the wings support struts, vertical stabiliser and the propeller.

Figure 4: The spot where the aircraft touched down.

Figure 5: The aircraft in an inverted position.

1.13 Medical and Pathological Information

1.13.1 Not applicable.

1.14 Fire

1.14.1 There was no evidence of a pre- or post-impact fire.

1.15 Survival Aspects

1.15.1 The accident was considered survivable as the cockpit area was not affected. The pilot had his safety harness on and it did not fail during the accident sequence.

1.16 Tests and Research

1.16.1 On 7 February 2020, the Pratt & Whitney R1340-AN-1 engine Serial Number: ZP103488 was transported to a SACAA-approved engine overhaul facility AMO situated at Springs Aerodrome for teardown inspection. The rear engine case was opened for inspection and it showed evidence of missing gear teeth on the impeller intermediate drive and a failed impeller bearing.

Note: REAR SECTION

Rear-case — The rear case attaches to the rear of the supercharger case and supports the accessories and accessory drives.

Figures 6 & 7: The missing gear teeth on the impeller intermediate drive (left) and a failed impeller bearing (right).

1.16.2 The rear case was consequently removed from the blower case and further damage was noticed on the impeller.

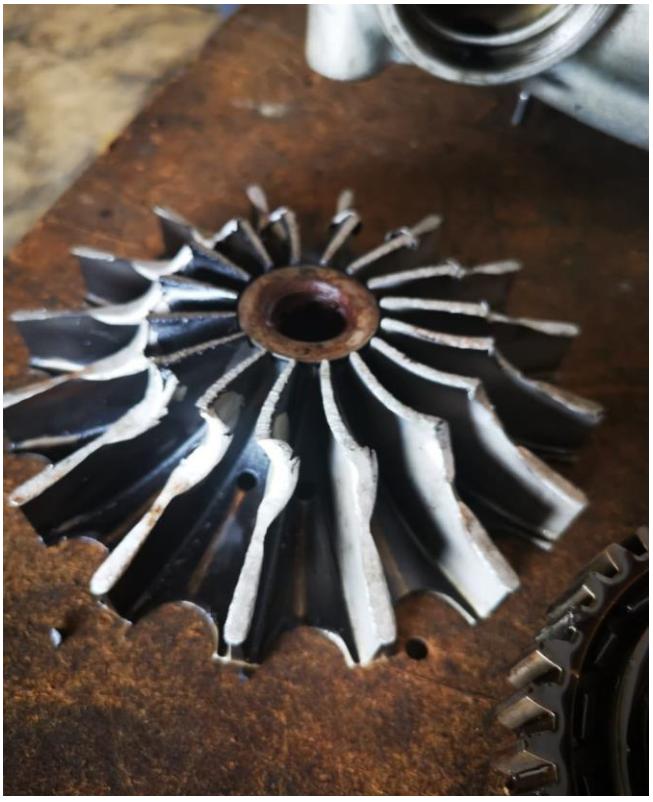

Figure 8: The damaged impeller.

1.16.3 The failure had caused the supercharger to malfunction, which resulted in an engine failure (see Appendix 5.2 - engine report).


Figure 9 & 10: The gear teeth shavings (left) and the impeller drive shaft with missing gear teeth (right).

1.17 Organisational and Management Information

1.17.1 The aircraft was maintained by the AMO 1310. The AMO was issued an AMO certificate on 31 October 2019 with an expiry date of 31 October 2020.

1.17.2 The operator was issued an Air Operating Certificate (AOC) number CAA/G362D, certificate number FO13944 on 29 July 2019 with an expiry date of 31 May 2020. He had Agricultural Operations (Part 137) endorsed on it.

1.18 Additional Information

Source: Article - Radial Engine Time Between Overhaul: What's My TBO for the R-985 & R-1340?
Released: 13 January 2017

Article by: Aaron Abbott

1.18.1 The engine's primary accessories (Carburettor, Fuel pump, Magnetos, Starter, Propeller Governor, and Generator) are designed to run to engine TBO. It is our recommendation that they be overhauled at the same TSO as the engine. Ref: AC65-12A Chapter 10 Page 411 Par. Major Overhaul Our basic TBO recommendations are 1000 to 1400 hours operating time since overhaul. In order to determine this "recommended" Time Before Overhaul we have taken into consideration all forms of Agricultural utilization of the R-1340 & R-985 engine and have averaged the operating time between overhauls of engines submitted to us for overhaul over the last 25 years. (See link attached on appendices)

1.18.2 **RECIPROCATING ENGINE OVERHAUL (Source: Airframe and Powerplant - MECHANICS POWERPLANT HANDBOOK document AC65-12A, Page 411)**

1.18.2.1 *Both maintenance and overhaul operations are performed on aircraft powerplants at specified intervals. This interval is usually governed by the number of hours the powerplant has been in operation. Tests and experience have shown that operation*

beyond this period of time will be inefficient and even dangerous because certain parts will be worn beyond their safe limits. For an overhauled engine to be as airworthy as a new one, worn parts as well as damaged parts must be detected and replaced during overhaul. The only way to detect all unairworthy parts is to perform a thorough and complete inspection while the engine is disassembled. The major purpose of overhaul is to inspect the engine parts. Inspection is the most precise and the most important phase of the overhaul. Inspection cannot be slighted or performed in a careless or incomplete manner. Each engine manufacturer provides very specific tolerances to which his engine parts must conform and provides general instructions to aid in determining the airworthiness of the part. However, in many cases, the final decision is left up to the mechanic. He must determine if the part is serviceable, repairable, or if it should be rejected. A knowledge of the operating principles, strength, and stresses applied to a part is essential in making this decision. When the powerplant mechanic signs for the overhaul of an engine, he certifies that he has performed the work using methods, techniques, and practices acceptable to the FAA Administrator.

1.18.3 ***Major Overhaul***

1.18.3.1 *Major overhaul consists of the complete reconditioning of the powerplant. The actual overhaul period for a specific engine will generally be determined by the manufacturer's recommendations or by the maximum hours of operation between overhaul, as approved by the FAA. At regular intervals, an engine should be completely dismantled, thoroughly cleaned, and inspected. Each part should be overhauled in accordance with the manufacturer's instructions and tolerances for the engine involved. At this time, all accessories are removed, overhauled, and tested. Here again, instructions of the manufacturer of the accessory concerned should be followed.*

1.18.4 ***Civil Aviation Regulations, 2011, Part 43, Subpart 2***

Overhaul, repair and substitution of major components

43.02.5 (1) An aircraft, its components and installed equipment shall be overhauled or substituted at such times as stipulated in its approved maintenance programme.

(2) A procedure for reinstating the validity of a certificate of airworthiness deemed suspended when an aircraft is involved in an accident or incident that renders one or more Class I products defective is prescribed in Document SA-CATS 43.

(3) Requirements for the overhaul of components and equipment installed on an aircraft and of engines and propellers are prescribed in Document SA-CATS 43.

(4) (a) Where the Director has approved a time between overhaul (TBO) that differs from that recommended or specified by the manufacturer, such TBO shall be specified in the aircraft's approved maintenance programme.

(b) Where a manufacturer has not recommended or specified the overhaul of an

item at certain times and the Director considers its overhaul at certain intervals necessary in the interest of safety, the Director may prescribe a TBO for such item in the aircraft's approved maintenance programme.

(5) Requirements for the substitution of products, components and parts with new or overhauled items are prescribed in Documents SA-CATS 43.

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

2.1. General

From the evidence available, the following analysis was made with respect to this accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

2.1.1 Man

The pilot was issued a Commercial Pilot Licence (CPL) and a valid medical certificate with no restrictions. The pilot was appropriately qualified as well as type rated to conduct the flight as per the provisions contained in the Civil Aviation Regulations (CAR) 2011 as amended.

2.1.2 Aircraft

2.1.2.1 According to the reviewed aircraft maintenance records, the aircraft was maintained in accordance with the approved maintenance schedule and there were no reported defects documented prior to the flight that could have contributed or have caused the accident. The aircraft had accumulated a total of 9345.4 hours and 31.7 hours since its last MPI.

2.1.2.2 The engine was last overhauled on 25 May 2001 and had accumulated a total of 555.4 hours. On 6 January 2020, the engine oil was drained to replace cylinder number 4 which was unserviceable. The engine was refilled using 20W50 oil. There were no recorded anomalies of oil consumption. At the time of the accident, the engine had flown a total of 31.7 hours since its last inspection. The AMO had stated that the engine was maintained in accordance with AG-CAT maintenance manual (see inspection procedure above). There were no recorded defects in the flight folio or the logbooks. Removal of the power case from rear case is not required during these inspections, therefore, the damage of the impeller bearing, and the gear teeth could not have been detected during the inspections and prior to the accident. The stripped components looked well lubricated.

2.1.2.3 The manufacturer recommends that the engine overhaul be carried out at an interval of 1000 to 1400 hours and the engine had only flown a total of 555.4 hours since its last overhaul in May 2001. This meant that the engine had not been overhauled in 18 years and

that the manufacturer did not state a period between overhaul. The failure of the impeller bearing caused the supercharger to malfunction, which resulted in an engine stoppage.

2.1.3 Mission

2.1.3.1 This was a crop spraying operation on a farm in Doornkop area. After two full loads of chemical were uplifted and sprayed without incident, the aircraft returned to base for the third load. The first and second spray patterns were uneventful, but during a go-around for the third spray pattern at about 50ft AGL, the engine lost power and stopped. The pilot instantly dumped the remaining chemical and initiated a forced landing on an open field, which was unsuccessful. The landing would have been successful had the ground on which the aircraft landed on was not soft and muddy.

3 CONCLUSION

3.1. General

From the evidence available, the following findings, causes and contributing factors were made with respect to this accident. These shall not be read as apportioning blame or liability to any particular organisation or individual.

To serve the objective of this investigation, the following sections are included in the conclusion heading:

- **Findings:** are statements of all significant conditions, events or circumstances in this accident. The findings are significant steps in this accident sequence, but they are not always causal or indicate deficiencies.
- **Causes:** are actions, omissions, events, conditions, or a combination thereof, which led to this accident.
- **Contributing factors:** are actions, omissions, events, conditions, or a combination thereof, which, if eliminated, avoided or absent, would have reduced the probability of the accident or incident occurring, or mitigated the severity of the consequences of the accident or incident. The identification of contributing factors does not imply the assignment of fault or the determination of administrative, civil or criminal liability.

3.2. Findings

3.2.1 The pilot completed his skills test on 27 March 2019 and was issued a CPL with an expiry date of 31 March 2020.

3.2.2 The pilot was issued a Class 1 aviation medical certificate on 20 March 2019 with an expiry date of 31 March 2020.

3.2.3 The pilot had accumulated a total of 1757.3 flying hours, of which 238 hours were on the aircraft type.

3.2.4 The AME who certified the aircraft was issued an AME licence. The licence was reissued on 23 April 2018 with an expiry date of 9 July 2020.

3.2.5 The aircraft was maintained by an approved AMO 1310. The AMO was issued an AMO approval certificate on 31 October 2019 with an expiry date of 31 October 2020.

3.2.6 The aircraft was issued a Certificate of Registration (C of R) on 19 December 2017.

3.2.7 The aircraft was issued a Certificate of Airworthiness (C of A) on 13 January 2018 with an expiry date of 31 January 2020.

3.2.8 The last Mandatory Periodic Inspection (MPI) was carried out on 9 January 2020 at 9313.7 hours. The aircraft had accumulated a total of 9345.4 hours following the maintenance and including the accident flight.

3.2.9 The engine was last overhauled on 25 May 2001 and had been subjected to continuous inspections. The last inspection was carried out on 6 January 2020 at 523.7 hours since its last overhaul. The engine hours since new are not known, however, the engine had accumulated a total of 555.4 hours since its last overhaul.

3.2.10 The manufacturer only recommends that the engine overhaul be carried out at an interval of 1000 to 1400 hours and there is no limit in terms of years. This meant that the engine had not been overhauled in 18 years and that the manufacturer did not state the period between overhaul in terms of years.

3.2.11 The engine stopped during a crop spraying exercise and the pilot executed a forced landing on an open field.

3.2.12 The investigation revealed that the engine stopped because of the failed impeller bearing and broken impeller gear which caused the supercharger to malfunction.

3.3. Probable Cause/s

3.3.1 The investigation revealed that the engine stopped because of the failed impeller bearing and broken impeller gear which caused the supercharger to malfunction.

4. SAFETY RECOMMENDATIONS

4.1. General

The safety recommendations listed in this report are proposed according to paragraph 6.8 of Annex 13 to the Convention on International Civil Aviation and are based on the conclusions listed in heading 3 of this report; the AIID expects that all safety issues identified by the Investigation are addressed by the receiving States and organisations.

4.2. Safety Recommendation

4.2.1 It is recommended that in the interest of safety, the manufacturer includes the limit of years for overhaul to ensure that the safe operating standards of the type aircraft are not compromised for aircraft which fly low (fewer) hours per year.

5. APPENDICES

5.1 Appendix 1: Source: Link
5.2 Appendix 2: Engine strip report

This Report is issued by:

Accident and Incident Investigation Division
South African Civil Aviation Authority
Republic of South Africa

Appendix 1: Engine strip report

R1340 TBO.html

Radial Engine Time Between Overhaul: What's My TBO for the R-985 & R-1340?

□January 13, 2017aircraft engine maintenance, radial engine□R-1340, R-985□

Please allow me to offer some information in regard to Pratt & Whitney R-1340 & R-985 engine Time Before Overhaul intervals (TBO's) for engines utilized on current agricultural aircraft. A letter from Pratt & Whitney (P&W) faxed to the Federal Aviation Administration (F.A.A.) dated February 13, 1990 is useful in understanding the organization's corporate position on the radial engine.

Ayres AT-301 Air Tractors VH-ODB and VH-ODM at Tintinara SA in May 1989
Designed by Leland P. Snow, the AT-302 designation indicates 320 gallon hopper and P&W R-1340 radial engine

From http://www.goodall.com.au/photographs/aerial-agriculture-80-1/80saerialag-1.html

"Pratt & Whitney have no company or F.A.A approved methods for providing any engineering substantiation or manual/publication revision relating to new methods or procedures which are being accomplished by operators and overhaul shops on Pratt & Whitney reciprocating engines."

This letter establishes a, "hands off" attitude on P&W's part concerning the Reciprocating Radial engines. Oil consumption is a major issue and is addressed in a cautionary statement constituting part of the P&W TBO considerations given in the R-1340 & R-985 overhaul

manual (part number 123440).

"Oil consumption is usually one of the best indications as to whether or not the engine requires overhaul, provided the engine is performing normally and there is no indication of possible trouble or irregularities requiring more than normal line maintenance attention. A sudden increase of oil consumption or a gradual increase of oil consumption to double that which has previously been average, is usually case for overhaul."

The engine's primary accessories (Carburetor, Fuel pump, Magnetos, Starter, Propeller Governor, and Generator) are designed to run to engine TBO. It is our recommendation that they be overhauled at the same TSO as the engine. Ref: AC65-12A Chapter 10 Page 411 Par. Major Overhaul Our basic TBO recommendations are 1000 to 1400 hours operating time since overhaul. In order to determine this "recommended" Time Before Overhaul we have taken into consideration all forms of Agricultural utilization of the R-1340 & R-985 engine and have averaged the operating time between overhauls of engines submitted to us for overhaul over the last 25 years.

Manufactuered in 1989, Weatherly 620A VH-WEA is powered by a 9-cylinder, Pratt & Whitney R-985 radial engine however the aircraft itself has a relatively low spraying capacity of 1200 litres.
From http://airqueensland.blogspot.com/2015/01/r-mach-aviation_7.html

It must be noted that there is an Airworthiness Directive 68-09-01 issued to the R-985 engine. It is concerning Crankshaft flyweights and flyweight liner replacement. This AD mandates that it

be accomplished at 1200 or 1600 hrs depending on propeller installation. In order to accomplish this, the engine must be disassembled to the point it is more economically feasible to overhaul than to limit to repair and replacement only. This Time Before Overhaul recommendation is made with the assumption that all manufacturers' recommended/required periodic inspections are complied with in a timely manner throughout the life of the engine. This recommendation is not to certify or guarantee that an operator will achieve a specific number of hours operation time before an overhaul is necessary. This TBO recommendation should in no way be considered a maximum TBO limit as it is possible to safely operate an R-1340 & R-985 past 1200 or 1400 hours TSO. It is merely a RECOMMENDATION that, hopefully, will better enable an operator to develop a safe, economic engine overhaul schedule.

Appendix 2: Engine strip report

CLACK AIR cc

HANGER NO.4 NORTH
SPRINGS AIRFIELD
TEL NO: 011817 2562
FAX NO: 086 654 2172
www.clackair.co.za

EMAIL: brian@clackair.co.za
P.O.BOX 8176
VERWOERD PARK
1453

DATE: 07-Feb-2020

PLATORAND LUGBESPUITING CC
Aircraft Reg: ZS-IRW

Dear Juan,

Dis-assembling of Pratt&Whitney R 1340-AN-1 Eng. S/No:ZP103488 .

Removal of all front spark plugs, engine turned freely, compression on all cylinders.

Remove all cylinders from Power Case. All Cylinders and Pistons show normal wear.

Remove Nose Case. Cam-ring, tappet rollers and tappet pins are normal, all in the case looks normal.

With power case removed from rear case. Evidence of teeth missing on impellor intermediate drive.

Removal of the Rear Case from the Blower Case, damage was found on the impellor and case.

Appears as if the impellor bearing failed, which caused the Supercharger to malfunction and eventual engine failure.

All relevant pictures forwarded to Juan VIA WhatsApp

Best regards

Brian Clack