



FACTUAL NOTES, ENGINE TEARDOWN INVESTIGATION IN SUPPORT OF ACCIDENT INVESTIGATION OF VIKING AIR LIMITED DHC6-400 (N153QS) PERFORMED FOR NATIONAL TRANSPORTATION SAFETY BOARD.

Customer: Bayshore Global LLC
Aircraft Model: VIKING AIR LIMITED, DHC6-400, **Registration:** N153QS
Location: [REDACTED] (examination site)
Accident Date: 20 May 2023
Engine Model: PT6A-34, **Serial No.** RB0988

Civil Aviation Authorities Identification: WPR23LA192
TSB Identification: A23F0156
P&WC File No.: 23-075
RFA No.: 23SIE00139

I ACCIDENT SYNOPSIS

During Ferry flight on 20 May 2023, pilots reported fuel transfer problems about 3 hours into the flight over the Pacific Ocean and returned towards the mainland. The pilots reported fuel starvation about 40 miles southwest from the San Francisco coast and did a forced landing into the ocean. Both pilots were fatal. The aircraft right-hand wing and right-hand engine were recovered.

PROPRIETARY RIGHTS NOTICE

EXPORT CONTROL CLASSIFICATION		LOCATION	U.S. REGULATION			
			EAR		ITAR	
		U.S.	P-ECCN	9E991	P-USML	NSR
		OUTSIDE U.S.	ECCN	9E991	USML	NSR
			LOCAL REGULATION			
		CANADA	EIPA (ECL)		DPA (CG)	
NSR			No			
Date of marking	18 June 2024					

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 2 of 22

II FACTUAL INFORMATION

1.0 INVESTIGATION PARTICIPANTS

The powerplant investigation was performed on 12 June, 2024 at [REDACTED] located in [REDACTED]. The following individuals participated in the investigation as representatives of their respective organisations:

[REDACTED]

Air Safety Investigator
National Transportation Board (NTSB)

[REDACTED]

Investigator
Pratt and Whitney Canada (PWC)

[REDACTED]

Insurance Representative
[REDACTED]

2.0 RIGHT HAND (RH) ENGINE HISTORY

Engine Model: PT6A-34, **Serial No.:** RB0988

Logbook Available: Yes: ☐ *No: ☒

**The engine logbooks were not available at the time of the investigation.*

Time Since New (TSN): UNK

Cycles Since New (CSN): UNK

Time Since Overhaul (TSO): UNK

Cycles Since Overhaul (CSO): UNK

3.0 RIGHT HAND (RH) ENGINE EXAMINATION

All positional references are in relation to view from aft looking forward. Upstream and downstream references are in relation to gas path flow from the compressor inlet to exhaust.

External Condition

The engine data plate confirmed the engine serial number RB0988 (Ref. Photo No.1). The engine had been removed from the airframe with the top airframe cowling remaining attached (Ref. Photo No. 2). The external surfaces of the gas generator case and exhaust duct were corroded with environmental deposits present. The air inlet housing was attached to the gas generator case with no cracks or distress observed on the inlet case struts. The accessory gearbox (AGB), reduction gearbox (RGB) assemblies and internal components were not present with the engine (Ref. Photo No. 3 and No. 4). Laying loose with the engine were three (3) AGB gears, the internal AGB scavenge oil pump, main oil pressure



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 3 of 22

pump gears and cover and scavenge oil pump deflector, all were heavily corroded (Ref. Photo No. 5). The airframe exhaust ducts were attached to the engine exhaust duct (Ref. Photos No. 6). The accessory gearbox mounted engine controls were present and attached to their respective hardware (Ref. Photo No. 7). The P3, PY, wire rope/casing, fuel, and oil lines were present.



Photo No. 1



Photo No. 2



GO BEYOND

Service Investigation Factual Notes

P&WC 12342 (2021-02)

Page: 4 of 22

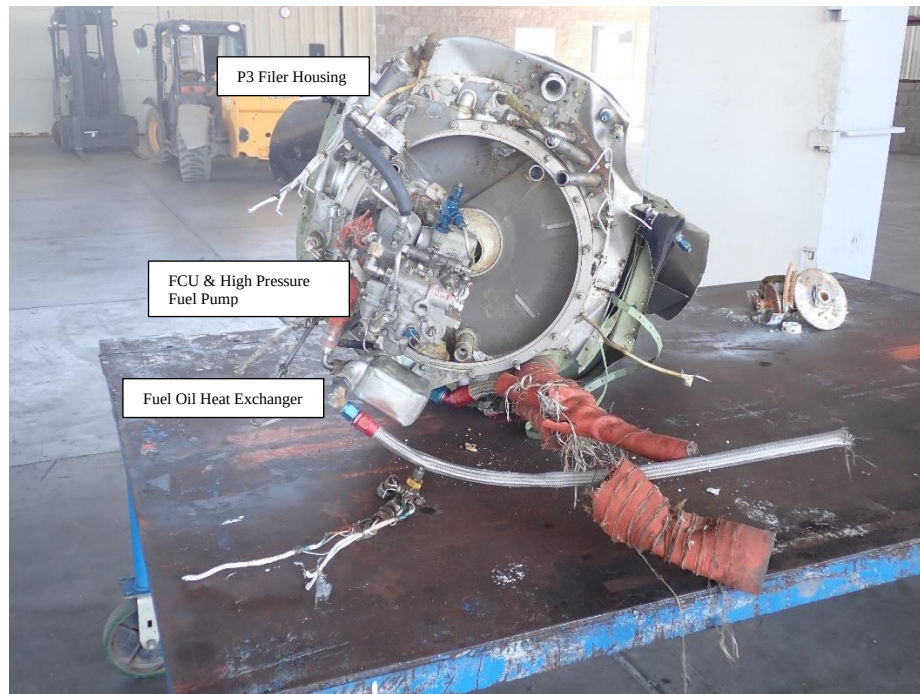


Photo No. 3

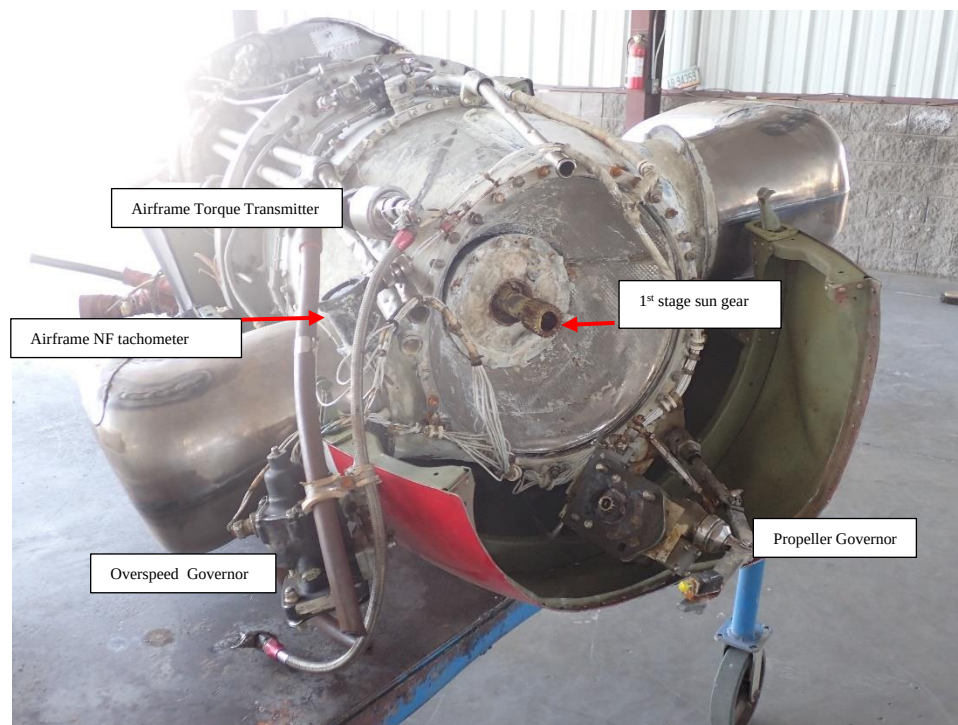


Photo No. 4



GO BEYOND

Service Investigation Factual Notes

P&WC 12342 (2021-02)

Page:

5 of 22

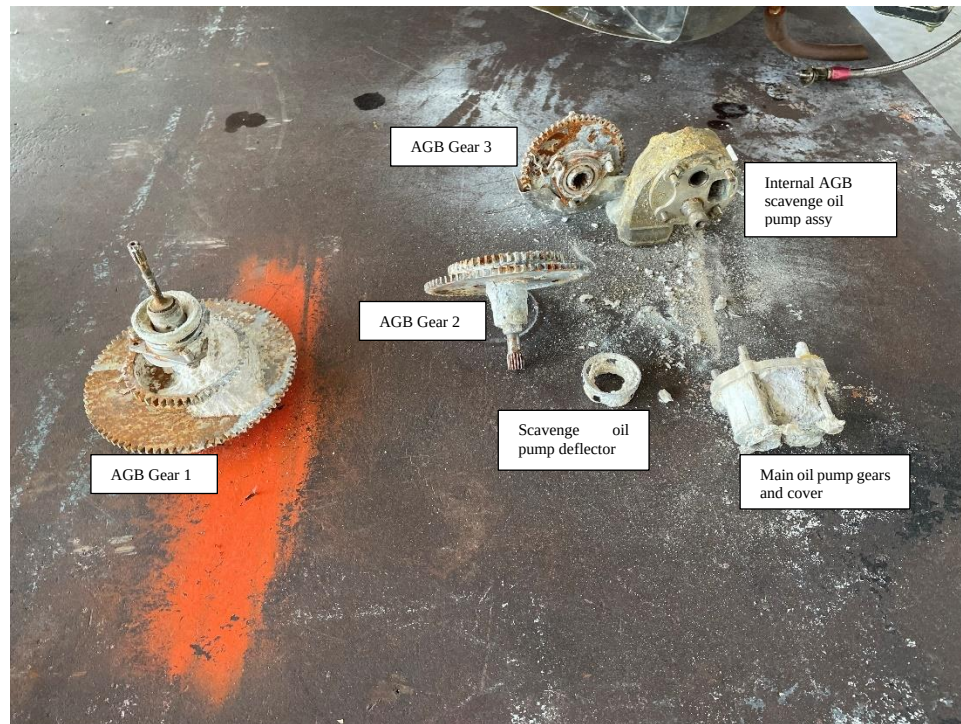


Photo No. 5

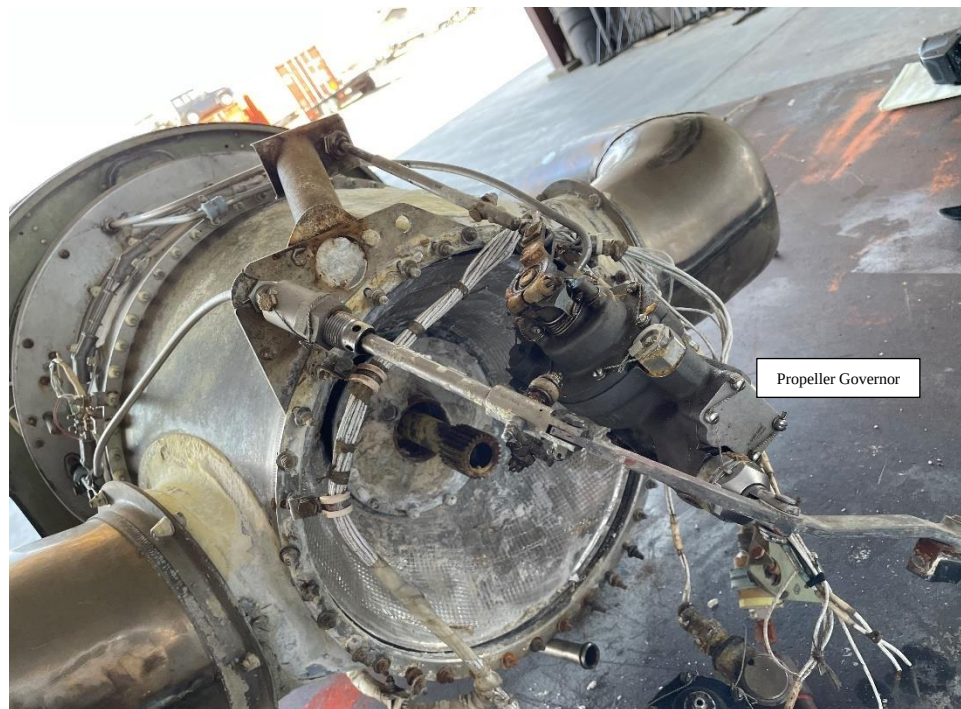


Photo No. 6



GO BEYOND

Service Investigation
Factual Notes

P&WC 12342 (2021-02)

Page: 6 of 22



Photo No. 7



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 7 of 22

Power Control Linkage and Reversing Linkage

The reversing lever and the front linkages were in place and secured with safety wire and cotter keys. The airframe carbon block was attached to the reversing lever (Ref. Photo No. 8, red arrow). The airframe propeller speed control rod end was bent (Ref. Photo No. 9, red oval). The wire rope casing was in place and secure but was not capable of manual movement. The rear linkage was connected to the 2nd from top hole of the CAM box (Ref. Photo No. 10, red oval) and secured. The airframe FCU rod end connector was fractured (Ref. Photo No. 10, red arrow).



Photo No. 8



Photo No. 9



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 8 of 22

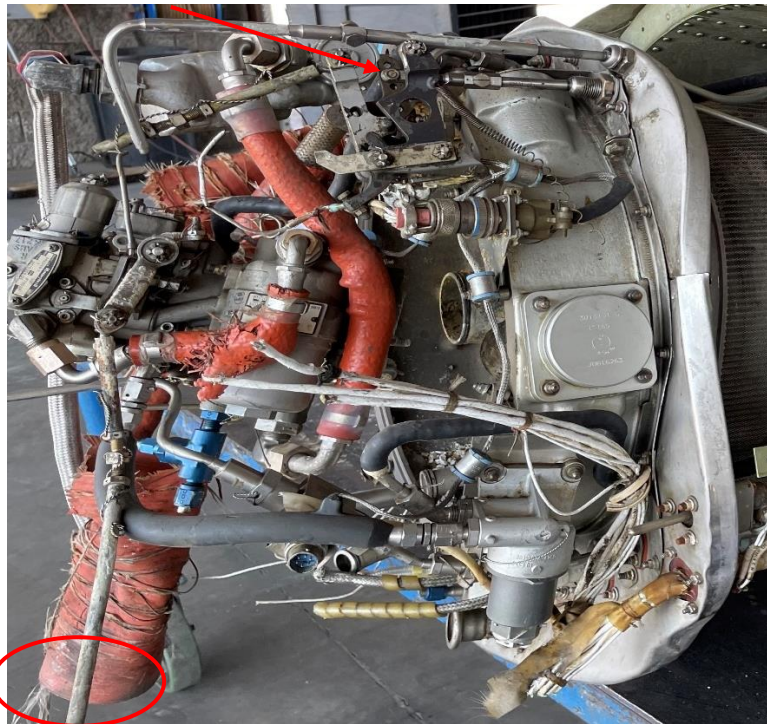


Photo No. 10

Pneumatic Lines

Compressor Discharge Air (P3) and P3 Filter: The front end of the line was secured to a PMA boss attached to the gas generator case port (Ref. Photo No. 11). The B nut to the fuel control fitting was lockwired and torqued. The P3 filter and housing contained sediment and environmental debris (Ref. Photo No. 12).

Power Turbine Control (Py): The Py line was secured to fuel control and found to be bent at several locations and continuous to the propeller governor. The B nuts to the fuel control fitting, firesheild connections and propeller governor were lockwired and torqued.



GO BEYOND

Service Investigation
Factual Notes

P&WC 12342 (2021-02)

Page: 9 of 22

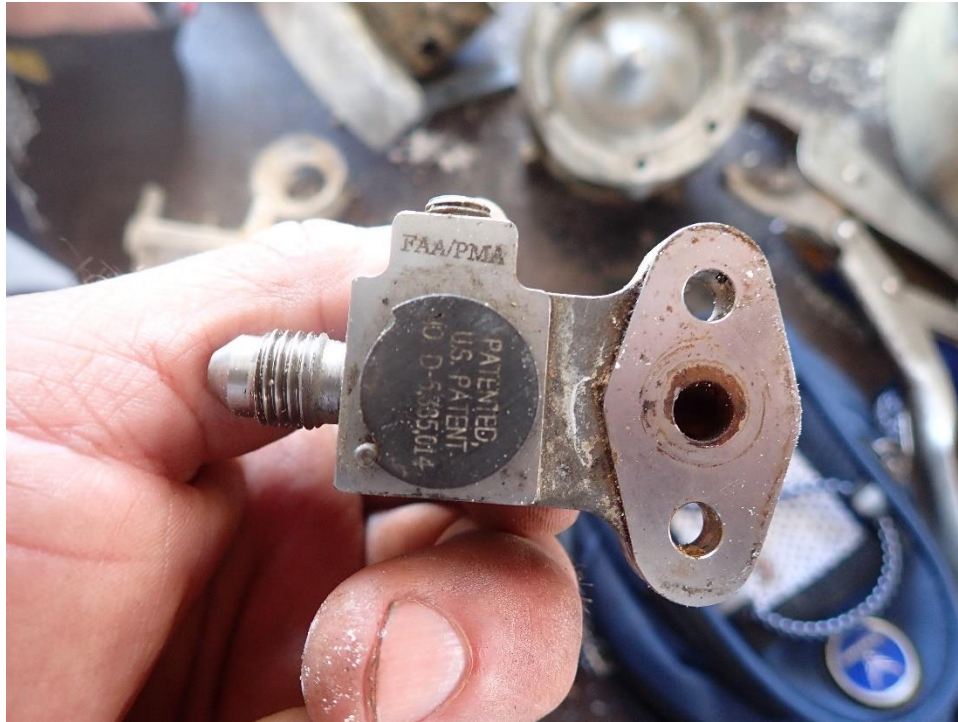


Photo No. 11



Photo No. 12





GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 10 of 22

Chip Detector(s) and Filters

Chip Detector(s): Not Received: (The AGB/ RGB chip detectors mount to the RGB front housing and AGB cover which were not recovered).

Oil Filter: Residual oil present and water in the filter housing. Environmental debris present, no metallic debris present (Ref. Photo No. 13).



Photo No. 13

Fuel Filter: Water and environmental sediment/debris present in the filter bowl with an odor of fuel. No metallic debris was found in the filter pleats (Ref. Photo No. 14).



Photo No. 14



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 11 of 22

Compressor Turbine (CT) Section

The gas generator case, bladed CT disk assembly and CT Vane ring were covered with sediment and environmental debris (Ref. Photo No. 15 through No. 18). The bladed CT disk was mechanically wedged between two CT blades and the CT vane ring to allow removal of the CT disk assembly which damaged two blades and one CT vane airfoil. The CT shroud segments were environmentally stained and corroded.



Photo No. 15



Photo No. 16



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 12 of 22



Photo No. 17



Photo No. 18



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 13 of 22

Combustion Section

The external surface of the CC liner assembly was covered with environmental staining and debris, no damage was observed (Ref. Photo No. 19, red arrows). The CC Liner was not removed during the investigation.

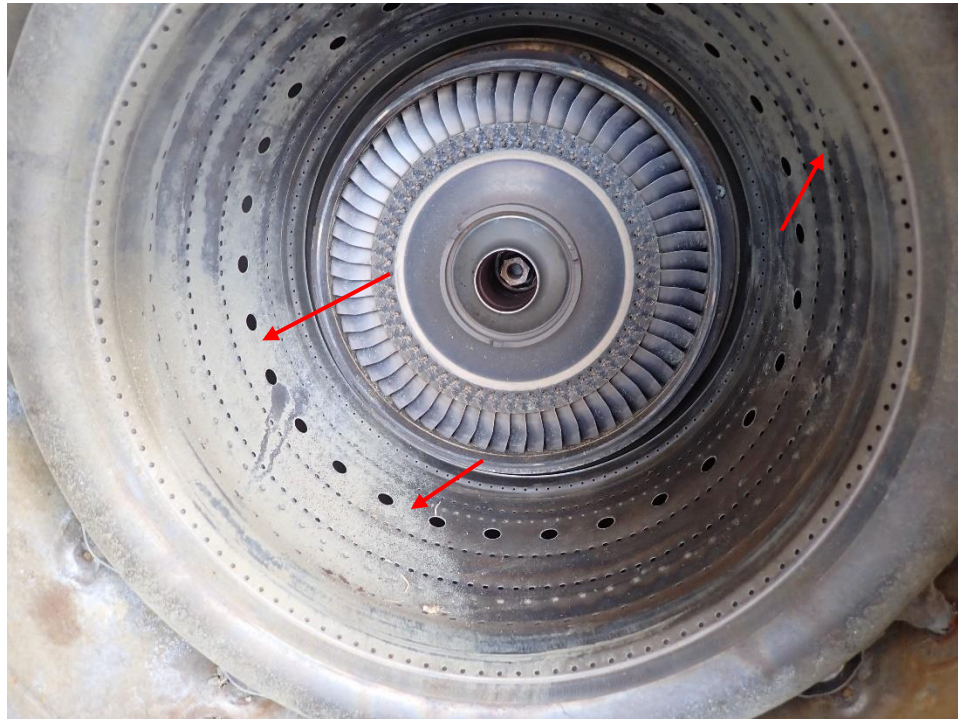


Photo No. 19



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 14 of 22

Power Turbine (PT) Section

The ITT probes, busbar and harness were intact with no burning or damage noted and were covered with environmental staining and corrosion (Ref. Photo No. 20). The bladed PT disk and PT Vane ring were covered with environmental staining and corrosion (Ref. Photo No. 21 and No. 22).



Photo No. 20

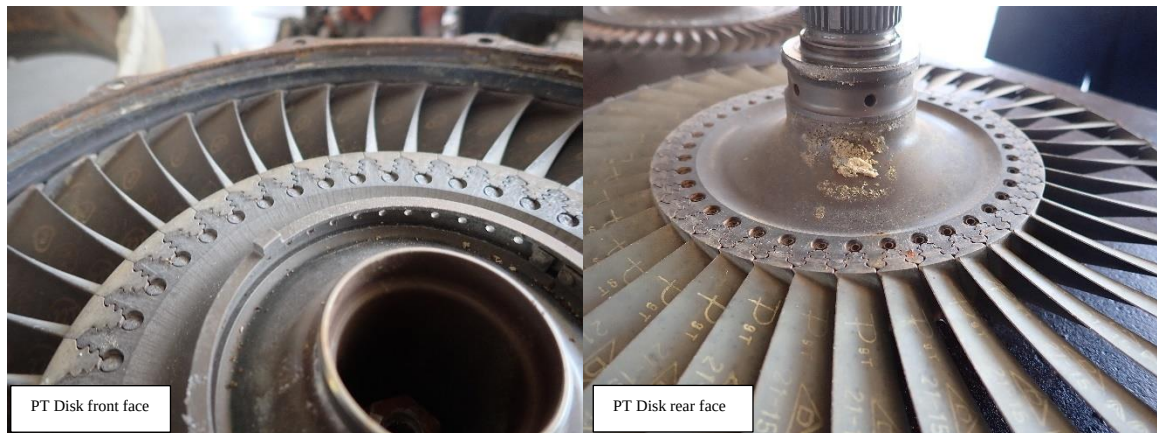


Photo No. 21



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 15 of 22



Photo No. 22

The PT Shaft housing was heavily corroded at the RGB rear housing mating diameter (Ref. Photo No. 23). Manual rotation of the PT shaft was difficult but possible with use of a breaker bar. No further disassembly of the PT shaft housing was carried out during the investigation.



Photo No. 23



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 16 of 22

Compressor Section

The 1st stage compressor rotor blades were inspected through the air inlet struts and found to be in satisfactory condition with no evidence of distortion or foreign object damage (FOD) (Ref. Photos No. 22 and No. 23). The shroud around the blade tips was unremarkable. The No. 1 bearing flexible housing was visible at the air inlet housing and was heavily corroded (Ref. Photo No. 24). No further access or disassembly of the compressor rotor assembly was carried out during the investigation.



Photo No. 22

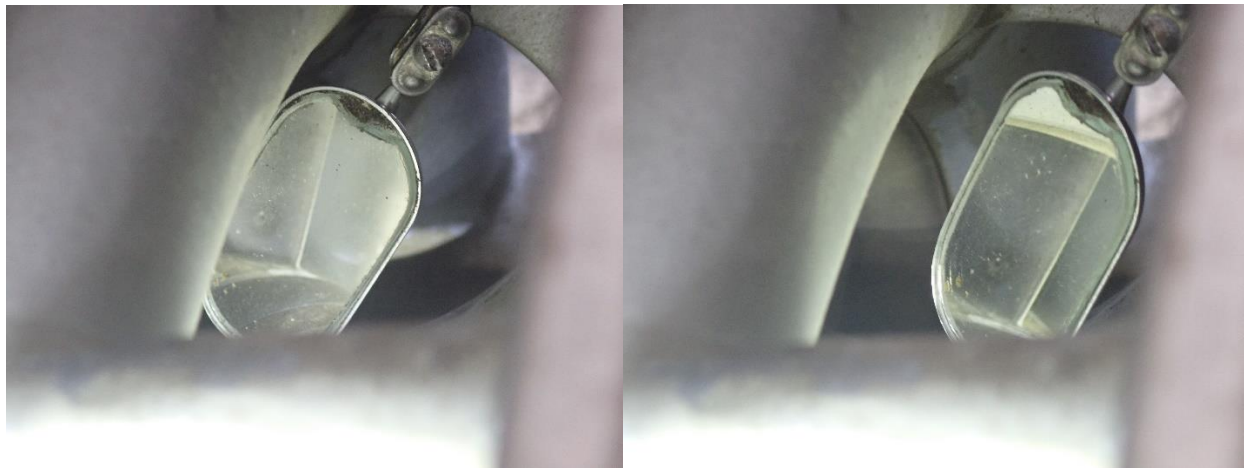


Photo No. 23





GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 17 of 22



Photo No. 24



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 18 of 22

Reduction Gearbox (RGB)

The front and rear RGB housings were missing along with all internal 1st and 2nd stage reduction gear components. The 1st stage sun gear was attached to the PT shaft housing assembly and heavily corroded (Ref. Photo No. 25).

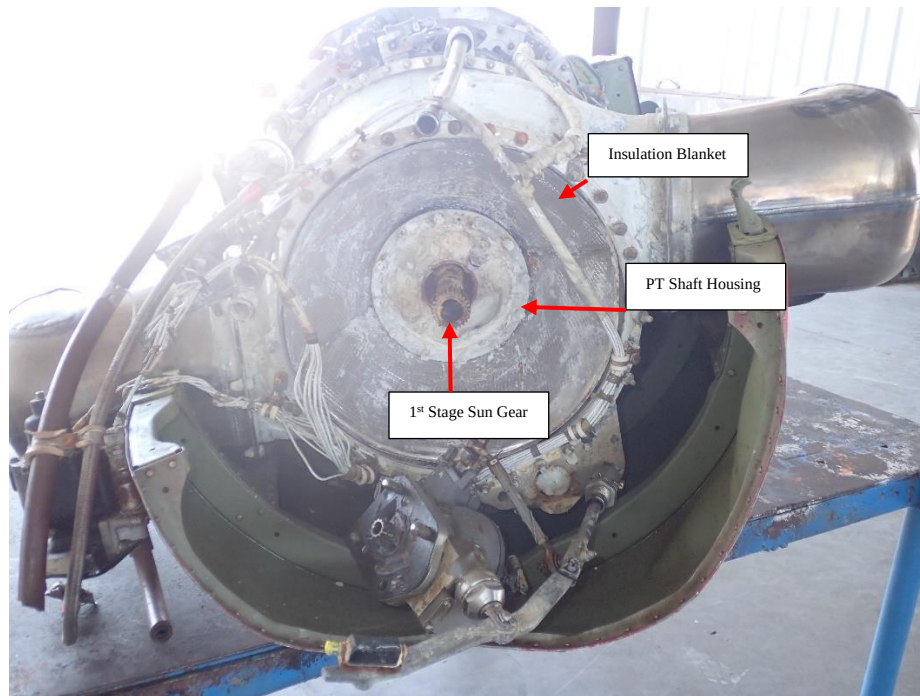


Photo No. 25



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 19 of 22

Accessory Gearbox (AGB)

The AGB cover, diaphragm and external scavenge oil pumps were not present during the examination. Three (3) AGB gears, the internal AGB scavenge oil pump, main pressure pump gears and spacer, all were laying loose with the engine and heavily corroded (Ref. Photo No. 26).

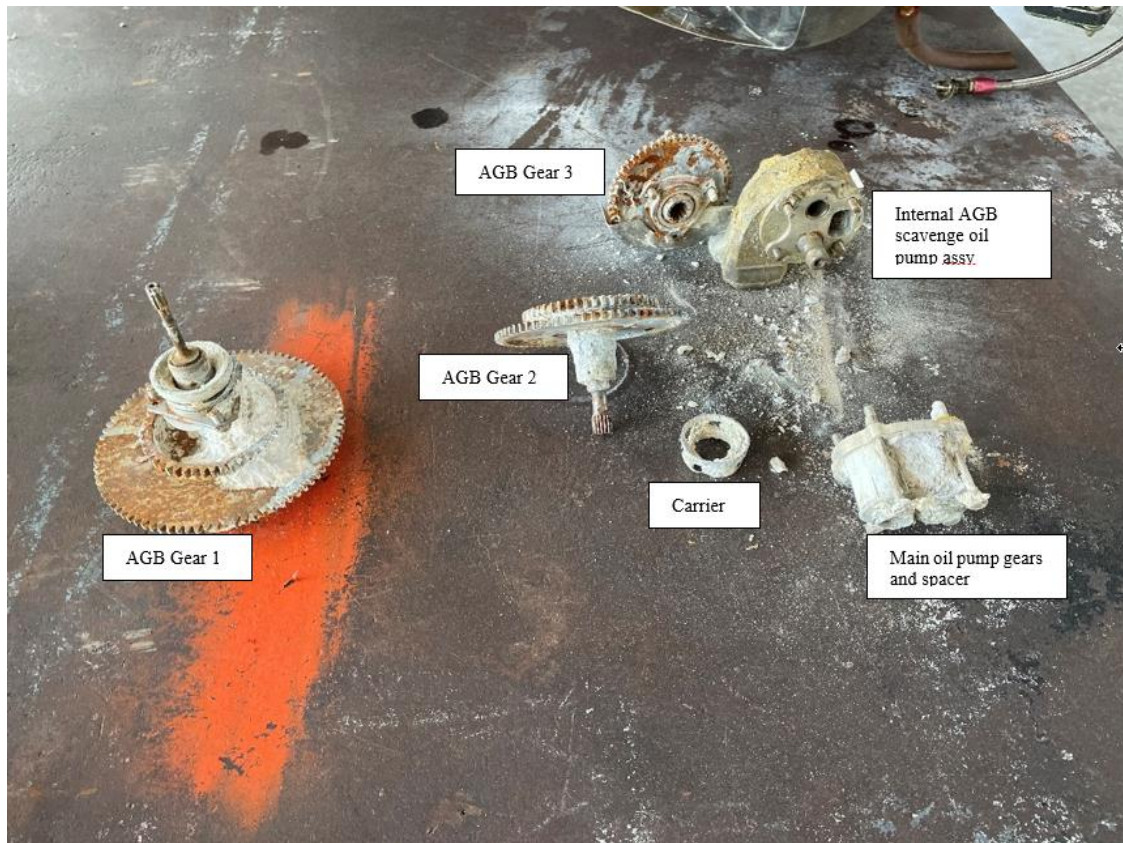


Photo No. 26



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 20 of 22

Controls and Accessories

The LH and RH ignition plugs and cables were attached and secured to the gas generator case. The cables were cut aft of the air inlet housing.

The fuel oil heat exchanger was loosely attached to the air inlet housing and held in place by its respective oil and fuel lines.

The high-pressure fuel pump and fuel control unit were attached to their respective fuel lines. The fuel pump drive shaft was attached to the AGB drive gear which was separate from the engine (Ref. Photo No. 27).

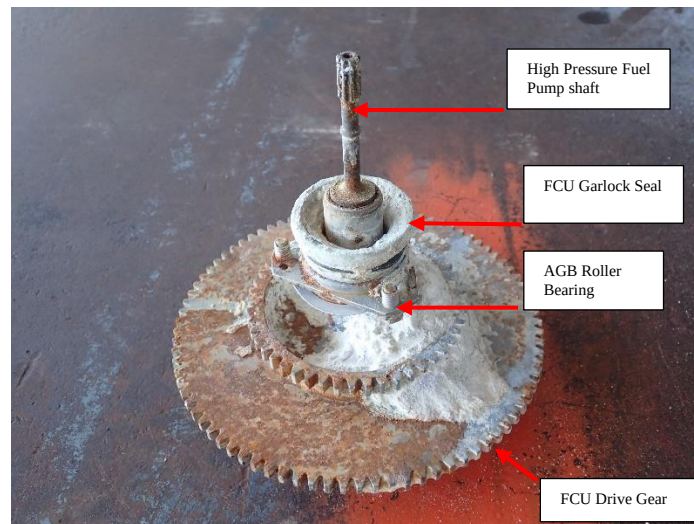


Photo No. 27



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 21 of 22

The FCU condition lever was fractured from the FCU and was not present during the investigation (Ref. Photo No. 28, red oval).

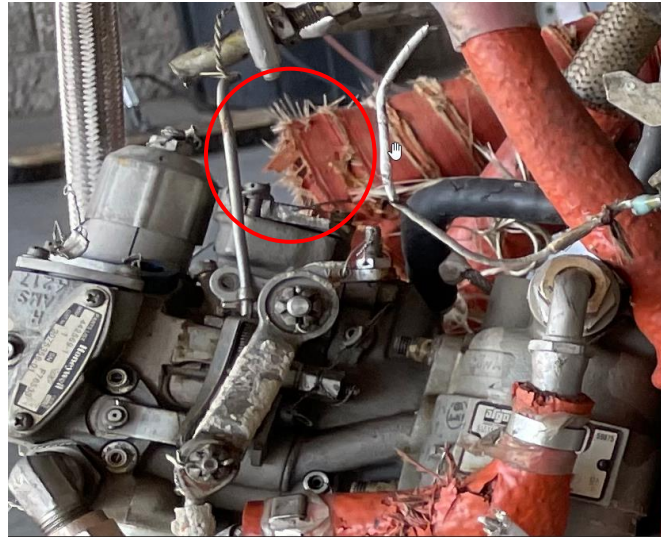


Photo No. 28

The fuel nozzles and fuel flow divider were intact and securely attached to the gas generator case. The fuel nozzles were not removed during the investigation.

The BOV was removed and found to be contaminated with water (Ref. Photo No. 29). The BOV piston was able to be moved freely by hand.



Photo No. 29

The propeller governor and overspeed governors were present and attached by their respective wire harnesses and air lines.



GO BEYOND

Service Investigation

Factual Notes

P&WC 12342 (2021-02)

Page: 22 of 22

III ADDITIONAL ACTIVITIES / FURTHER ANALYSIS

A final report of the engine examination will be provided by P&WC.

IV SUMMARY

The engine did not display deformation to the 1st stage compressor rotor airfoils characteristic of the engine developing power at the time of impact.

There were no indications of any pre-impact mechanical anomalies to any of the engine components that would have precluded normal engine operation.

V CLOSING

These factual notes are based on engine examination conducted 12 June 2024 and may be altered or corrected in the final investigation report on the basis of further information.

Pratt & Whitney Canada Corp.



Service Investigation Department
18 June 2024

Revision Reason: Revised to correct left-hand wing and left-hand engine were recovered to right-hand wing and right-hand engine were recovered.

