

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR25LA053

ENGINE EXAMINATION

March 17-21, 2025

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A. ACCIDENT

Location: Spokane, Washington
Date: December 2, 2024
Time: 1530 Pacific daylight time
Airplane 1: N29GA, Gulfstream AM CORP COMM DIV690D

B. ENGINE EXAMINATION

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Federal Way, Washington

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Phoenix, AZ

C. SUMMARY

On December 02, 2024, about 1530 Pacific standard time, a Gulfstream AM CORP COMM DIV 690D, N29GA, was substantially damaged when it was involved in an accident near Spokane, Washington. The pilot was not injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

The pilot reported that, during the RNAV (GPS) instrument approach to runway 04L at Felts Field Airport (SFF), Spokane, Washington, the airplane was about 100 ft above ground level, he added power, and both engines were unresponsive. The airplane landed about 950 ft short of the runway threshold in soft terrain. During the landing roll, the landing gear collapsed, and the airplane came to rest upright.

D. DETAILS OF THE EXAMINATION

1.0 Engine Examination

Left Engine

Engine Manufacturer: Honeywell Aerospace Technologies
Engine Model Number: TPE331-10T-513K
Engine Part Number: 3108110-3
Engine Serial Number: P99443

The engine was received crated and sealed. After removal of the crate, the engine was examined and the following discrepancies were noted:

- Damage to the threads of the temperature compensator was observed.
- Rubbing was observed to the upper section of the 3rd stage turbine shroud.
- Damage to the starter/generator gear shaft and seal was observed.



Figure 1: View of left engine create at examination site.

The engine was mounted to a stationary engine stand and all the airframe interface components were removed in preparation for an engine run.

The oil filter was removed, and an oil sample was taken for analysis. A review of the oil analysis did not identify constituents that would have precluded the engine from a test run.

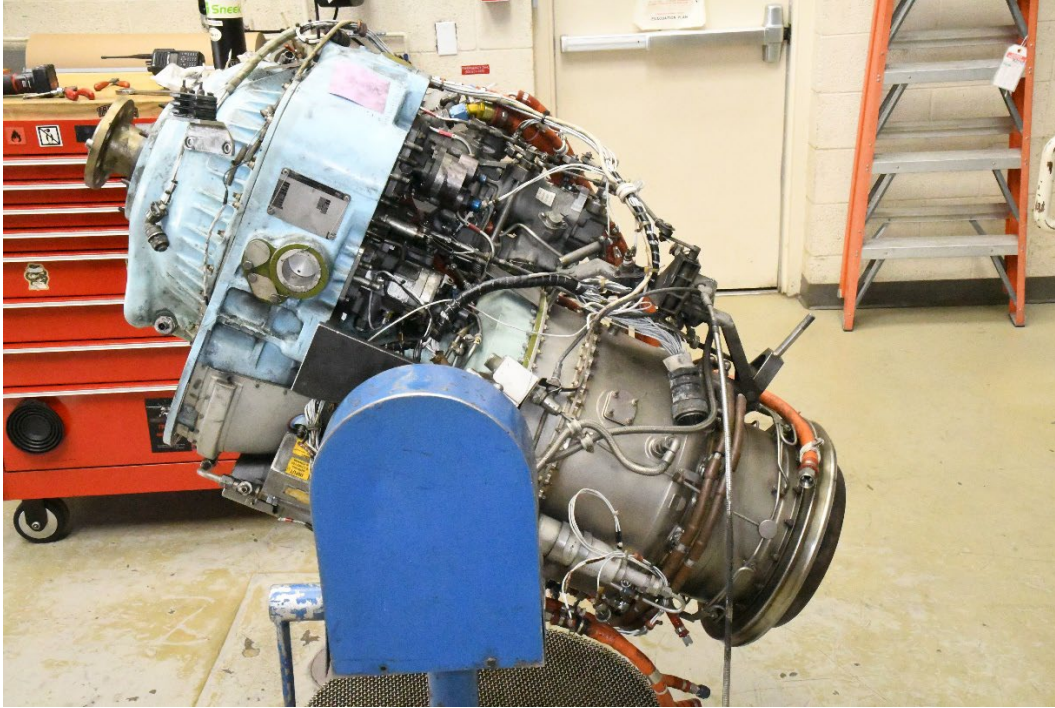


Figure 2: View of left engine on engine stand.

A lighted borescope was utilized to examine the 1st stage turbine nozzles, rotor blades, 1st stage centrifugal compressor impeller, and the torque sensor within the reduction gear box, no anomalies were noted.

The engine was mounted on a test stand and prepared for the test run, installing the appropriate oil and fuel connections, test equipment and propeller.

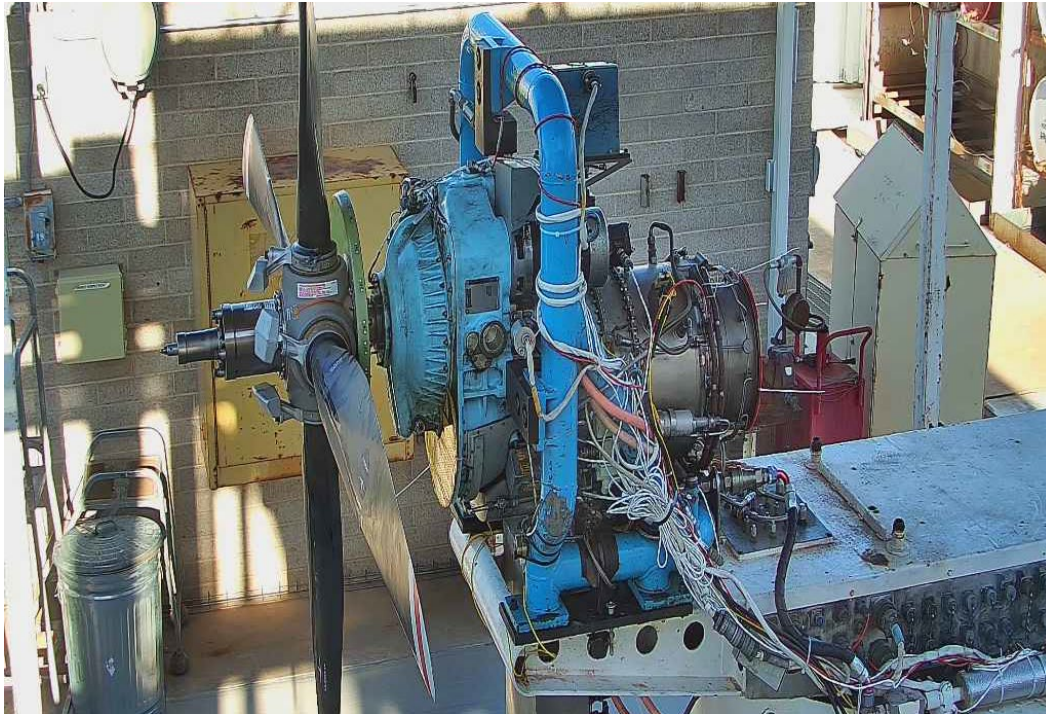


Figure 3: View of left engine on test stand.

The anti-ice valve was activated from the control room and the actuation of the anti-ice valve solenoid was heard.

Using the engine starter, the engine was motored several times to ensure there were no fuel or oil leaks. The engine started during the first attempt to start. The engine was operated at various power setting for about 10 min and then shut down. A visual examination of the exterior for leaks was conducted, no leaks observed. The engine was then restarted and operated at various power settings for about 10 min. The anti-ice valve was activated from the control room and a corresponding increase of about 15° F in the exhaust gas temperature (EGT) was observed. An abnormal voltage reading from the airframe torque transducer was observed. The engine was shut down and a differential oil pressure transducer was attached to the auxiliary port of the lab torque measurement block. The engine was then restarted and operated at various power settings, the differential oil pressure reading from the torque measurement block reached a maximum of 103 psi. The engine was then shut down and removed from the test stand. The nose cone, propeller shaft and flange, planetary gear assembly, NTS quill and coupler shafts, and the diaphragm assembly were removed. The torque sensor helical cam gear was manipulated by hand and a slight binding was noted. The torque sensor assembly was then removed from the engine and placed under a microscope. Scoring and copper in color debris was observed in the area forward of the internal splines within the helical cam gear. Damage to the aft edges of all of the helical spline teeth on the helical cam gear shaft was observed. The damage to the torque sensor assembly was consistent with the helical cam gear being driven aft as would be expected during a propeller strike. The

aft position would account for the anomalous differential oil pressure (torque indications) during the engine test run.

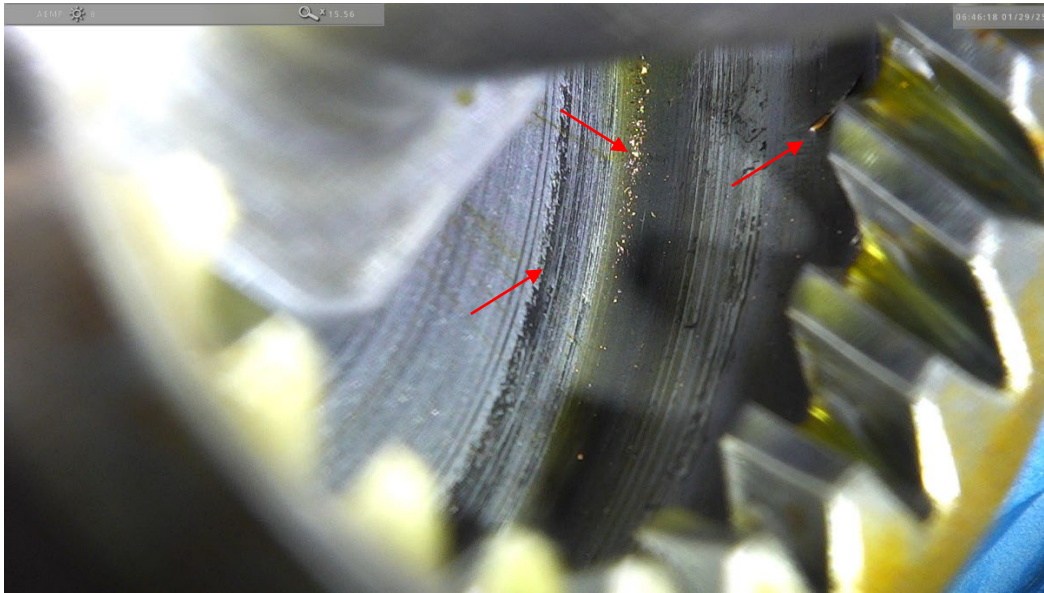


Figure 4: View of scoring and copper in color debris forward of internal splines within the helical cam gear (left engine).



Figure 5: View of damage to helical spline teeth on the helical cam gear shaft (left engine).

SUMMARY

The left engine examination and test run revealed that the left engine operated at various power settings, responded to power lever inputs, including rapid power lever increases. No preaccident mechanical failures or malfunctions with the engine were noted that would have precluded normal operation.

Right Engine

Engine Manufacturer: Honeywell Aerospace Technologies

Engine Model Number: TPE 331-10T-513K

Engine Part Number: 3108110-3

Engine Serial Number: P99444

The engine was received crated and sealed. After removal of the crate, the engine was examined and the following discrepancies were noted:

- Damage to the threads of the temperature compensator was observed.
- Rubbing was observed to the upper section of the 3rd stage turbine shroud.



Figure 6: View of right engine crate at examination site.

The oil filter was removed, and an oil sample was taken for analysis. A review of the oil analysis did not identify constituents that would have precluded the engine from a test run.



Figure 7: View of right engine on engine stand.

A lighted borescope was utilized to examine the 1st stage turbine nozzles, rotor blades, 1st stage centrifugal compressor impeller, and the torque sensor within the reduction gear box, no anomalies were noted.

The engine was mounted on a stand and prepared for the test run, installing the appropriate oil and fuel connections, test equipment and propeller.



Figure 8: View of right engine on test stand.

The anti-ice valve was activated from the control room and the actuation of the anti-ice valve solenoid was heard.

Using the engine starter, the engine was motored several times to ensure there were no fuel or oil leaks. The engine started during the first attempt to start. During the first application of power, an abnormal reading from both the aircraft torque transducer (voltage) and the differential oil pressure was observed. As the power to the engine was increased, a shift in differential oil pressure was noted and a corresponding change in the reading from the aircraft torque transducer was also observed. Prior to the shift in the differential oil pressure the reading from the torque measurement block reach a maximum of 89 psi. The engine was operated at various power settings for about 20 min. The anti-ice valve was activated from the control room and a corresponding increase of about 15° F in the exhaust gas temperature (EGT) was observed. The engine was then shut down and removed from the test stand. The nose cone, propeller shaft and flange, planetary gear assembly, NTS quill and coupler shafts, and the diaphragm assembly were removed. The torque sensor assembly was then removed from the engine and placed under a microscope. Scoring and copper in color debris was observed in the area forward of the internal splines within the helical cam gear. Damage to the aft edges of all of the helical spline teeth on the helical cam gear shaft was observed. The damage to the torque sensor assembly was consistent with the helical cam gear being driven aft as would be expected during a propeller strike. The damage to the helical cam gear assembly would account for the anomalous differential oil pressure (torque indications) during the engine test run.

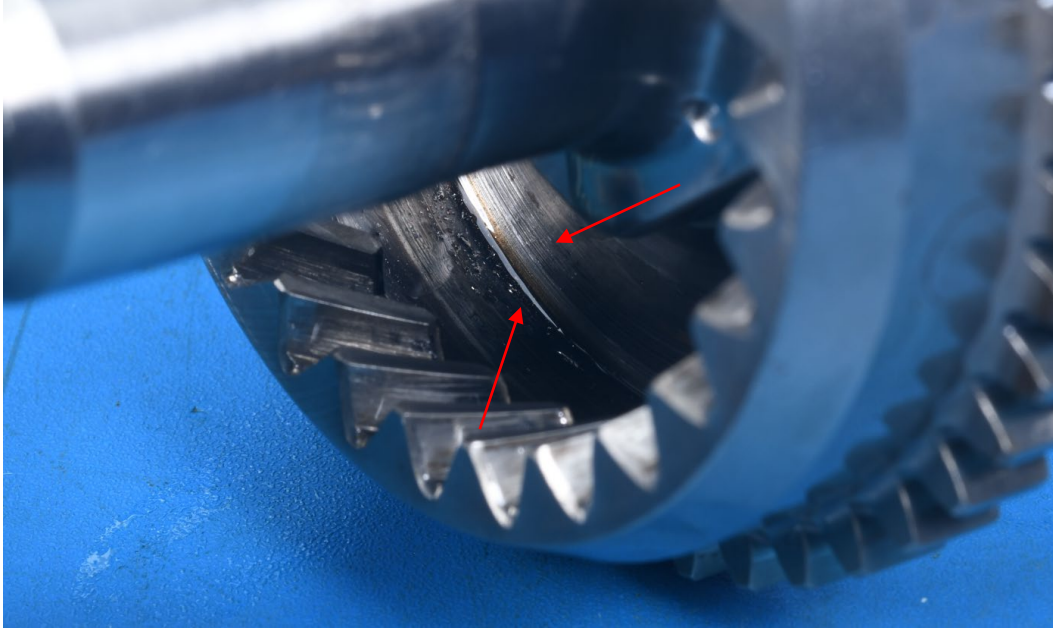


Figure 9: View of scoring and copper in color debris forward of internal splines within the helical cam gear (right engine).



Figure 10: View of damage to helical spline teeth on the helical cam gear shaft (right engine).

SUMMARY

The right engine examination and test run revealed that the right engine operated at various power settings, responded to power lever inputs, including rapid power lever increases. No preaccident mechanical failures or malfunctions with the engine were noted that would have precluded normal operation.

2.0 Additional Testing

An exemplar torque sensor assembly was mounted to a test stand and the helical cam gear placed in an aft driven position (excessive torque) as would be expected during a propeller strike. A corresponding increase in the positive torque oil pressure was observed, similar to the oil pressure torque indications during the engine(s) test run.

3.0 Annual Inspection

09-09-2024<>N29GA<>SN:15025<>LH Engine Logbook<>EngSN:P99443C<>Hobbs:9041.5 TSO:601.0<>CSO:583		TSN:9038.0<>CSN:10343	
Performed the following inspection items:			
1. C/W 150 hr/Periodic inspection per Twin Commander 690C/690D MM Rev.4, dated 08/09/2002 inspection guide. 2. C/W engine 100, 200, and 300 hr engine inspection items. 3. CW annual magnesium housing corrosion inspection.			
Performed the following AD's and SB's:			
4. C/W Honeywell AD 2018-13-05 hydraulic torque sensor gear assemblies, by SOAP sample, sample came back normal, next due 150 hrs TIS.			
Performed the following maintenance items:			
5. Adjusted LH engine propeller governor reset screw "B" 2 turns CCW. 6. Engine ground test run up, parameters nominal and leak checked, ok. 7. All annual ICA's for added equipment were checked and ok. 8. AD's checked thru 2024-18.			
I certify that this engine has been inspected in accordance with an Periodic/150 hr. inspection under FAR91.409(f3) and is approved for return to service. Pertinent details are on file at this agency under invoice number: SHO-24-6283.			
Date:09-09-2024	Signature:_____		Ryan Grenhoff
I certify that this work has been inspected and determined to be in airworthy condition and approved for return to service with respect to the work performed.			
Date:09-09-2024	Signature:_____		Ryan Grenhoff
Byerly Aviation, Inc. Greater Peoria Airport		Peoria, IL. 61607 Certificate # [REDACTED]	

Figure 11: View of left engine annual inspection.

09-09-2024<>N690D<>SN:15025<>RH Engine Logbook<>EngSN:P99444C<>Hobbs:9041.5
TSO:601.0<>CSO:583
TSN:9023.5<>CSN:10370

Performed the following inspection items:

- C/W 150 hr/Periodic inspection per Twin Commander 690C/690D MM Rev.4, dated 08/09/2002 inspection guide.
- C/W engine 100, 200, and 300 hr. inspection items.
- C/W annual magnesium case corrosion inspection, ok at this time.

Performed the following AD's and SB's:

- C/W Honeywell AD 2018-13-05 hydraulic torque sensor gear assemblies, by SOAP sample, and RH engine came back normal. Next due in 150 hrs. TIS.

Performed the following maintenance items:

- Adjusted RH engine propeller governor reset screw "B" 2 turns CCW.
- R&R RH engine ignition leads with new PN:50221-24 & 50221-8, operational checked ok.
- Engine ground test run up, parameters nominal and leak checked, ok.
- All annual ICA's for added equipment were checked and ok.
- AD's checked thru 2024-18.

I certify that this engine has been inspected in accordance with an Periodic/150 hr. inspection under FAR91.409(f3) and is approved for return to service. Pertinent details are on file at this agency under invoice number: SHO-24-6283.

Date:09-09-2024 Signature: _____ Ryan Grenhoff

I certify that this work has been inspected and determined to be in airworthy condition and approved for return to service with respect to the work performed.

Date:09-09-2024 Signature: _____ Ryan Grenhoff

Byerly Aviation, Inc. Greater Peoria Airport


BYERLY
AVIATION

Peoria, IL. 61607 Certificate # XXXXXXXXXX

Figure 12: View of right engine annual inspection.

Submitted by:

Eric M. Gutierrez
Air Safety Investigator