

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN24LA193

POWERPLANTS

Group Chair's Factual Report

July 10, 2025

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A. ACCIDENT

Location: Covert, Kansas, USA
Date: May 18, 2024
Time: 20:15 Local Time
Airplane: Air Tractor AT-502, N15189

B. ENGINE EXAMINATION GROUP

Investigator-in-Charge	Andrew Finne National Transportation Safety Board Aurora, Colorado, USA
Group Chair	Stephen J. Yee National Transportation Safety Board Washington, D.C., USA
Group Member	Ezra Olson Federal Aviation Administration Wichita, Kansas, USA
Accredited Representative (Canada)	Beverley Harvey Transportation Safety Board of Canada Ottawa, Ontario, Canada
Technical Advisor (Canada)	Mike Hodge Pratt & Whitney Canada Bridgeport, West Virginia, USA

C. EVENT SUMMARY

On May 18, 2024, about 2015 Central Daylight Time, an Air Tractor AT-502, registration N15189, was substantially damaged when it was involved in an accident near Covert, Kansas. The pilot was not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 137 agricultural flight.

According to the pilot, during the turnaround after his second swath run, he felt the tail drop and noticed that all the engine gauges, except the interstage turbine temperature gauge, were past redline. He attempted to reduce engine power but found the engine unresponsive to changes of the power lever. He conducted an off-field landing at a nearby gravel road. During the landing, the airplane impacted tree branches and ground looped into a roadside ditch which resulted in substantial damage to both wings. The pilot was only able to reduce engine power after coming to rest when the start control lever was moved to the fuel cut-off position.

D. DETAILS OF THE EXAMINATION

All directional and numbering references (front, rear, right, left, top, bottom, clockwise, counterclockwise) are made aft-looking-forward unless otherwise specified. References to clock positions, directions, and lengths are approximate.

1.0 Engine Description

The accident airplane was powered by one Pratt & Whitney Canada (PWC) PT6A-34AG turboprop engine, which has a three-stage axial plus one-stage centrifugal compressor driven by a single-stage compressor turbine (CT) and a reverse-flow annular combustion chamber (Figure 1). A free-turning¹, single-stage power turbine (PT) drives a propeller shaft through the reduction gearbox. The CT rotates counterclockwise while the PT rotates clockwise. According to the Federal Aviation Administration (FAA) Type-Certificate Data Sheet E4EA, Revision 30, dated June 16, 2021, the PT6A-34AG turboprop engine model has a maximum continuous equivalent shaft horsepower rating of 783 shaft horsepower².

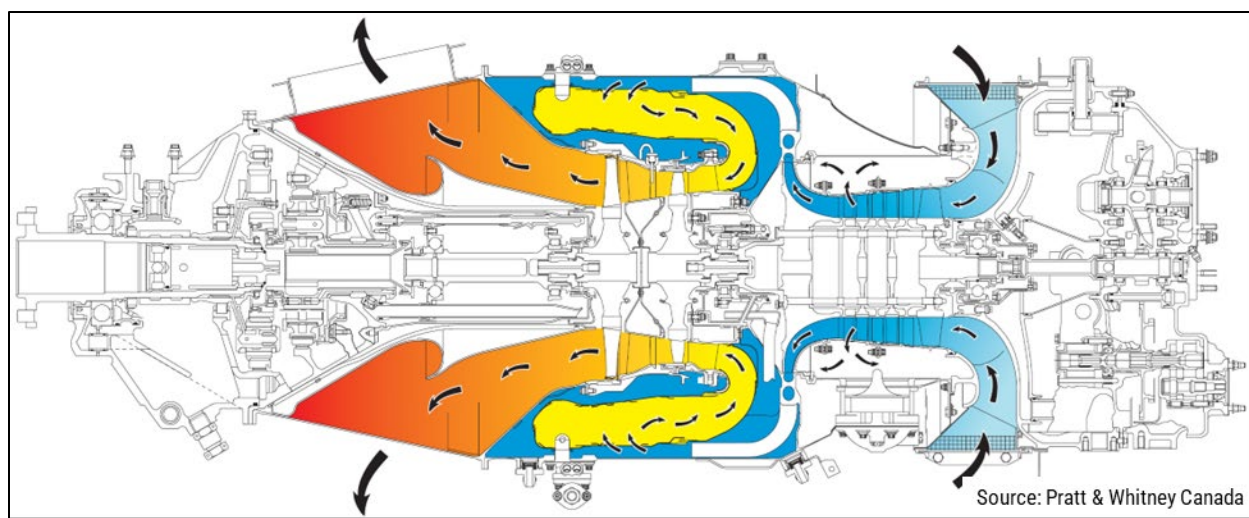


Figure 1: PWC PT6A engine cross-section and airflow

¹ The compressor and power turbines are not connected and turn at different speeds and in opposite directions. This design is referred to as a "free turbine" design.

² Engine ratings are based on static sea level condition 29.92 inches of mercury pressure, compressor intake screen installed, no external accessory loads, and no airbleed.

2.0 Engine and FCU Maintenance History

2.1 Engine Maintenance History

PWC records showed the accident engine serial number (ESN) PCE-PH0869, was manufactured on December 1, 2012.

Four maintenance entries from the engine logbook are shown in Table 1 below from when the engine was installed on a previous airplane.

Table 1: Engine History on A/C N883LA

DATE	2/8/2013	7/20/2020	9/25/2020	8/25/2022
TIME SINCE NEW (TSN)	1.0 (hours)	3,860.4	3,900.0	3,900.0
CYCLES SINCE NEW (CSN)	3 (cycles)	1,460	1,475	1,460
MAINTENANCE (MX)	Installation	100-Hour Inspection	Removal	Repair
MX ENTRY	Figure 2	Figure 3	Figure 4	Figure 5

On February 8, 2013, the engine was installed new on an Air Tractor AT-502B, registration N883LA (Figure 2).

		Engine Model		Engine Serial Number	
Date		PT6A-34AG		PCE-PH0869	
February 8, 2013					
Engine – TSN		Engine – Flights		Engine – Starts	
1.0 Hours		3		6	
				N/A	
Engine – TSO					
Aircraft Make		Aircraft Model		Aircraft - Registration	
Air Tractor		AT-502B		N883LA	
Aircraft Serial Number		502B-2883		Aircraft - Total Time	
				1.0 Hours	
Engine Performance		Torque		Fuel Flow	
OAT: 22° C BARO: 29.79 Baseline		1380 ft-lbs		60 gph	
Actual		1380 ft-lbs		56 gph	
				NG	
				98%	
				ITT	
				730°C	
				94%	
				680°C	
This engine installed, ground run, leak checked and found to operate satisfactory. The aircraft was test flown in accordance with Air Tractor, Inc. QCPM Manual Section 7: Inspection and Testing, Production Flight Test Procedures and Flight Test Form 1008, Revision Orig., dated 11/1/11. This engine was found to operate satisfactory and is in condition for safe operation. This engine complies with all applicable Airworthiness Directives through Biweekly AD 2013-02, published January 14 through January 27, 2013.					

Figure 2: Maintenance entry showing original engine installation

On July 20, 2020, the operator completed a 100-hour engine inspection (Figure 3).

7/20/2020 Air Tractor AT-502 N883LA S/N 502B-2883 Hobbs: 3860.4 Hr ACTT: 3860.4 Hr
 Pratt & Whitney PT6A-34AG S/N PCE-PH0869 Hobbs: 3860.4 Eng TT - 3860.4 Hr Eng
 TSN - 3860.4 Since HSI - 490.8 Hrs Starts - 1460 Flts - 11790

Figure 3: Maintenance entry showing completed engine inspection

On September 25, 2020, the engine was removed from N883LA for additional testing and inspection to correct power surges. The logbook entry showed the engine accumulated 39.6 hours since July 20, 2020, totaling 3,900.0 hours TSN, but it did not show engine starts (also called cycles, Figure 4). A printed e-mail within the logbook, dated August 29, 2022, stated the engine accrued 15 starts since July 20, 2020, which would result in 1,475 CSN.

9/25/2020 Air Tractor AT-502 N883LA S/N 502B-2883 Hobbs: 3900.0 Hr ACTT: 3900.0 Hr
 Pratt & Whitney PT6A-34AG S/N PCE-PH0869 Hobbs: 3900.0 Eng TT - 3900.0 Hr Eng
 TSN - 3900.0 Since HSI - 530.4

Removed this engine from the above airframe for additional testing and inspection to correct power surges.

Figure 4: Maintenance entry showing engine removal

On August 25, 2022, the engine was sent to Airforce Turbine Service in Tynan, Texas, who completed a compressor repair, hot section inspection, clean and flow of the fuel nozzles, and 100-hour inspection. This was the last engine repair completed prior to the accident. The recorded engine time was 3,900 hours TSN, the same as recorded on September 25, 2020. However, engine cycles incorrectly showed 1,460 CSN, the same as recorded on July 20, 2020 (Figure 5).

Airforce Turbine Service P.O. Box 146 Tynan, TX 78391 www.pt6a.aero		 ATS		Certified Repair Station	
				TQZR133K	
		Phone	(361) 547-3386		
		Fax	(361) 547-7273		
Cycle Sheet				Date	8/25/22
W.O.	10377				
A/C Reg.	A/C Model	Eng Model	Eng S/N (PCE#)	Tach/Hobbs	
N883LA	AT-502B	PT6A-34AG	PH0869	3,900	
Eng TT	Eng TSO	Eng CSN	Eng CSO	Eng TSHSI	
3,900	N/A	Starts: 1,460 Flights: 11,790	N/A	0.0	

Figure 5: Maintenance entry showing engine repair

Three maintenance entries are shown in Table 2 below from when the engine was installed on the accident airplane.

Table 2: Engine History on A/C N15189

DATE	11/2/2022	6/19/2023	1/1/2024
TSN	3,900.0	4,094.5	4,348.2
CSN	1,460	Unknown	1,627
MX	Install	100-Hour Inspection	100-Hour Inspection
MX ENTRY	Figure 6	Figure 7	Figure 8

On November 2, 2022, this engine was installed into the accident airplane, registration N15189, by Moyer Aviation, Inc. in Ulysses, Kansas. The engine did not accrue any additional hours or cycles since being repaired on August 25, 2022 (Figure 6).

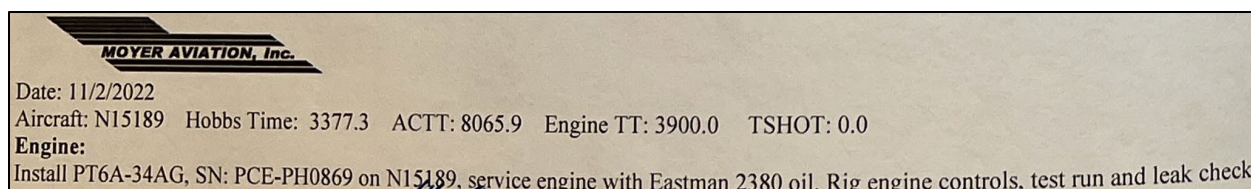


Figure 6: Maintenance entry showing engine installation

On June 19, 2023, a 100-hour inspection was completed. The airplane accumulated 194.5 hours since the engine was installed, which would result in the engine totaling 4,094.5 hours TSN. However, the recorded engine time was 3,900 hours TSN. No engine cycles were listed (Figure 7).

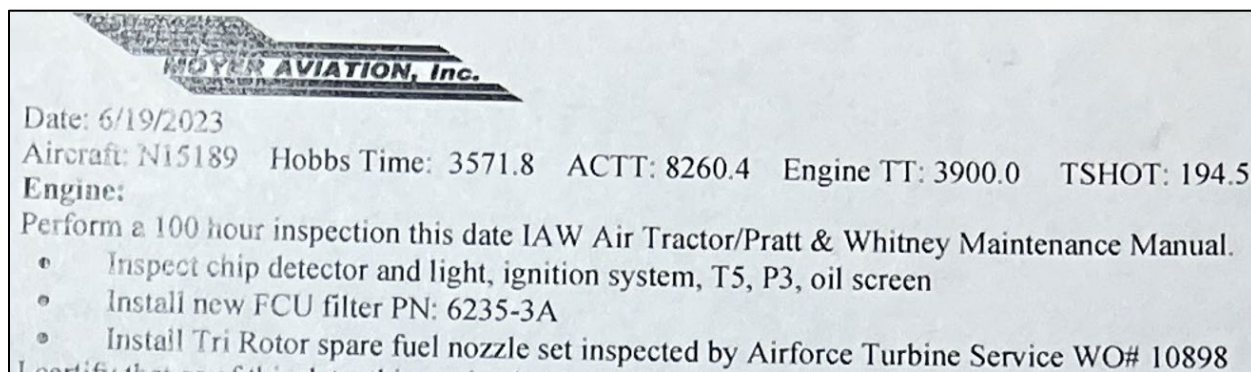
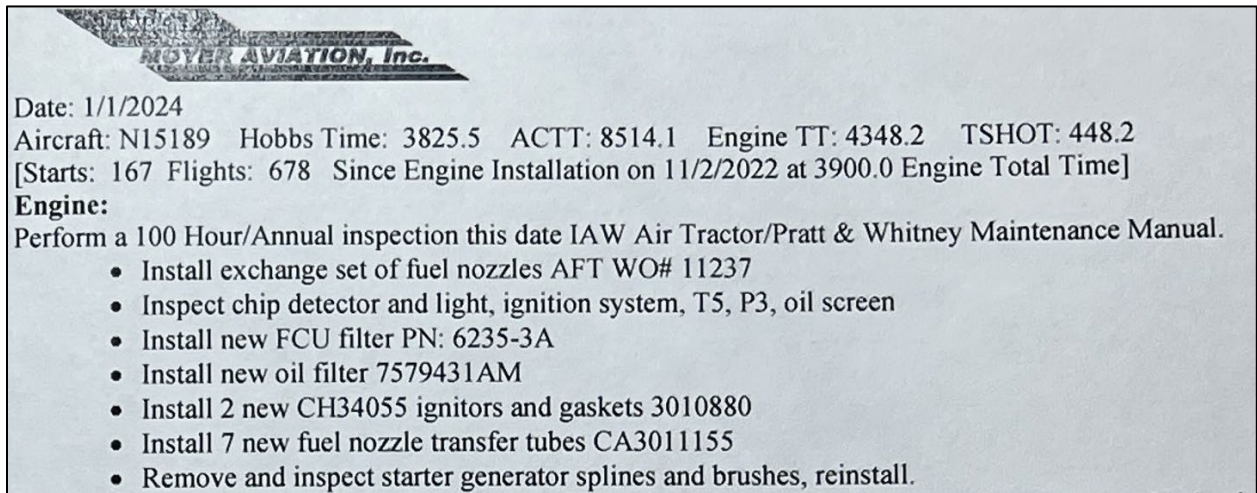


Figure 7: Maintenance entry showing engine inspection

On January 1, 2024, the last recorded maintenance prior to the accident flight was a 100-hour annual engine inspection performed by Moyer Aviation, Inc. Engine total accumulated cycles was not listed. However, the entry stated the engine accrued

167 starts since installation, which would result in the engine totaling 1,627 CSN (Figure 8).

A screenshot of a maintenance log entry. At the top left is a logo for 'MOYER AVIATION, Inc.' with the tagline 'MAINTENANCE & REPAIR'. The entry text includes: 'Date: 1/1/2024', 'Aircraft: N15189', 'Hobbs Time: 3825.5', 'ACTT: 8514.1', 'Engine TT: 4348.2', 'TSHOT: 448.2', and '[Starts: 167 Flights: 678 Since Engine Installation on 11/2/2022 at 3900.0 Engine Total Time]'. A section titled 'Engine:' follows, with the instruction 'Perform a 100 Hour/Annual inspection this date IAW Air Tractor/Pratt & Whitney Maintenance Manual.' and a bulleted list of tasks: 'Install exchange set of fuel nozzles AFT WO# 11237', 'Inspect chip detector and light, ignition system, T5, P3, oil screen', 'Install new FCU filter PN: 6235-3A', 'Install new oil filter 7579431AM', 'Install 2 new CH34055 ignitors and gaskets 3010880', 'Install 7 new fuel nozzle transfer tubes CA3011155', and 'Remove and inspect starter generator splines and brushes, reinstall.'

MOYER AVIATION, Inc.
MAINTENANCE & REPAIR

Date: 1/1/2024
Aircraft: N15189 Hobbs Time: 3825.5 ACTT: 8514.1 Engine TT: 4348.2 TSHOT: 448.2
[Starts: 167 Flights: 678 Since Engine Installation on 11/2/2022 at 3900.0 Engine Total Time]

Engine:
Perform a 100 Hour/Annual inspection this date IAW Air Tractor/Pratt & Whitney Maintenance Manual.

- Install exchange set of fuel nozzles AFT WO# 11237
- Inspect chip detector and light, ignition system, T5, P3, oil screen
- Install new FCU filter PN: 6235-3A
- Install new oil filter 7579431AM
- Install 2 new CH34055 ignitors and gaskets 3010880
- Install 7 new fuel nozzle transfer tubes CA3011155
- Remove and inspect starter generator splines and brushes, reinstall.

Figure 8: Maintenance entry showing last engine inspection prior to accident flight

2.2 Fuel Control Unit Maintenance History

The engine logbook had five maintenance entries (including the original engine installation) related to the fuel control unit (FCU) and are shown in Table 3 below. All entries occurred before the accident engine was installed on the accident airplane N15189.

Table 3: Accident Engine's FCU History

ORIGINAL FCU S/N	C75968	C75968	C75192 [†]	C75192 ^{†*}	A85159 [‡]
NEW FCU S/N	n/a	C75197 [†]	C75879 [†]	C75879 [†]	n/a
MX DATE	2/8/2013	10/16/2018	7/20/2020	8/5/2020	8/25/2022
TSN AT MX	1.0	Unknown	3,860.4	3,879.1	3,900
CSN AT MX	3.0	Unknown	1,460	Unknown	1,475
MX ENTRY	Figure 2	Figure 9	Figure 10	Figure 11	Figure 12
* Repeat FCU removal/replacement maintenance entry † No date of removal found ‡ No date of installation found					
9/25/2020: Engine removed from N883LA for testing and inspection to correct power surges.					
11/2/2022: Engine installed in N15189.					

PWC records showed the engine's originally installed FCU was serial number (s/n) C75968.

On October 16, 2018, the originally installed FCU, p/n 4138008-3Y³, s/n C75968, was replaced with p/n 4138008-3, s/n C75197. The letter "Y" after the p/n indicates this FCU had its bypass valve sleeve replaced in accordance with Honeywell Service Information Bulletin SIB-73-094 (Figure 9).

10-16-18	0	Removed Fuel Control	P/N-4138008-3 Y	S/N- C75968
		Installed Fuel Control	P/N- 4138008-3	S/N- C75197

Figure 9: First entry showing original FCU removal and replacement

No subsequent logbook entry showed when FCU C75197 was removed. The next FCU-related entry was on July 20, 2020, which showed the installed FCU, p/n 4138008-3, s/n C75192, was removed and replaced with FCU p/n 4138008-3, s/n C75879. No previous logbook entry was found showing when C75192 was installed (Figure 10).

³ P/n 4138008-3 is Honeywell's p/n for a single fuel delivery line configuration FCU with manual override. A flow divider attaches to the FCU and divides fuel flow between the primary and secondary fuel manifolds at startup.

7/20/2020 Air Tractor AT-502 N883LA S/N 502B-2883 Hobbs: 3860.4 Hr ACTT: 3860.4 Hr
Pratt&Whitney PT6A-34AG S/N PCE-PH0869 Hobbs: 3860.4 Eng TT - 3860.4 Hr Eng
TSN - 3860.4 Since HSI - 490.8 Hrs Starts - 1460 Flts - 11790

Replaced starter generator P/N 25059-2 S/N S00085XL2 with P/N 23048-0006 S/N 1110. Replaced FCU P/N 4138008-3 S/N C75192 with like serviceable item S/N C75879. Replaced flow divider p/n 3019906 with like overhauled item s/n 12675. Replaced forward fitting on flow divider dump valve hose. Chip plugs inspected, tested and re-installed. Serviced oil screen. Removed inspected, cleaned and re-installed engine air filters. Performed rigging and operational checks of prop and engine. AD's checked through 2020-14.

"I certify that this engine has been inspected I/A/W a 100 Hr /Annual Inspection and was determined to be in airworthy condition".

Figure 10: Second FCU removal and replacement entry

On August 5, 2020, a logbook entry stated "Replaced starter fuel control P/N 4138008-3Y S/N C75985 with like item 0.0 TSO S/N C75879." PWC states the PT6 engine does not have a part named "starter fuel control." PWC confirmed s/n C75985 was an FCU shipped from the manufacturer in 2012. This entry also stated FCU s/n C75192 was replaced with C75879, which appeared to be a repeat statement from the previous July 20, 2020 entry (Figure 11).

8/5/2020 Air Tractor AT-502 N883LA S/N 502B-2883 Hobbs: 3879.1 Hr ACTT: 3879.1Hr
Pratt&Whitney PT6A-34AG S/N PCE-PH0869 Hobbs: 3879.1 Eng IT - 3879.1 Hr Eng
TSN - 3879.1 Since HSI - 509.5Hrs

Replaced starter fuel control P/N 4138008-3Y S/N C75985 with like item 0.0 TSO S/N C75879. Replaced FCU P/N 4138008-3 S/N C75192 with like serviceable item S/N C75879. Op's checked and found okay.

Figure 11: Third FCU removal and replacement entry

The accident fuel control unit, p/n 3244777-6-5⁴, s/n A85159, was already installed on this engine when it was received by Airforce Turbine Service for repair. On August 25, 2022, final repair inspection noted this FCU was in serviceable condition. No FCU-related logbook entries were found showing the date when this fuel control unit was installed (Figure 12).

⁴ P/n 3244777-6-5 is PWC's p/n for an FCU with a starting flow control configuration that divides fuel flow to the manifolds at startup.

Customer: TRI-ROTOR Date: 08-25-2022
W/O#: 10377 PT6A- 34AG PCE PH0869

FINAL INSPECTION
PAGE 3 OF 3

ACCESSORIES	PART NO.	SERIAL NO.	COND.
FUEL PUMP	386101-5	003678	Serv.
START FLOW CONTROL	3019109	9521	Serv.
FLOW DIVIDER	3014703	175-528	Serv.
FUEL CONTROL UNIT	3244777-6-5	485139	Serv.
FUEL HEATER	105526	W495619	Serv.
EXCITER BOX	NA	NA	NA
CONSTANT SPEED GOVERNOR	8210-002-01	1851937	Serv.
OVERSPEED GOVERNOR	NA	NA	NA
TRIM STICK	3031417CL 25	NA	Serv.
BLEED VALVE	3100829-03	234810	Serv.

Figure 12: Final inspection after repair showing accident FCU s/n

Only two FCU-related maintenance entries were found after the accident engine was installed on N15189 which stated new FCU (fuel) filters were installed.

3.0 Engine Examination

The accident engine was examined at the Dodson International Parts, Inc. facility in Rantoul, Kansas on July 31, 2024. Participants from the National Transportation Safety Board (NTSB), PWC, and the FAA attended the examination. The accident airplane and engine were secured with straps to a rolling cart when the investigation team arrived (Figure 13). According to the engine data plate, the ESN was PCE-PH0869 (Figure 14). A Hartzell technical advisor examined the accident propellers and provided a separate report for this investigation.



Figure 13: Accident airplane



Figure 14: Engine data plate

The engine had no evidence of external fire or uncontainment. The exhaust case was distorted and buckled. The accessory gearbox attached to the air inlet housing appeared undamaged (Figure 15).



Figure 15: Left side view of the accident engine

The cockpit condition lever movement had some resistance when cycled between shut-off and high idle positions. Lever resistance persisted even after disconnecting the lever's control cable from the engine's starting flow control. The power lever inside the cockpit was difficult to move. The reversing cable was disconnected from the beta lever at the front clevis (Figure 16) and the power lever cable was disconnected from the cambox's input lever (Figure 17). With both cables detached, all cambox and FCU actuation movements felt smooth and appeared to have full range of motion.

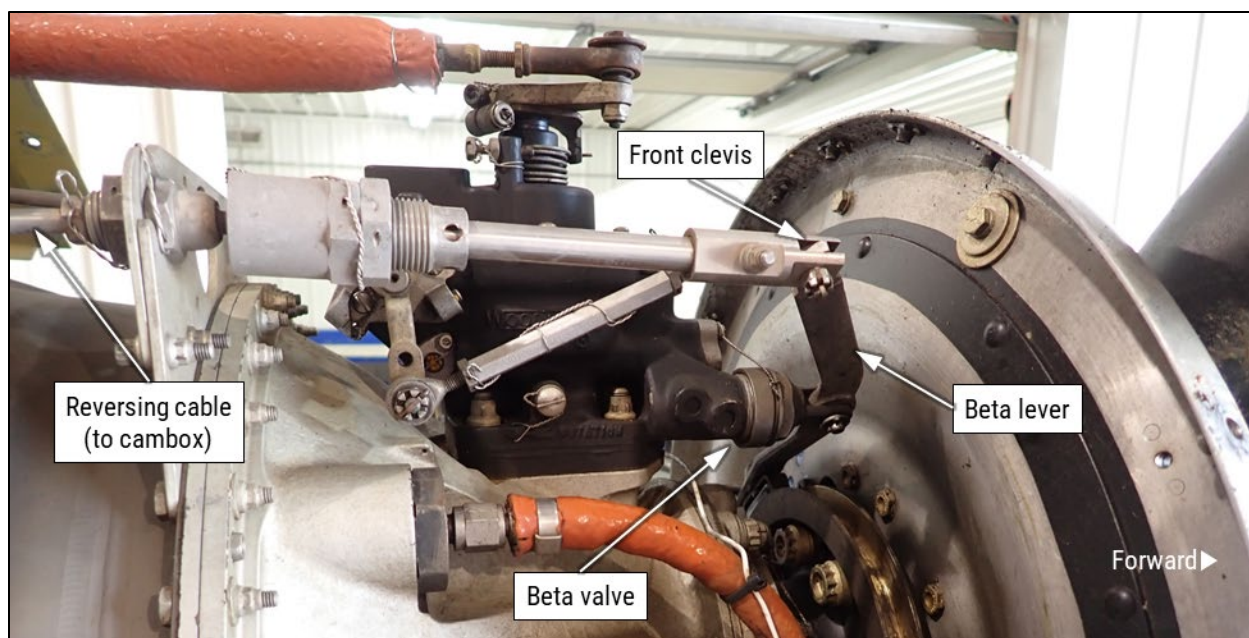


Figure 16: Front linkage rigging

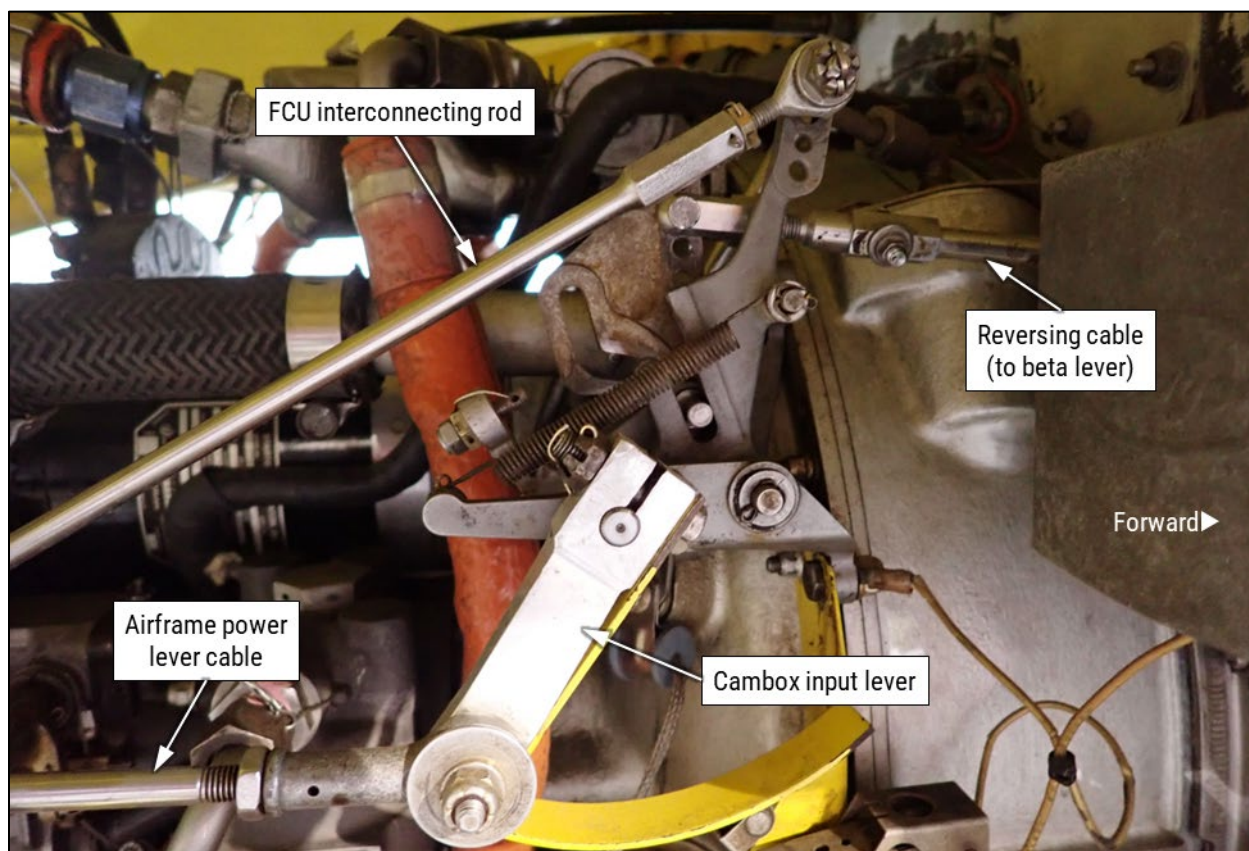


Figure 17: Rear linkage rigging

The beta ring appeared undamaged and was positioned full-forward because the propeller's hydraulic unit (piston, cylinder, and feathering spring assembly) had

separated from the propeller hub assembly during the impact sequence. The beta arm was properly positioned under the retention pin and the carbon block was correctly positioned in the beta ring. The pin's attachment flange was bent aft (Figure 18). The beta valve moved smoothly and appeared to achieve full travel. The propeller flange appeared undamaged and its dowel pins were securely in place with no evidence of movement (Figure 19).

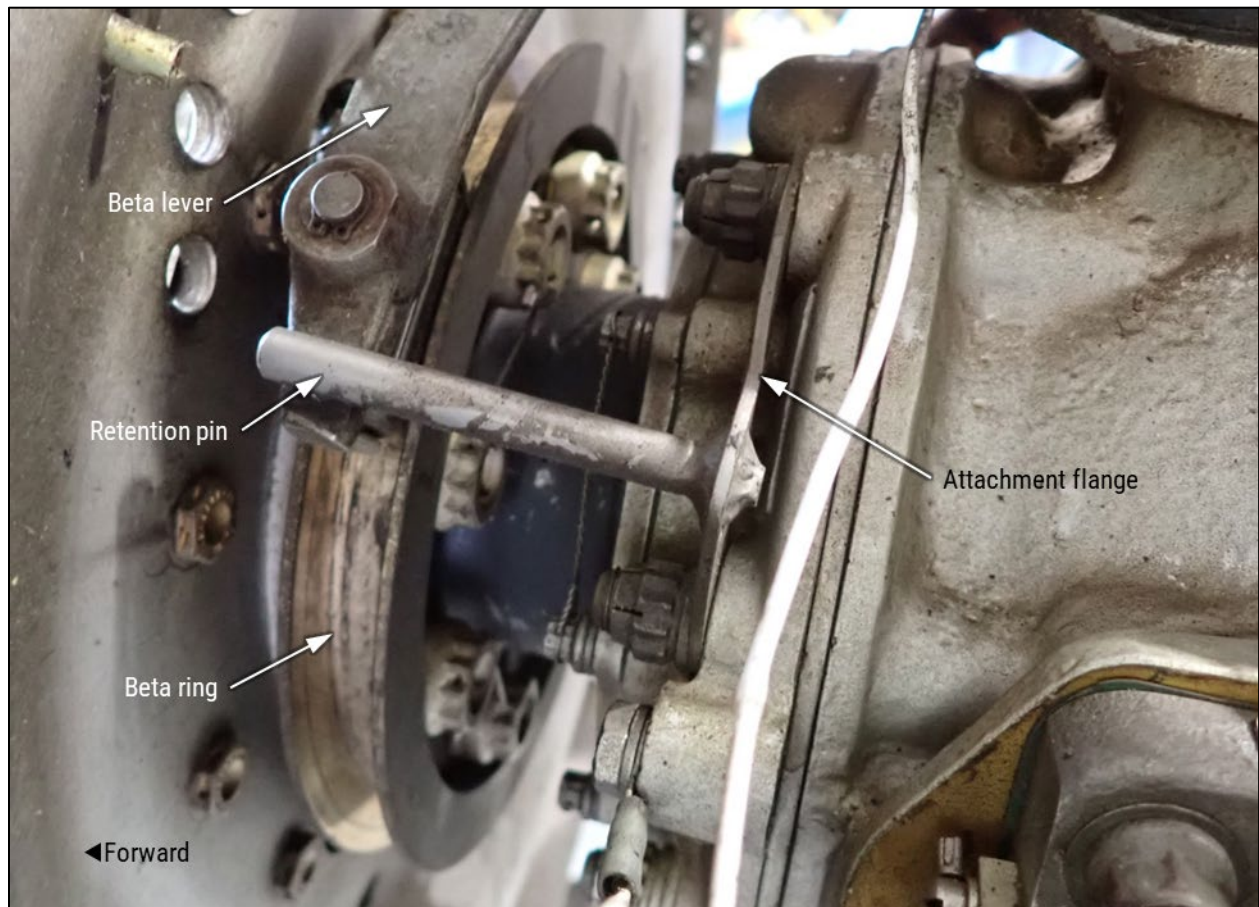


Figure 18: Beta ring in full-forward position

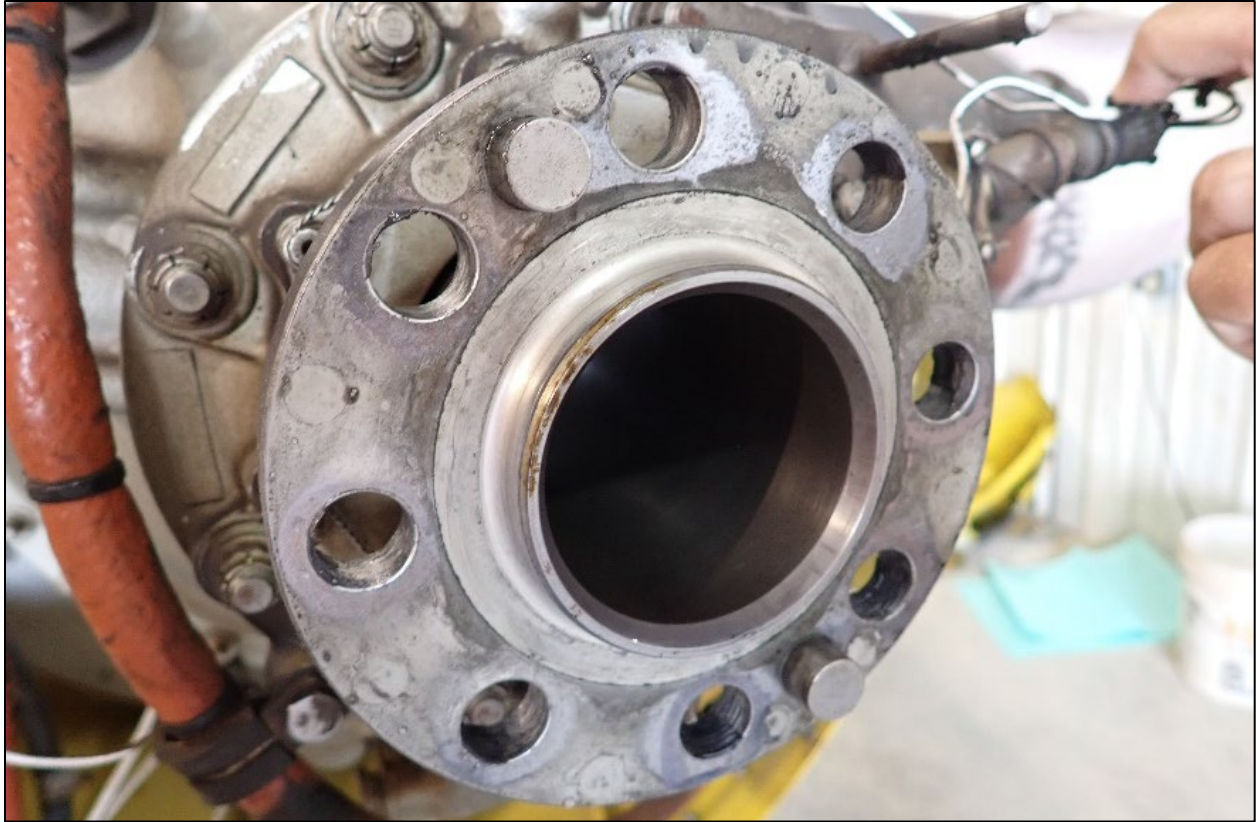


Figure 19: Propeller flange

The airbox surrounding the gas generator section was in good condition and removed from the engine. The air inlet screen was removed to access the stage 1 compressor which rotated smoothly (Figure 20). No cracks were found on the inlet struts. Borescope inspection of the stage 1 compressor found some blades had previous leading edge blend repairs, but all blades appeared typical of normal operational condition. Visible portions of the stage 1 stator vanes appeared undamaged (Figure 21). The compressor turbine blades appeared full length and undamaged when inspected by borescope through the 9 o'clock fuel nozzle port. The compressor was not disassembled further.

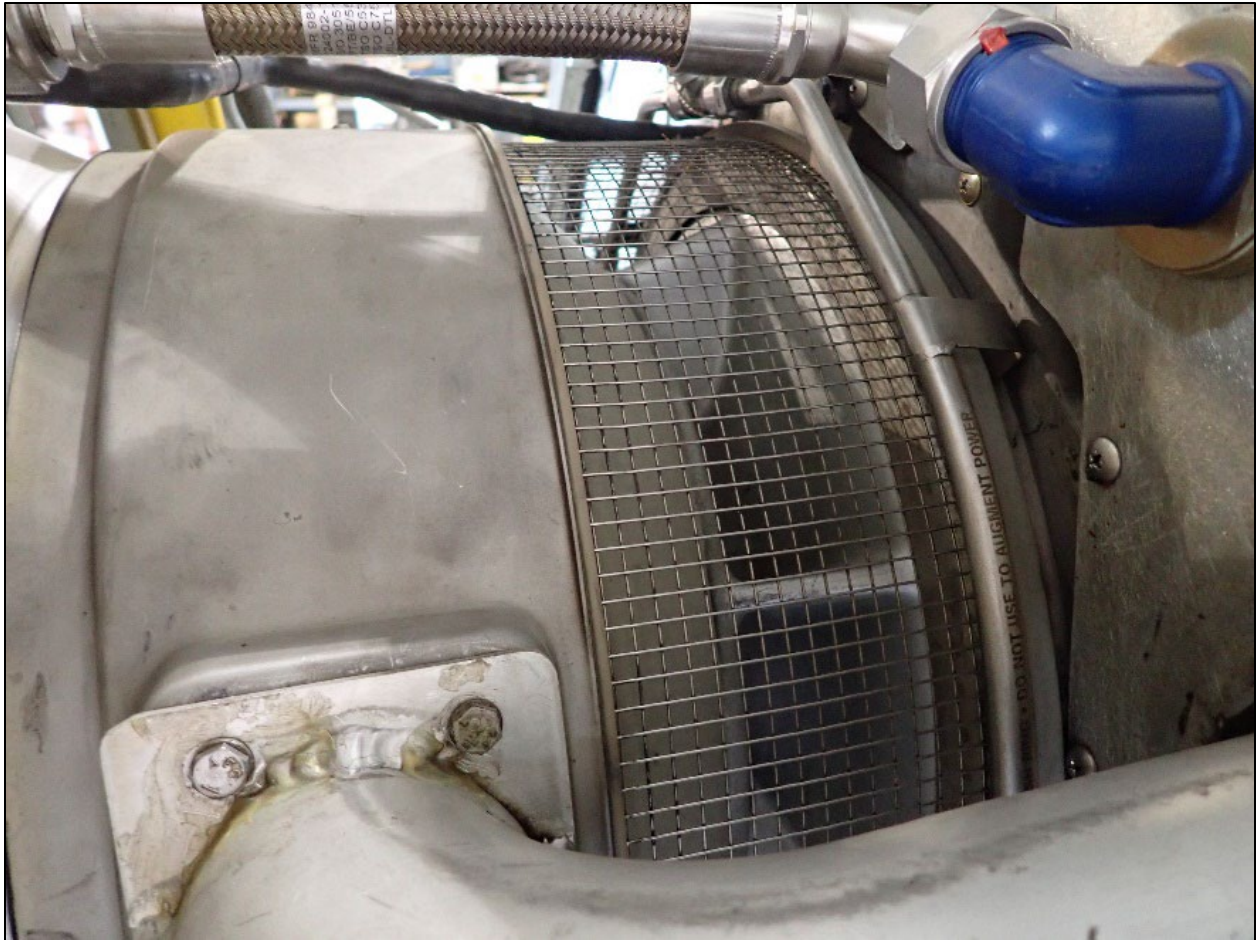


Figure 20: Air inlet screen



Figure 21: View of stage 1 compressor blade leading edges

The PT rotated when the propeller flange was rotated by hand. Light metal scraping was heard coming from inside the power section. The PT stator housing and PT vane ring assembly appeared in good condition. The upstream and downstream sides of the vane ring's inner bore baffle had light circumferential rubs. The vane ring's outer diameter step near the airfoil trailing edge had circumferential rubs from 7 to 11 o'clock (Figure 22).

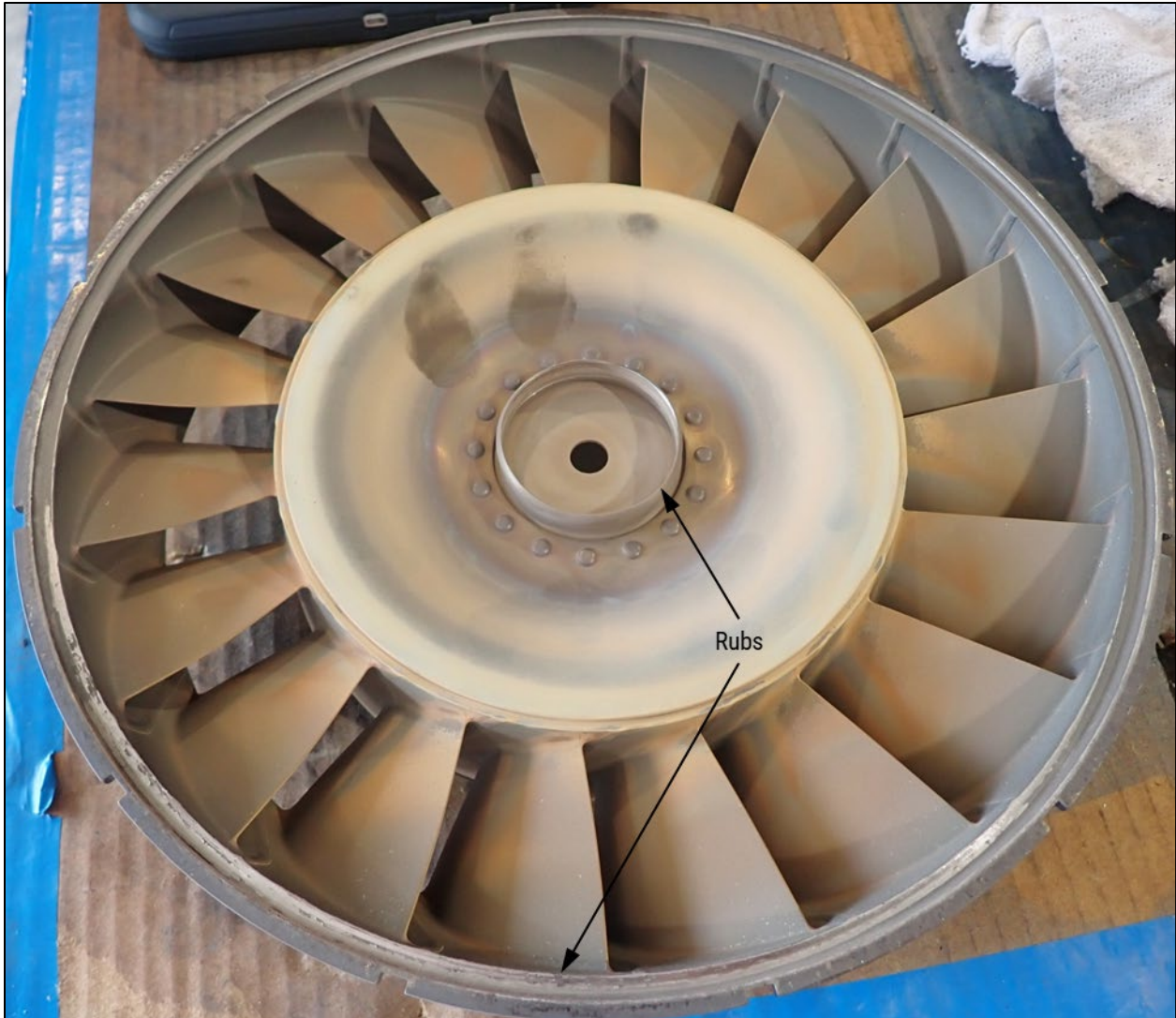


Figure 22: Downstream side PT vane ring

The PT disk spigot bore had circumferential rubs that corresponded to rubs on the PT vane ring assembly's inner bore baffle (Figure 23). The PT blades were full length. The front faces and outer diameters of the blade tip shrouds were rubbed (Figure 24). Corresponding circumferential rubs were found on the PT shroud (Figure 25).

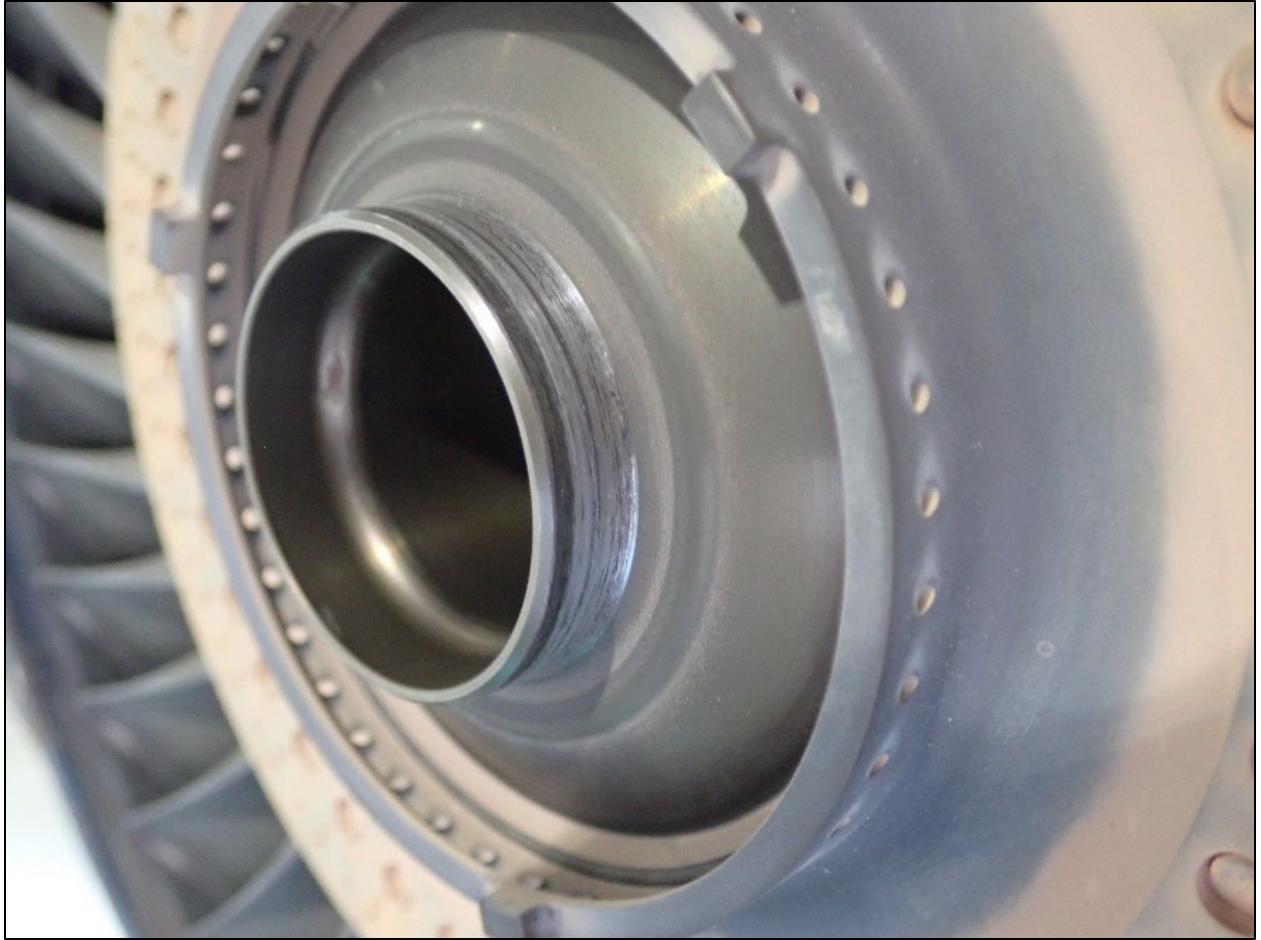


Figure 23: Upstream side of PT disk spigot bore rubs



Figure 24: Rubs on the front faces of the blade tip shrouds

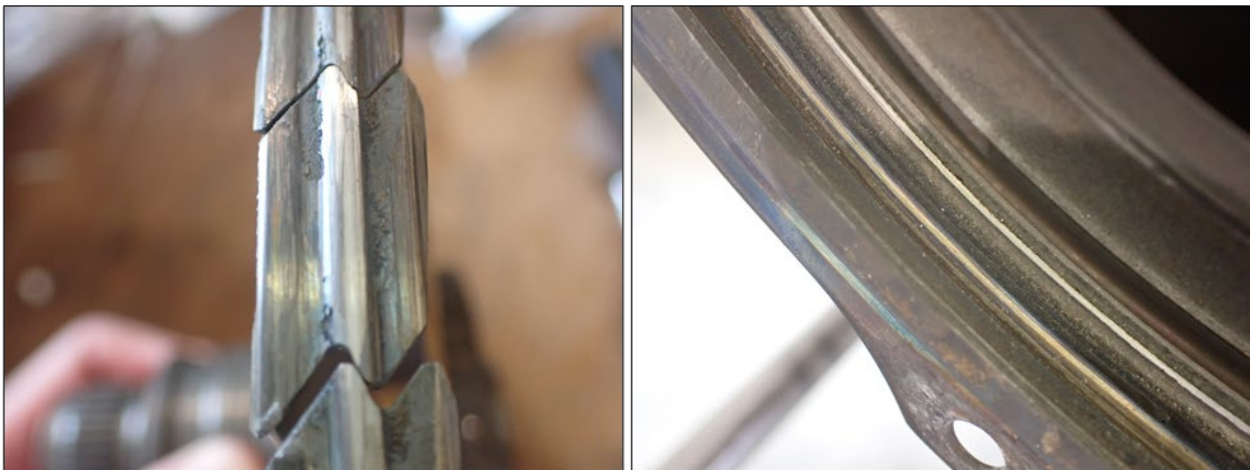


Figure 25: Rubs on PT blade tip shrouds (left) and on the PT shroud (right)

The downstream side of the combustor assembly and CT vane appeared undamaged and typical of normal engine operation. Light circumferential rubs were found on the CT outer shroud (Figure 26). The combustor liner appeared in good

condition and had no hot spots, burnthroughs, or fuel streaks. The combustor assembly and CT were not disassembled further.

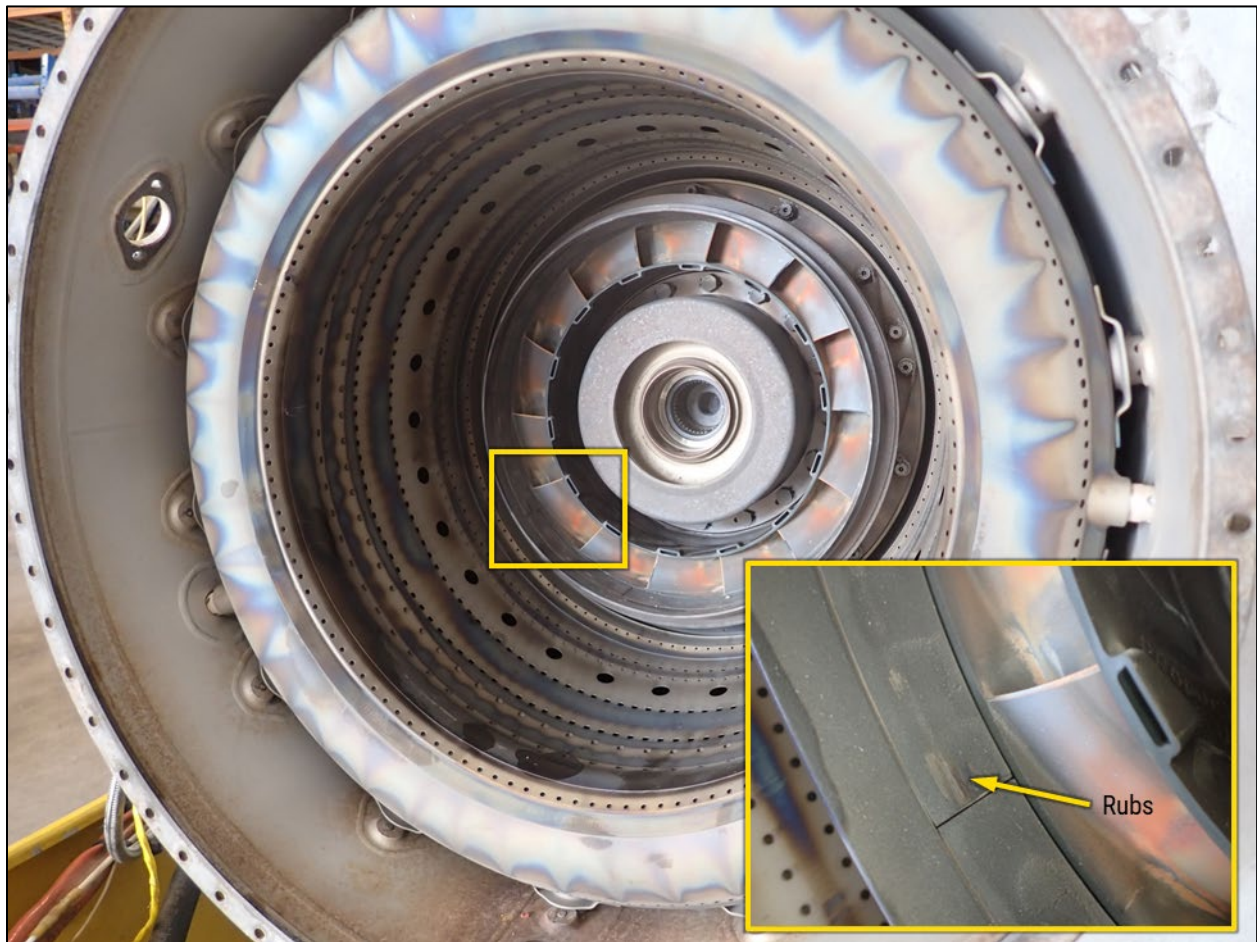


Figure 26: Downstream side of combustor and CT vane and rubbing on the CT outer shroud (inset)

The CT disk was in good condition. The upstream side of the CT disk face had rub marks on the attachment posts that corresponded with rubs on the CT vane ring inner platform. The splines on the disk forward coupling appeared undamaged. Circumferential rubs were found on the downstream spigot bore. CT blade airfoil tips had light circumferential rubs from contact with the CT shroud segments (Figure 27).



Figure 27: Upstream side of CT disk

The reduction gearbox chip detector was mostly clean with small metal particles adhered to the magnetic elements. Engine oil appeared normal with no acrid smell (Figure 28).



Figure 28: Small metal shavings on chip detector

The fuel filter appeared dirty but typical of normal operation. The fuel within the filter bowl was clear and free of debris (Figure 29).



Figure 29: Fuel filter and bowl

The flexible P3⁵ line from the compressor case to the FCU and the rigid Py⁶ line from the FCU to the propeller governor (also called constant speed unit) both appeared undamaged with all connections tightly secured in place (Figure 30). The P3 filter was dry, free of debris, and undamaged (Figure 31).

⁵ P3 is compressor discharge pressure.

⁶ The Py line is a pneumatic pressure air line between the propeller governor and the FCU used for overspeed control. In the event of an overspeed, the propeller governor can bleed Py pressure, which closes the FCU metering valve and reduces fuel flow.

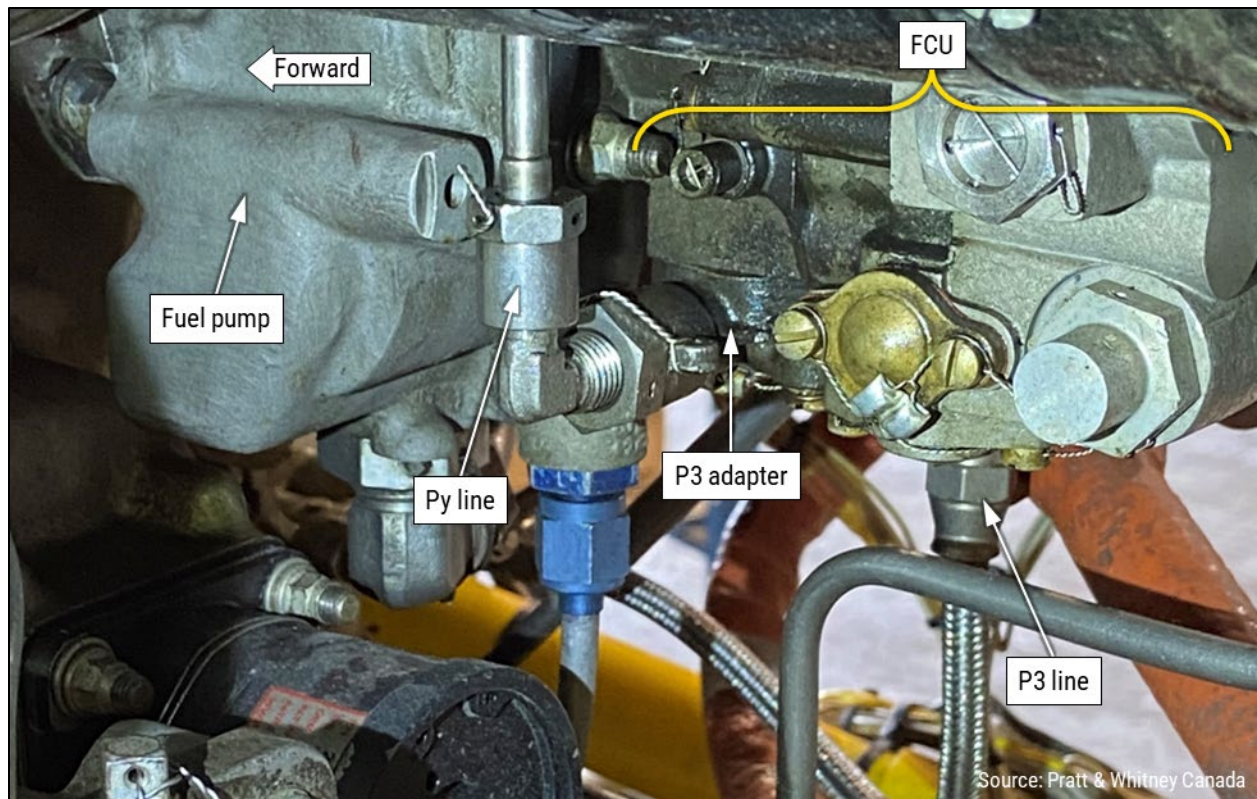


Figure 30: P3 and Py connections to FCU as-installed on the engine



Figure 31: P3 filter and bowl

The fuel pump and FCU were removed from the accessory gearbox. The nylon protective sleeve connecting the FCU to the fuel pump appeared undamaged and was in place on the drive shaft which spun freely. All fasteners were tight and secured with lockwire. The power control lever moved freely. According to the FCU data plate, the unit was a Honeywell p/n 3244777-6-5, s/n A85159. The FCU was held for further examination (Figure 32).

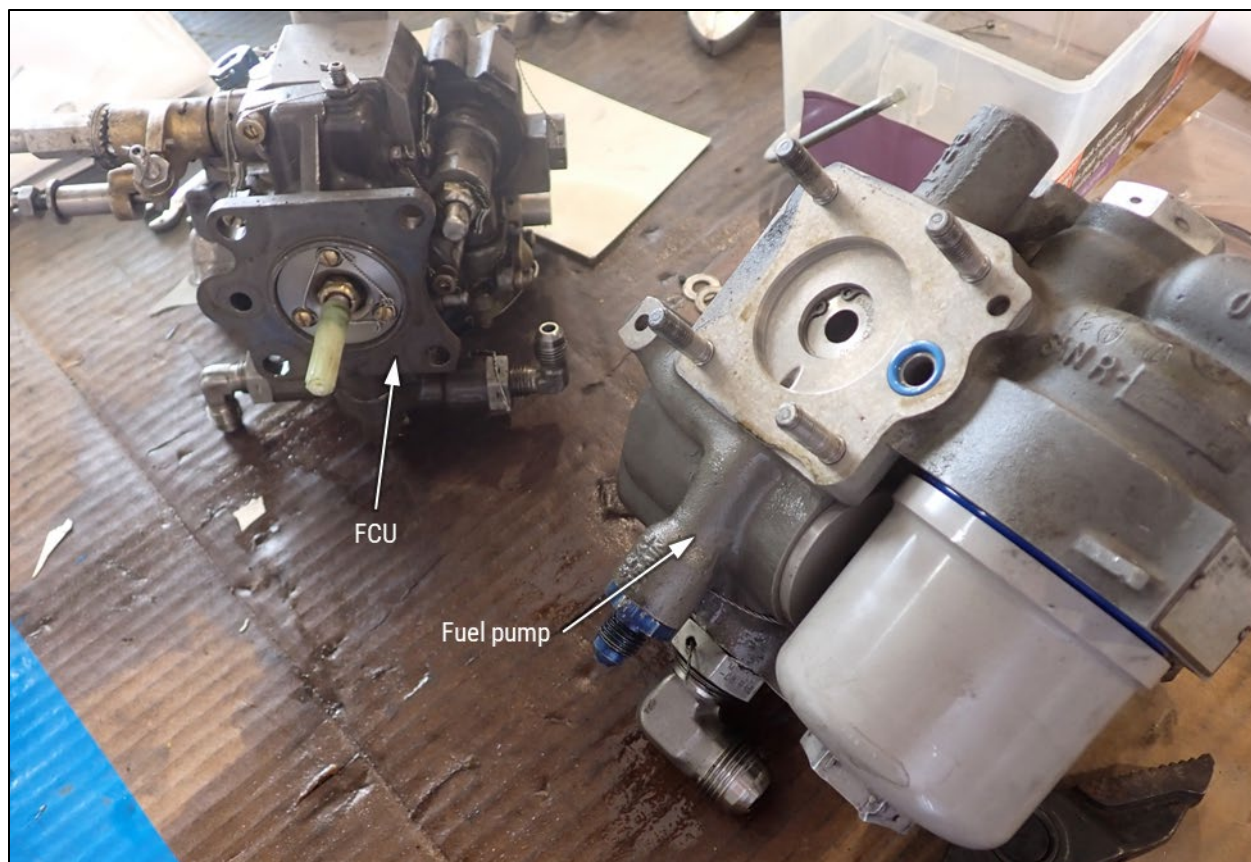


Figure 32: FCU and fuel pump

4.0 Fuel Control Unit Testing and Examination

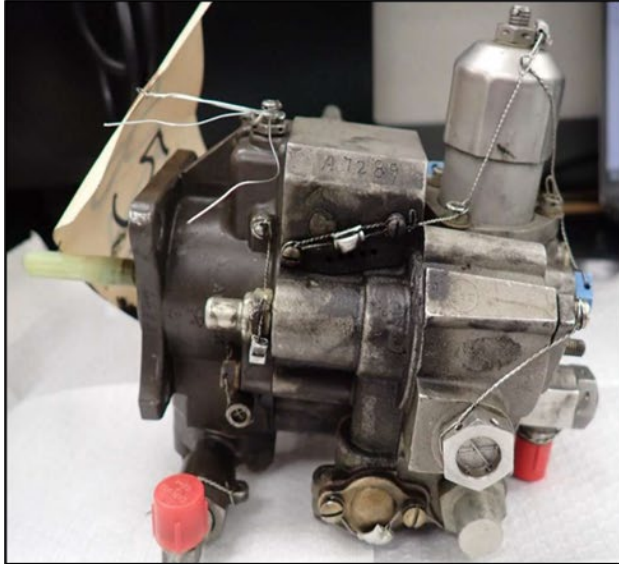
The accident engine's FCU and flexible P3 air supply line were sent in a cardboard box from the Dodson International Parts facility in Rantoul, Kansas to the VSE Aviation facility in Independence, Kansas for examination and testing on September 10, 2024. Participants from FAA attended this examination (Figure 33).

Follow-up examination was completed on November 12, 2024, at the same facility. Participants from PWC and FAA attended this examination. The NTSB did not attend either examination.

According to the data plate, the FCU was a Honeywell model DP-F2, PWC p/n 3244777-6-5, s/n A85159 (Figure 34). See Attachment 1 and Attachment 2 for examination results.



Figure 33: FCU shipment as-received by VSE Aviation



Source: VSE Aviation

Figure 34: Unboxed FCU (left) and data plate (right)

The FCU's fuel flow-metering valve regulates engine burn fuel flow over a wide range of settings and consists of a steel needle moving within a ported steel sleeve. A pneumatic bellows controls metering valve position using modified P3 compressor discharge air pressure to initiate acceleration, deceleration, and to control compressor speed (Ng). A P3 air adapter attaches to the FCU and meters incoming P3 compressor discharge air into Px and Py air pressures which act on the bellows.

The FCU (with flexible P3 air supply line) was tested in accordance with Honeywell Test Specification AETS 48182 (Figure 35). Test point K which checks for external air leakage specifies only "slow bubbling" is allowed from specific FCU locations, including the joint between the drive body and P3 air adapter. If excessive leakage is found, measured Px minus Py must be within ± 1.2 inches of mercury. This measurement was performed twice and found to be 15 and 36 inches of mercury, both outside of limits. The FCU was removed from the test stand and disassembled.

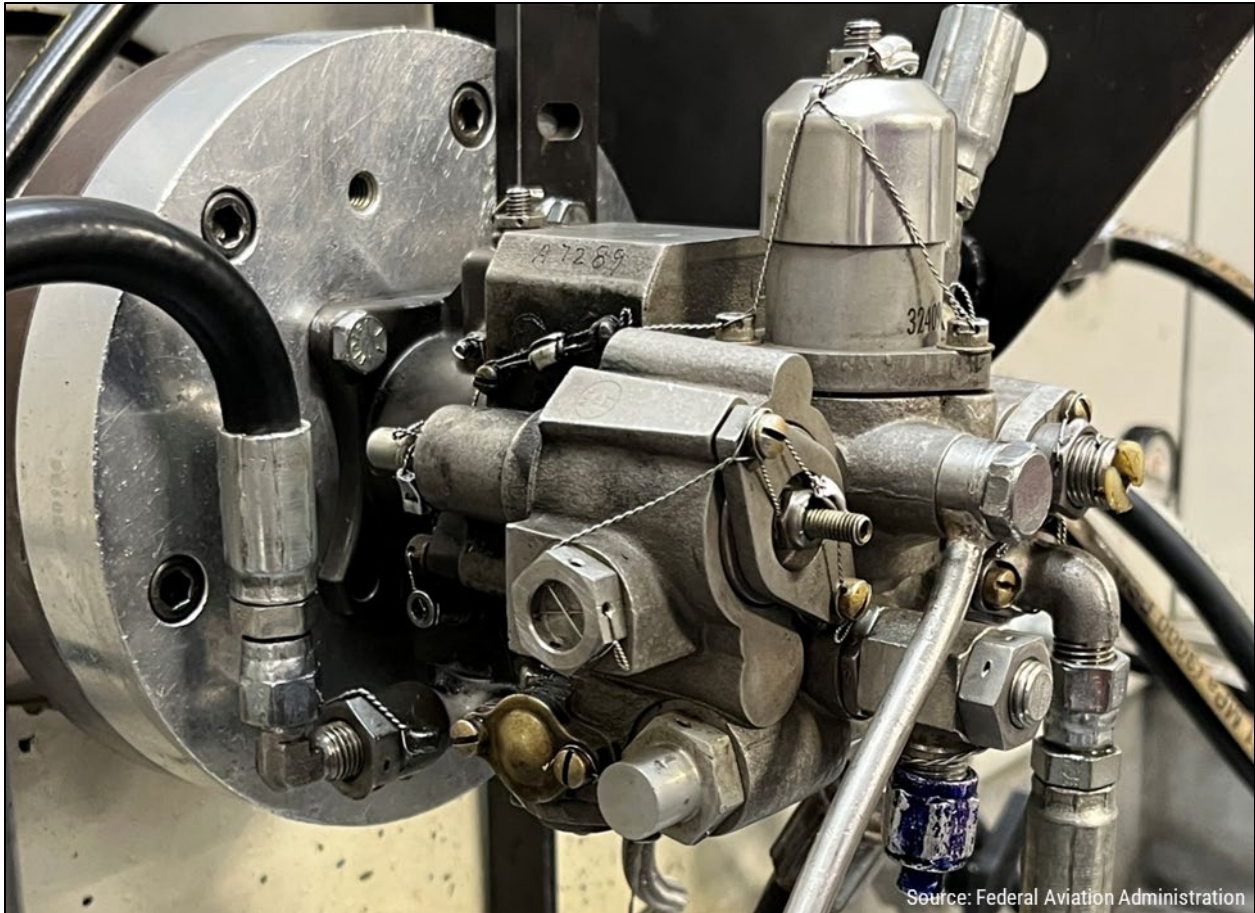


Figure 35: FCU test setup

The P3 adapter attached to the FCU's main body was loose and appeared to move with light finger pressure. Two screws securing the P3 adapter to the FCU's main body were safety wired; however, the wire on both screws appeared to be in a neutral configuration⁷ (Figure 36).

⁷ Properly installed safety wire (also called positive wire locking) should always tend to tighten a screw, bolt, nut, or fastener. Neutral configuration refers to safety wire installation that exerts no tightening or loosening force and is considered improper safety wiring practice.

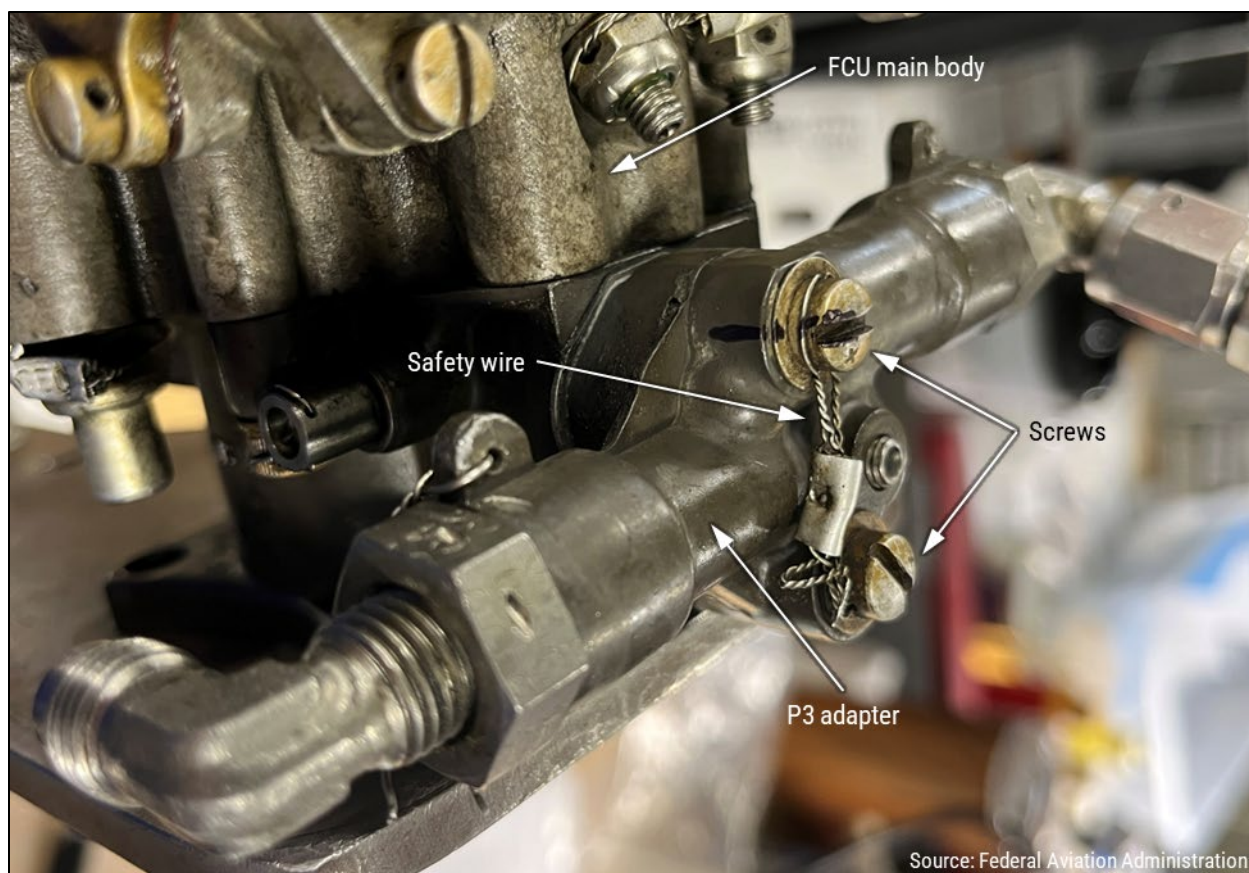


Figure 36: P3 adapter

The P3 adapter was removed from the FCU by cutting its safety wire and removing its two screws. A digital screwdriver registered zero torque to unscrew one screw while the other was removed by hand without the screwdriver. Both screws and their threaded holes appeared in good condition. Contact surfaces on the P3 adapter, aluminum gasket, and FCU main body appeared fretted. A light scratch was found between the Py restrictor and aft screw hole on the FCU main body (Figure 37). The P3 air adapter had small, metallic particles inside the Px air cavity (Figure 38).

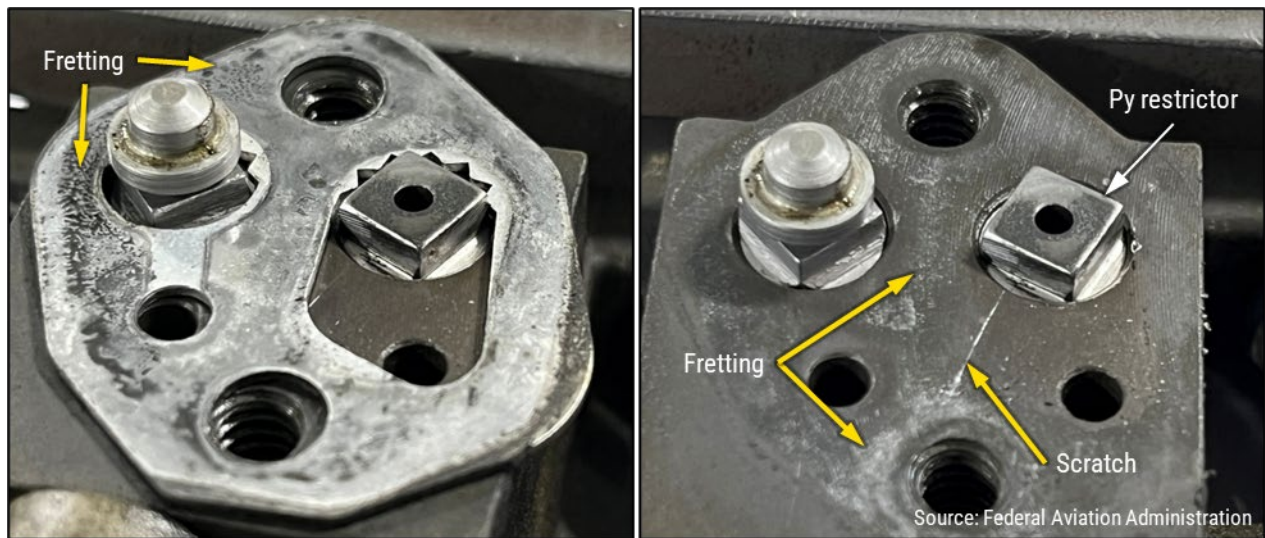


Figure 37: Fretted aluminum gasket (left) and FCU main body (right)

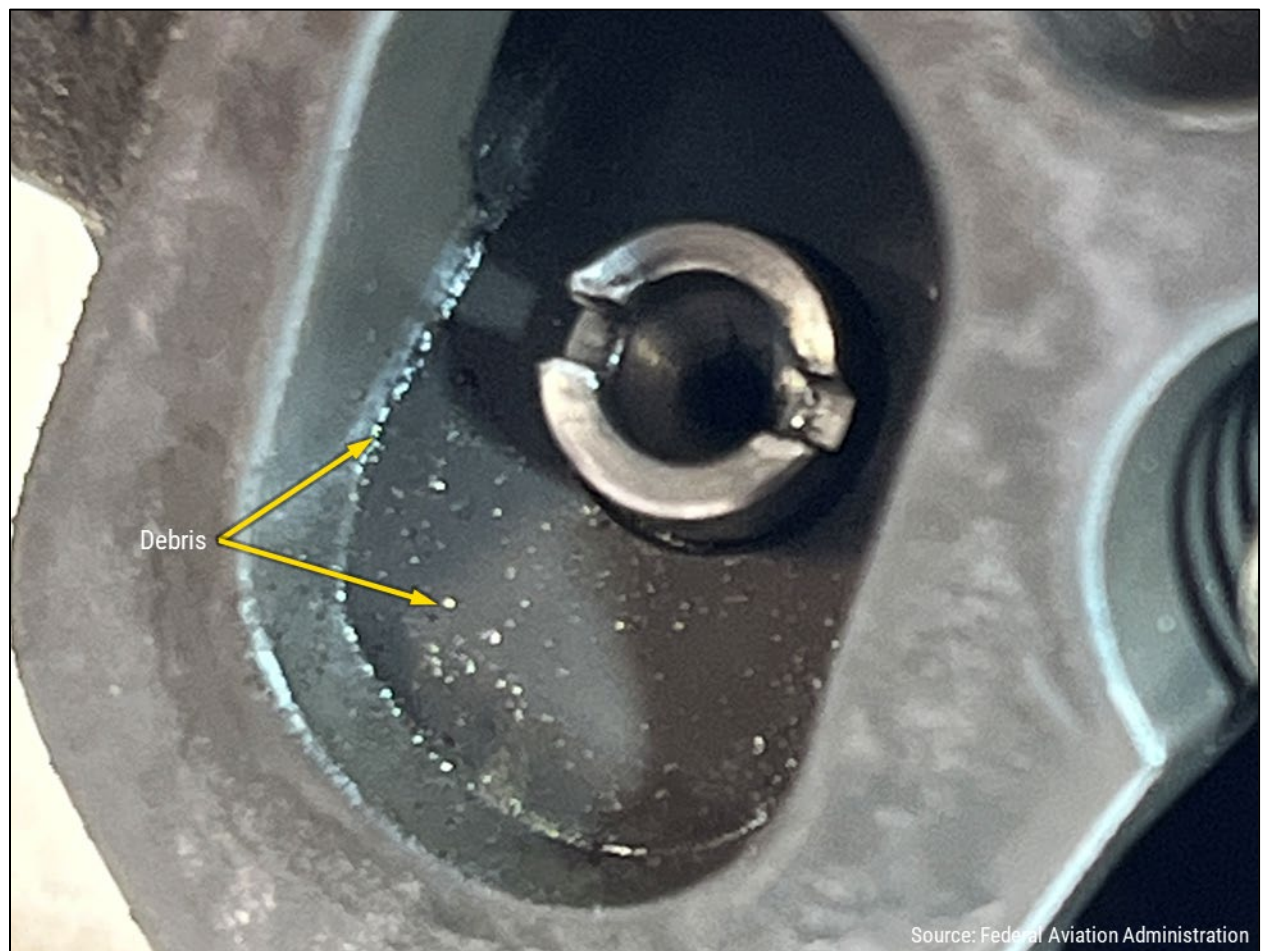


Figure 38: Metallic particles inside P3 adapter cavity

The flexible P3 supply line appeared undamaged and clear of internal obstructions. The P3 line connects to a pressure port fitting on the P3 adapter and has a

conical metering orifice to convert incoming P3 air into Px air. This orifice had a concentric impression around the cone portion of the fitting (Figure 39).

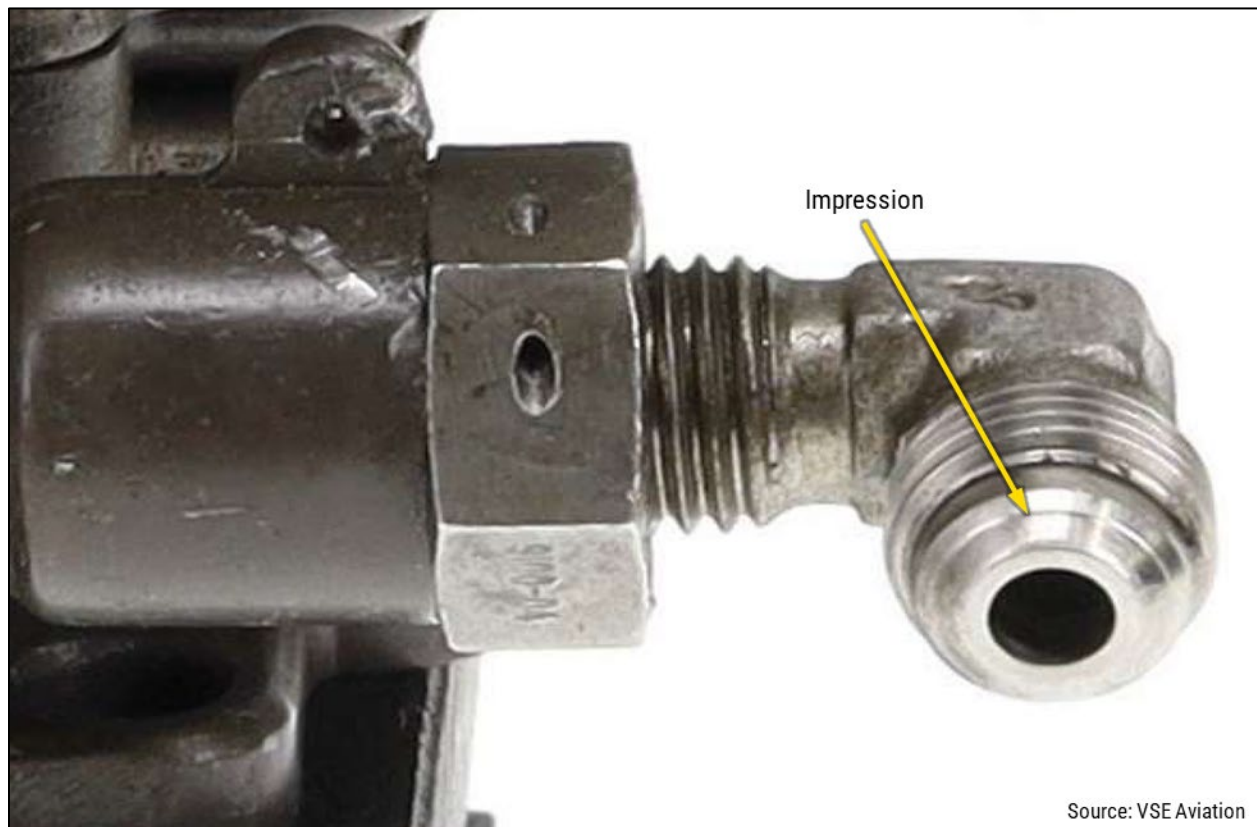


Figure 39: Impression on Px pressure port fitting

E. ATTACHMENTS

Attachment 1: VSE Aviation Investigation Report #1

Attachment 2: VSE Aviation Investigation Report #2

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