

ERA22FA086

POWERPLANTS

Group Chair's Factual Report - Attachment # 1

Woodward Fuel Control Unit, Serial Number, 2007669, Investigation Report

June 27, 2023

CUSTOMER HONEYWELL ENGINES & SYSTEMS		INVESTIGATION NO 1181227	
CUSTOMER ORDER Crash Investigation	WOODWARD SALES ORDER 3821491	WOODWARD WORK ORDER C106560	
CUSTOMER REJECTION DOCUMENT (CAR, QN, RFA, DMR, ETC.) N/A	WARRANTY DISPOSITION N/A	PRODUCT STATUS N/A	
PROGRAM/ENGINE TYPE GARRETT		ITEM RECEIVED 8070-425	ENGINE MFR MODEL RECEIVED N/A
PROGRAM CODE 82228	SERIAL NUMBER 2007669	ITEM SHIPPED 8070-425	ENGINE MFR MODEL SHIPPED 897780-17
PARENT ITEM NUMBER 8070-425	PARENT ITEM SERIAL NUMBER 2007669	FIRST SHIPPED 13-MAY-1986	LAST SHIPPED 14-AUG-1995
CUSTOMER SERIAL NUMBER N/A	APPLICATION N/A	VESSEL TYPE & VESSEL NUMBER Swearingen SA-226AT, N54GP	SITE & LOCATION GRID ID N/A
TIME/CYCLES SINCE NEW, OVERHAUL, OR REPAIR N/A			
DATE REPORT OPENED 29-AUG-2022		DATE PART REMOVED N/A	DATE RECEIVED 23-AUG-2022

TEAM MEMBERS (D1)

Product Engineer: Brandon Bolley
 Customer QA Engineer: Jean Taylor
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 Customer Account Manager: Charles J. Johnson
 Customer Service Rep: SHANNON L. COTE
 Compliance: Robert A. Feggestad
 Product Integrity Coordinator: James D. Rosplock

REASON FOR INVESTIGATION (D2)

Reported Situation: On December 10, 2021, about 2330 eastern standard time, a Swearingen SA-226AT, N54GP, was destroyed when it was involved in an accident near Bedford, New Hampshire. The commercial pilot was fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 135 on-demand cargo flight. According to preliminary information from the Federal Aviation Administration, the airplane was on the instrument landing system approach to runway 6 at Manchester Boston Regional Airport (MHT), Manchester, New Hampshire.

Reported Issue: During the approach, the pilot reported an engine failure at 2330:42 but did not specify which engine. Radio and radar contact were lost at 2330:51, when the airplane was about 1/4 mile from the runway. The wreckage was located on a river sand jetty, oriented north, and a post-crash fire consumed the cockpit, cabin, and both wings. No debris path was observed. A crater about 6 ft long, 3 ft wide, and 2 ft deep was observed at the beginning of the sand jetty. The left aileron was recovered in the water near the crater. The empennage was located just beyond the crater. The empennage remained intact, with the elevator and rudder attached and undamaged except for the right elevator tip. The right wingtip was located near the empennage and an outboard left-wing section was located 60 ft left of the main wreckage. Three landing gear were located near the main wreckage and the radome was located at the end of the sand jetty, in water. Elevator control continuity was confirmed from the elevator to the cockpit area. Rudder control continuity was confirmed from the rudder to the cabin area. No aileron cables were identified. The left engine was located in the main wreckage. The left propeller had separated and was partially embedded in mud to the left of the left engine. All three blades remained attached to the hub and did not exhibit rotational damage. The right engine was located forward and left of the main wreckage. The right propeller remained attached to the right engine and all three propeller blade roots remained attached to the hub and were charred. The right propeller blades appeared to be at or near the feathered position. Both engines and propellers were retained for further examination.

INVESTIGATION SUMMARY (D4)

Confirmation Text: NO REPORTED PROBLEM
 Discrepant Item Number: NA
 Discrepancy: No Discrepancy Found
 Finding: No Findings
 Conclusion:

The FCU was mounted on the left engine and had significant thermal damage from a post-crash fire. The nameplate was missing therefore the serial number of the FCU was not confirmed. The case number marked on the housing was 7009. Per

the engine logbook, the FCU was model 8070-425, serial number 2007669. Woodward shipping records show that SN 2007669 originally shipped in May 1986 and last shipped from Woodward in August 1995 as model 8070-429 with housing case number 60. There are no parts differences between last shipped model 8070-429 and received model 8070-425. The unit could have been converted by re-calibrating to meet the 8070-425 test requirements. Woodward shipping records show that housing case number 7009 originally shipped on SN 1581177 in September 1980.

The presence of foreign lockwire indicates that the unit was serviced at another facility since it was last shipped from Woodward. The unit was returned with customer fittings, power lever and speed lever linkages, pressurizing valve assembly, and the Tt2 sensor still installed. The Tt2 sensor and customer hardware were removed so that a visual as-received inspection could be performed. A portion of the Tt2 sensor bellows remained stuck in the housing and had to be removed manually (see Figure 1).

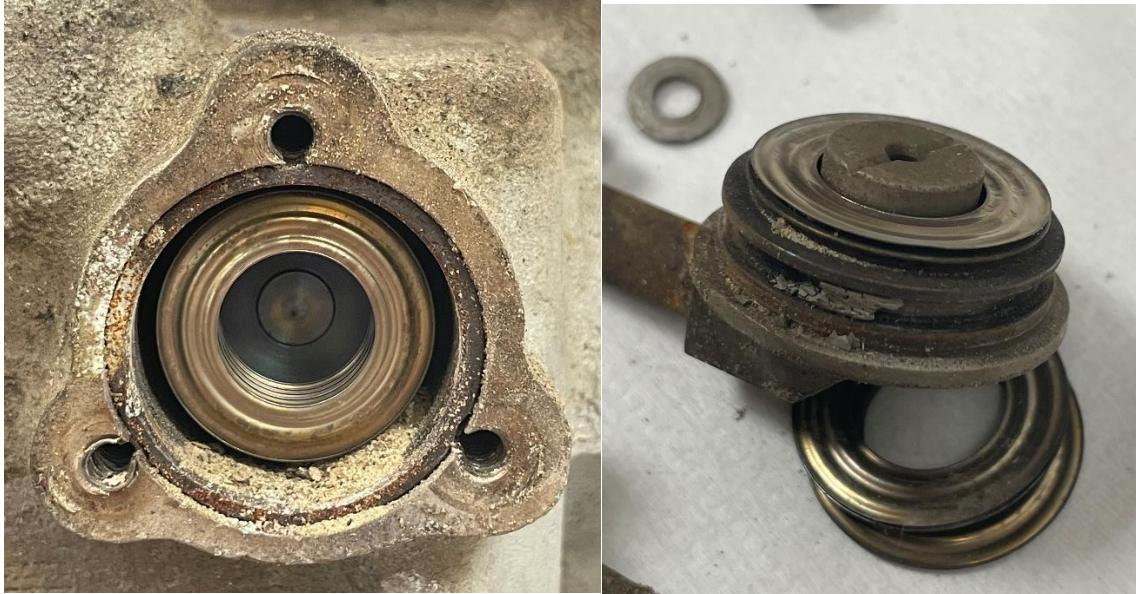


Figure 1. Tt2 Sensor Bellows

No external damage was noted. There was one attachment screw missing from the main cover and the inlet filter and inlet transfer tube that mates with the fuel pump were also missing. Heavy corrosion was noted on the specific gravity adjuster, power lever shaft, speed setting shaft, and several external plugs. The speed setting lever rotated normally. The power lever shaft rotated freely but was missing normal resistance from the mating linkage. The drive shaft could not be rotated by hand but turned stiffly with a mating drive spline tool.

A slave inlet filter and transfer tube were installed and the unit was mounted on the test stand for as-received testing. Heavy leakage was observed from the pump interface at low boost pressure (less than 5 psi) during initial startup. Fuel was also observed leaking steadily from the open Pt2 fitting in the cover, indicating that fuel was leaking past the internal packings that seal the fuel section from the air section of the FCU. The unit was removed from the test stand and the bypass valve cover was removed. The fluorosilicone packing installed on the bypass valve cover showed significant thermal damage and was no longer intact (see Figure 2). This packing prevents leakage from the bypass valve to the pump interface. The Max Power adjustment plug was removed from the cover and the fluorosilicone packing on the plug showed similar thermal damage (see Figure 3).

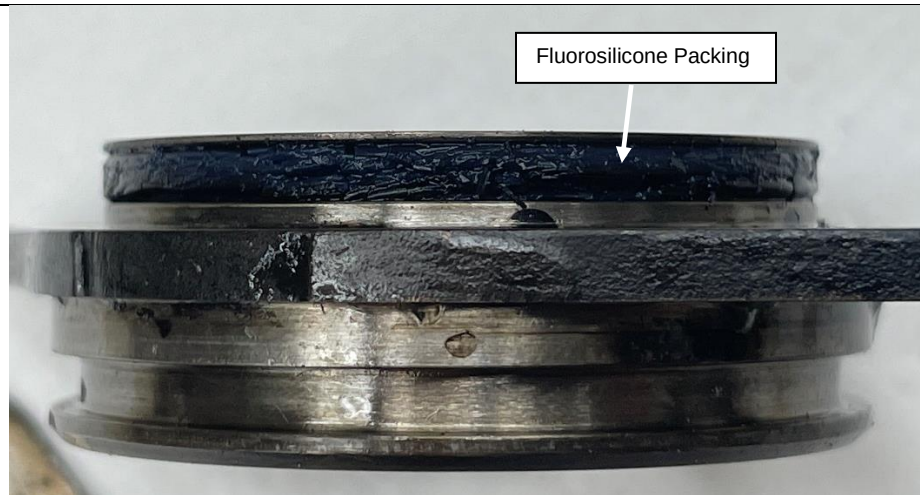


Figure 2. Bypass Valve Cover



Figure 3. Max Power Adjustment Plug

As-received testing could not be performed due to the significant leakage so the unit was disassembled to inspect the internal components. The majority of parts exhibited dark brown or black discoloration. All fluorosilicone packings showed thermal damage and crumbled apart during disassembly.

The Pt2 bellows assembly was removed and found to be extended (see Figure 4). Extension of the evacuated bellows indicates a leak to ambient pressure. Visual inspection found evidence that the solder joining the bellows and end caps melted and re-solidified. This is consistent with the observed thermal damage.



Figure 4. Pt2 Bellows Assembly

No other broken parts were observed during disassembly but removal of the internal components was difficult due to thermal damage. Portions of the phenolic retainer were missing from the top bearing of the overspeed governor assembly, but all bearing balls were present (see Figure 5). All springs were intact, but several of the springs showed evidence of heat set in a loaded position.



Figure 5. Overspeed Governor Bearing

During disassembly it was noted that the tang of the Flight Idle adjustment stop was positioned at approximately 5 o'clock. The CMM has instructions to install the stop with the tang at 3 o'clock at the completion of the power lever schedule preset calibration. This is a normal customer adjustment. Clockwise rotation would result in a higher Flight Idle setting.

ROOT CAUSE (D4)

Origin of Cause: NONE

General Cause: No Problem Found

Cause: No Problem Found or Identified

Root Cause: The unit was disassembled for inspection and no evidence of a pre-incident malfunction was found. All damage observed was consistent with impact and/or thermal distress.

CORRECTIVE ACTION PLAN (D5)

General Corrective Action: None Required

Specific Corrective Action: None Required

CORRECTIVE ACTION IMPLEMENTATION (D6)

Corrective Action Status: NO ACTION