

Engine Management Specialist LLC
2529 Old Davison Run Road
Clarksburg, WV 26301
PH: 304 622-0130
Fax: 304 622-3242
Email: TCritchfield@EMSengines.com



Report No: EMS-509-08-CF0243

ENGINE/COMPONENT SUMMARY REPORT

Customer: Sample Aviation, Inc.

Unit: PW308C Serial No: CF0243

TSN: 790 TSO: N/A TSHSI: N/A

CSN: 592 CSO: N/A

Reason for removal: No oil pressure at start

1.0 Synopsis:

1.1 The engine was removed from the right-hand position of a Falcon 2000EX-EASy N267BW and routed to Pratt & Whitney Engine Services for repair. The reported reason for removal was no oil pressure noted at start.

1.1.1 The oil pump assembly was removed and routed to Montreal Canada for a service investigation.

2.0 Teardown Findings:

During disassembly and hardware review the following conditions were noted.

2.1 The engine was disassembled to review all oil wetted components.

2.2 The HMU and Oil Pump drive exhibited gear teeth mesh damage, most of the damage was noted on outer tooth edges (Ref. Photo 1 & 2).

2.3 The Bearings exhibited no indications of oil starvation.

2.3.1 The #2 bearing exhibited some de-colorization.

2.3.2 PWES Service Investigation agreed to our request that all oil wetted bearings would be replaced as part of the repair workscope.

2.4 The Diffuser Case #3 Bearing Anti Rotation Slots exhibited heavy fretting wear with missing material (Ref. Photo 3, 4 & 5).

2.4.1 The fretting wear exhibited in the #3 Bearing slot area has been noted in other PW308C model units.

2.4.1.1 Liberated material from this area has not been noted in past events according to PWES.

2.4.1.2 Photo 6 is from Pratt & Whitney preliminary assessment in Montreal, Canada.

2.4.2 The foreign material found in the main oil pump assembly by Pratt & Whitney in photo 6 was also tested by Pratt & Whitney and confirmed to be of the same material components as used in the material to manufacture the Diffuser Case Assembly.

2.5 The remainder of the engine was disassembled to gain access to all oil wetted components and housings. These materials were cleaned, flushed and inspected for possible secondary damage.

2.5.1 Included in this workscope was the Main Oil Pump Assembly that was installed during the troubleshooting process prior to the engine removal.

2.5.1.1 Supplied Main Oil Pump Assembly P/N 30C4917-01 S/N CF0159 with TSN: 931.2 CSN: 483 will be reinstalled as the main oil pump assembly during this repair.

2.5.1.2 It was noted and confirmed by PWES that the First Run Warranty Service Policy on S/N CF0243 will not be affected in any negative way with the use of this Oil Pump Assembly S/N CF0159.

3.0 Main Oil Pump Assembly:

Investigation by Pratt & Whitney Canada (Montreal, Canada):

3.1 The Main Oil Pump Drive Gear exhibited distortion to the perpendicular alignment on its mounting shaft (Ref. Photo 7).

3.1.1 The retaining nut and tab washer were liberated from the pump shaft (Ref. Photo 8, 9 & 10).

3.1.2 The gear bore was deformed and scored (Ref. Photo 11).

3.1.3 The pump shaft was deformed and fractured (Ref. Photo 12).

- 3.1.4 The Main Oil Pump Elements exhibited impact damage Ref. Photo 13 & 14).
- 3.1.5 The Main Oil Pump Housing exhibited heavy scoring in gear bore (Ref. Photo 15).
 - 3.1.5.1 Foreign Debris was found in the pump housing (Ref. Photo 16).
 - 3.1.5.2 Foreign Debris measurements (Ref. Photo 17 & 18).
 - 3.1.5.2.1 Length: 0.1983”
 - 3.1.5.2.2 Front Width: 0.04235”
 - 3.1.5.2.3 Rear Width: 0.06298”
 - 3.1.5.2.4 Depth: Not received

4.0 Conclusion:

- 4.1 The most likely root cause for the Main Oil Pump failure (Ref. Photos 19 through 24).
 - 4.1.1 Fretting wear in Diffusers Case Anti Rotation Slots resulted in liberated material (Debris).
 - 4.1.2 The Debris followed the #3 bearing scavenged oil.
 - 4.1.3 The Debris bypassed the #3 bearing scavenge pump elements through the ‘Ball Type Anti-Flooding Valve’.
 - 4.1.3.1 Note: A last chance screen with the same P/N as the Main Oil Pump screen is also noted for the scavenge oil system. Although the manual diagrams only indicate that #1 & #2 scavenge pump elements are actually screened and a separate screen is used for the accessory gearbox scavenged oil. (See 4.1.5)
 - 4.1.4 The Debris was scavenged into oil tank.
 - 4.1.5 The Debris flowed through main oil pump screen.
 - 4.1.6 The Debris entered into “Main Oil Pump Elements” creating internal damage and pump failure.

5.0 Preventive Action:

- 5.1 The oil pump failure as a result of liberated debris from the diffuser case may not be isolated to this one event.
- 5.2 The reliability of this model unit should require further investigation on root cause analyst to ensure proper preventive action of such future events.
 - 5.2.1 The oil pump failure appears to be secondary damage as a result of the diffuser case fretting wear.



Tim Critchfield
Manager, Engine Management Specialist, LLC
August 10, 2008

Photos 1 & 2

HMU & Oil Pump drive gear

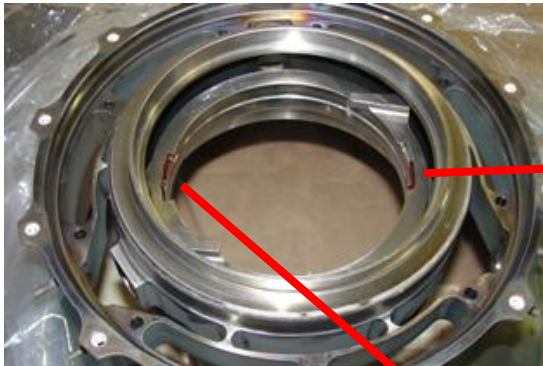
Oil Pump drive gear mesh damage
Mostly noted on outer tooth edges



Photos 3 & 4

Diffuser Case #3 Bearing Bore

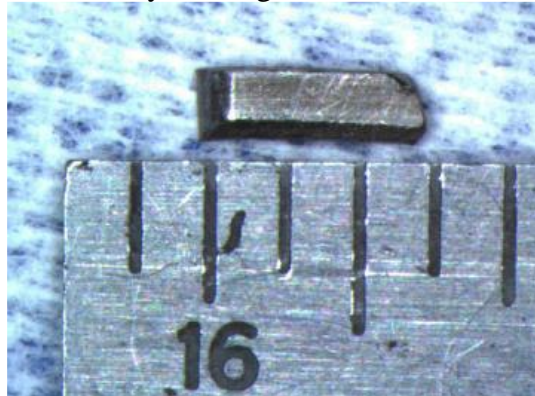
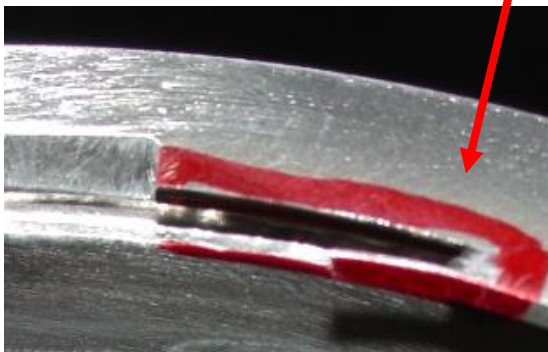
#3 Bearing Anti Rotation Slot
Fretting wear with missing material



Photos 5 & 6

#3 Bearing Anti Rotation Slot
Fretting wear with missing material

Material found in the Oil Pump Assy. during
disassembly investigation

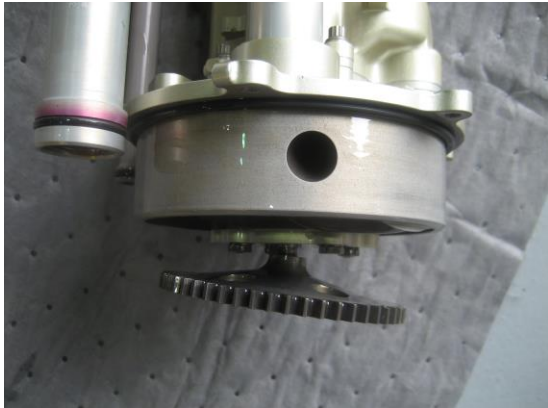


Photos 7 & 8

Oil Pump Drive Gear
Drive Gear Alignment on pump main shaft

Drive Gear retaining nut liberated from shaft





Photos 9 & 10

Oil Pump Drive Gear retaining nut
Locking tab washer still installed

Oil Pump Drive Gear
Lock tab retaining slot



Photos 11 & 12

Oil Pump Drive Gear
Shaft bore deformed and scored

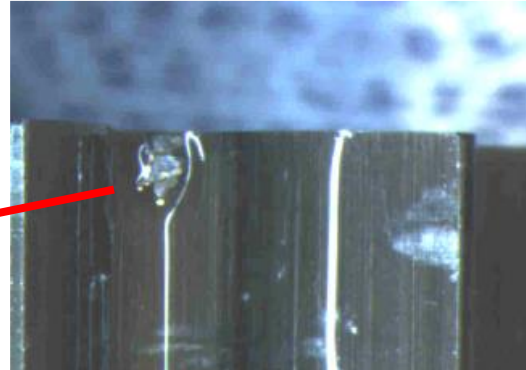
Oil Pump Main Shaft
Deformed and fractured



Photos 13 & 14

Main Pressure Pump Elements
Displayed foreign impact damage

Main Pressure Mating Pump Elements
Corresponding damage on mating surfaces



Photos 15 & 16

Main Pressure Pump Housing
Scoring damage noted



Main Pressure Pump Housing
Foreign Debris discovered in housing



Photos 17 & 18

Debris found in Main Oil Pressure Pump
Length: 0.1983”

Front Width: 0.04235”

Rear Width: 0.06298”

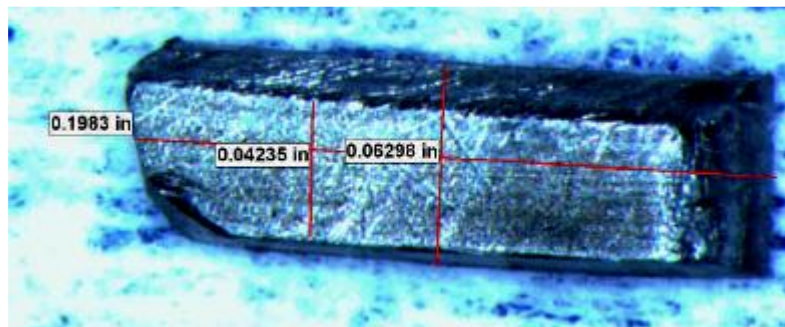
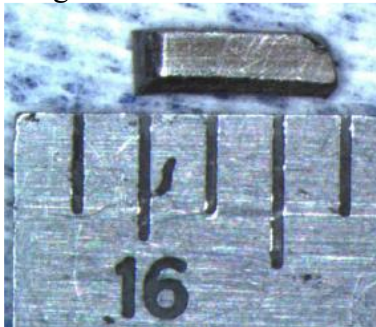
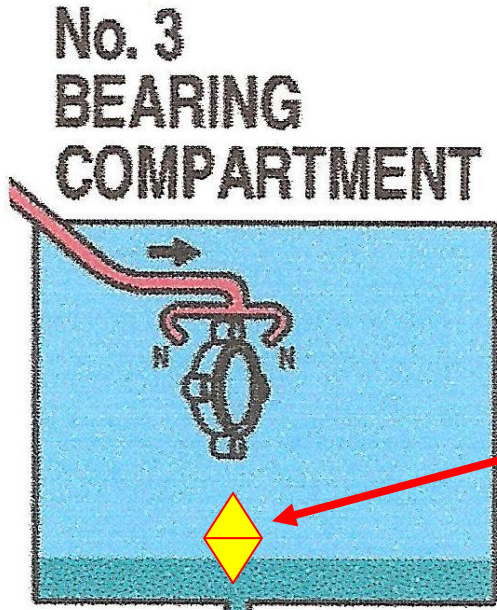
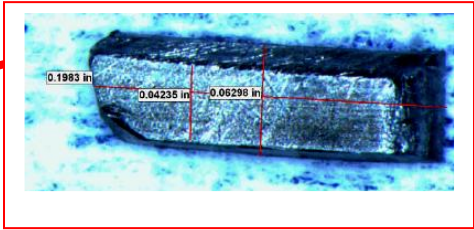


Photo 19

Debris from Diffuser Case Liberated and entered into the scavenge oil system

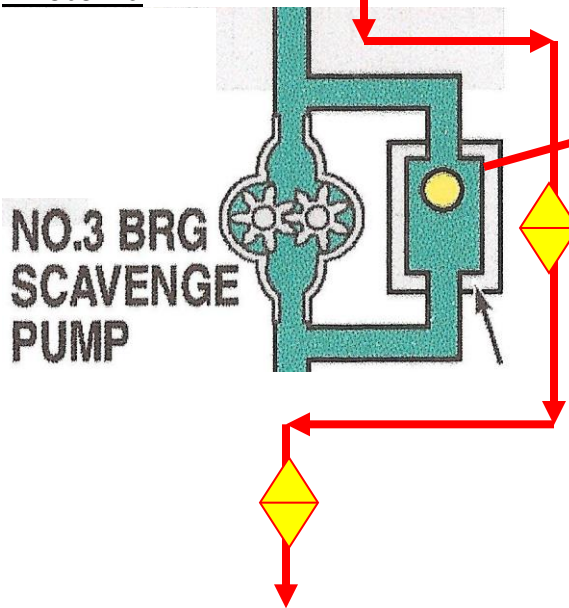


Reference as Debris 



#3 Brg. Scavenge Oil

Photo 20

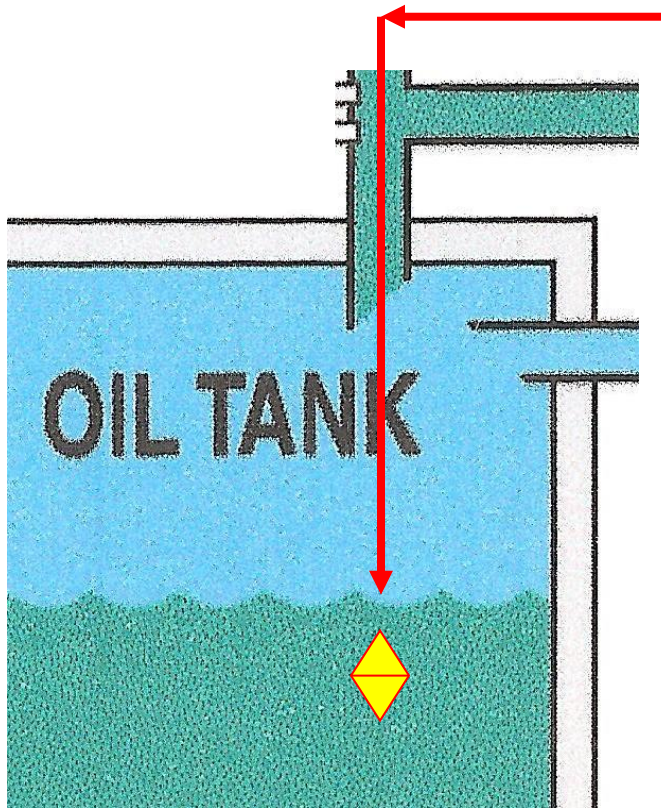


Ball Type Anti Flooding Valve



Photo 21

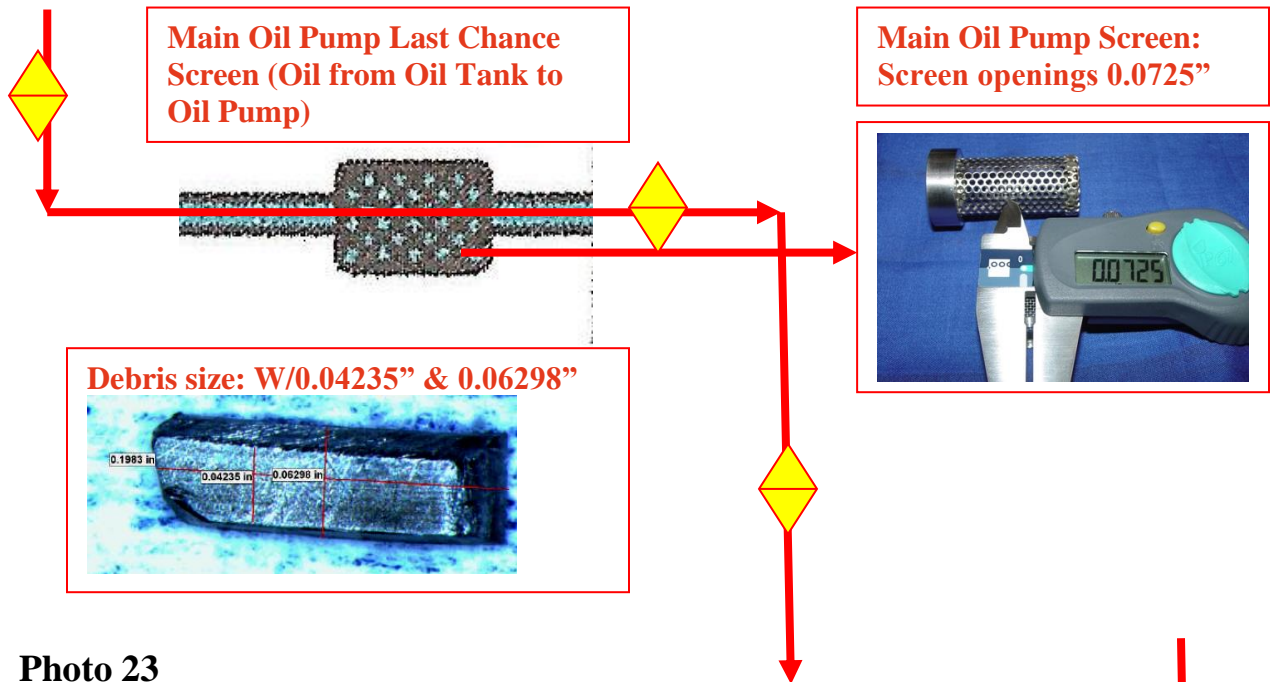




Debris flows into Oil Tank

Breather Air

Photo 22



Main Oil Pump Last Chance Screen (Oil from Oil Tank to Oil Pump)

Main Oil Pump Screen: Screen openings 0.0725"

Debris size: W/0.04235" & 0.06298"

Photo 23

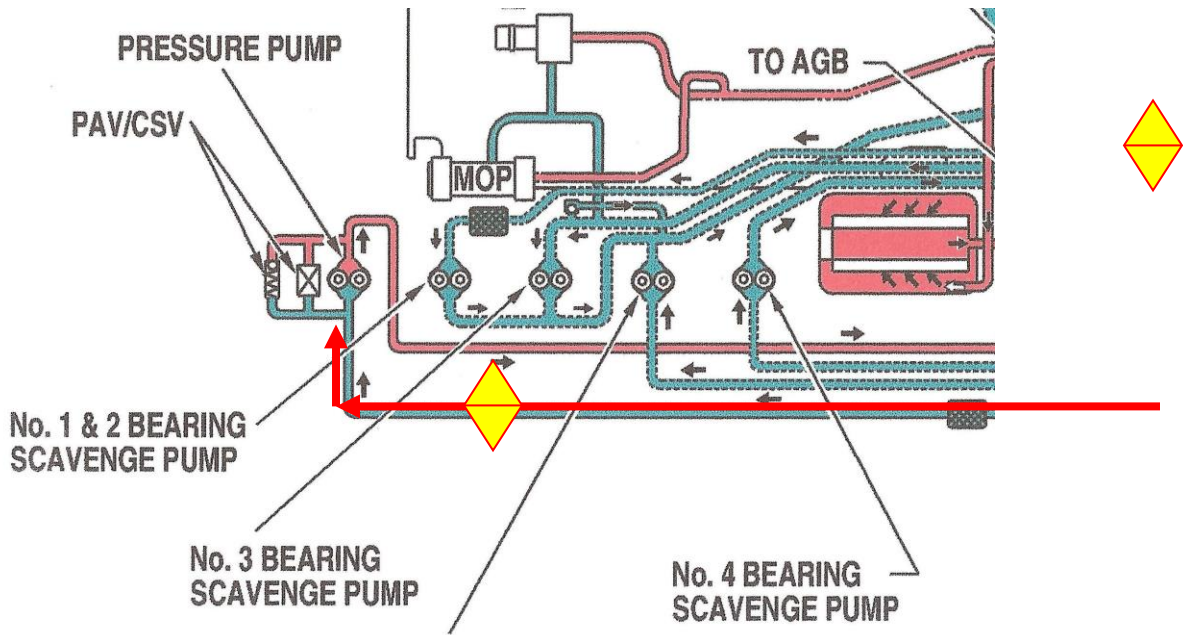
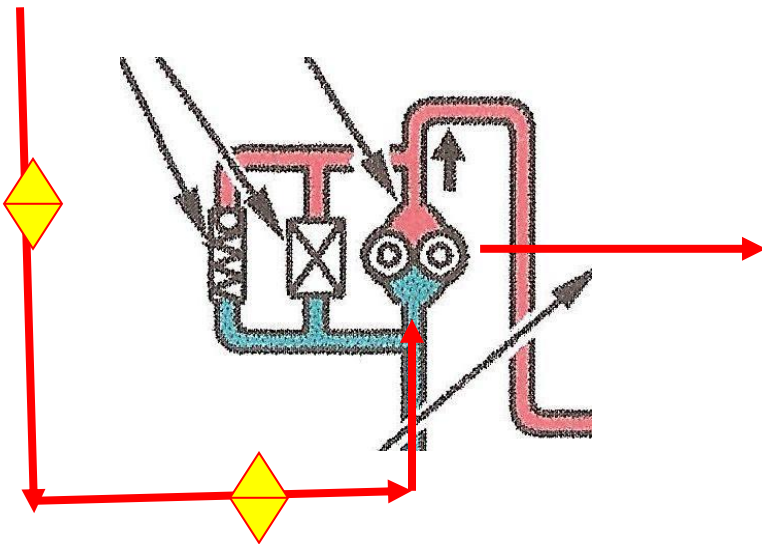


Photo 24



Main Oil Pump Assembly

