

NTSB File No. WPR22LA259

Quality Aircraft Accessories (QAA) Fuel Pump Exam Notes

Accident

Accident Date: July 16, 2022

Location: San Marcos, CA

Aircraft: Socata TB21, N718TB

Engines: Lycoming TIO-540-AB1AD (per aircraft TCDS), S/N unknown

Examination Location and Participants

Location: Quality Aircraft Accessories, Tulsa, OK

Date: December 15, 2022

Participants: Les Doud – QAA Air Safety Investigator

Dan Baker – NTSB IIC, Senior Accident Investigator

Joe Ellis – QAA, Manager, Quality Assurance

Riesa Ramos – QAA Chief Inspector

Fuel Pump Description

P/N: RG17980P/M

S/N: B-5197

The fuel pump was overhauled by QAA on 5/18/2022. The overhaul Work Order including the final acceptance test results and 8130-3 are attached to these notes.

The pump is an engine driven, vane-type, rotary fuel pump. Two vanes at 90° to each other rotate within an eccentric liner bore to provide pumping action. The fuel pump houses a diaphragm relief valve to maintain pressure (24-28 psig) over the required range of fuel flows (220-230 pph) at 2650 RPM, and an additional bypass valve to allow fuel to flow through the pump in the event of a pump failure. The /M in the model indicates the pump incorporates the modified relief valve housing (Service Bulletin 101SB018). The fuel pump components are illustrated in Figure 1.

As Received Condition

The fuel pump was shipped to QAA in the box shown in Photo #1 by the NTSB Investigator in Charge; UPS Tracking No. 1ZA39E760191174751.

The pump was shipped with the airframe-supplied fittings and fuel pressure sender still attached as shown in Photo #2. There was no exterior surface damage noted. The drive coupling (Item 110) was fractured at the intended safety shear section and the pump-end of the coupling was lodged in the rotor drive end (Item 115) slot as shown in Photo #3. The coupling fragment and drive end of the rotor shaft appeared to have some heat discoloration (Photo #4). The Items 105 and 120 retaining rings remained

secured in-place. The rotor was seized and could not be rotated by hand force, therefore bench testing of the pump before disassembly was not possible.

Figure 1: Pump housing and pumping element components
(Reference Crane/Lear Rome Component Maintenance Manual RG17980)

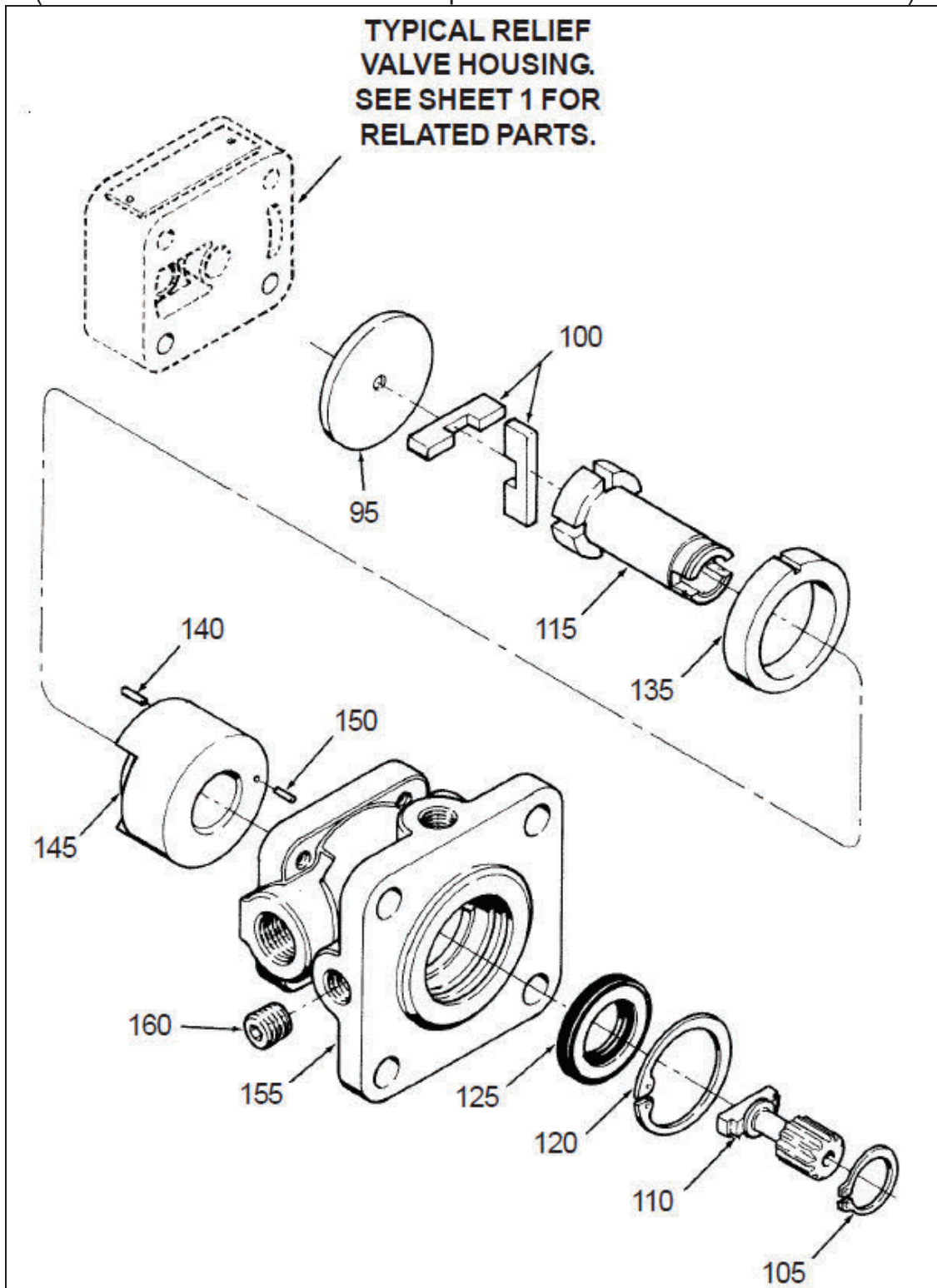


Photo #1 – Fuel pump box as-received



Photo #2 – Fuel pump as-received, before exam

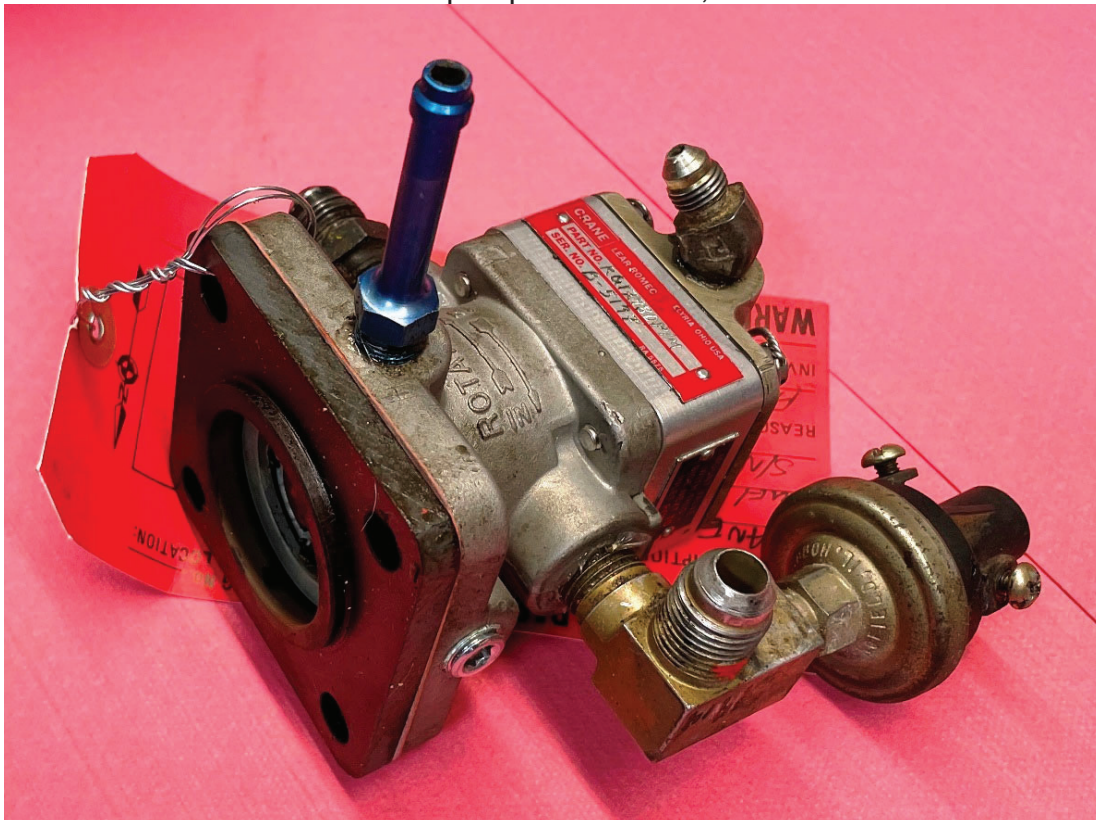


Photo # 3 – Mounting base of pump w/ fractured drive coupling

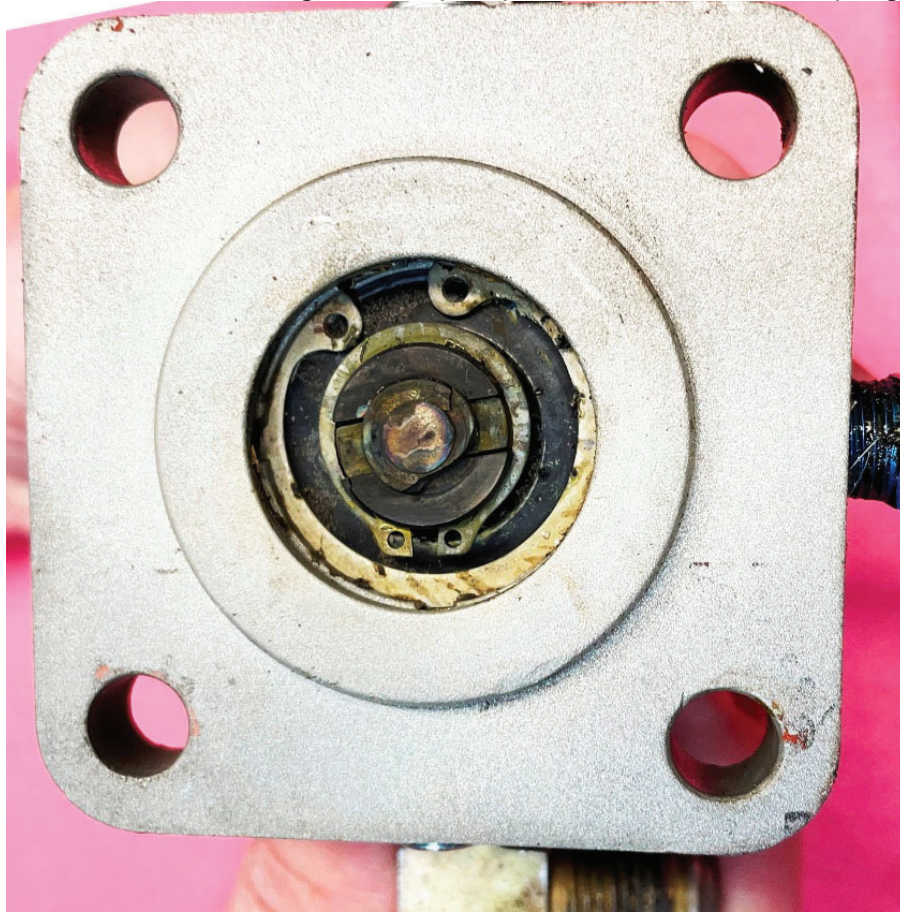
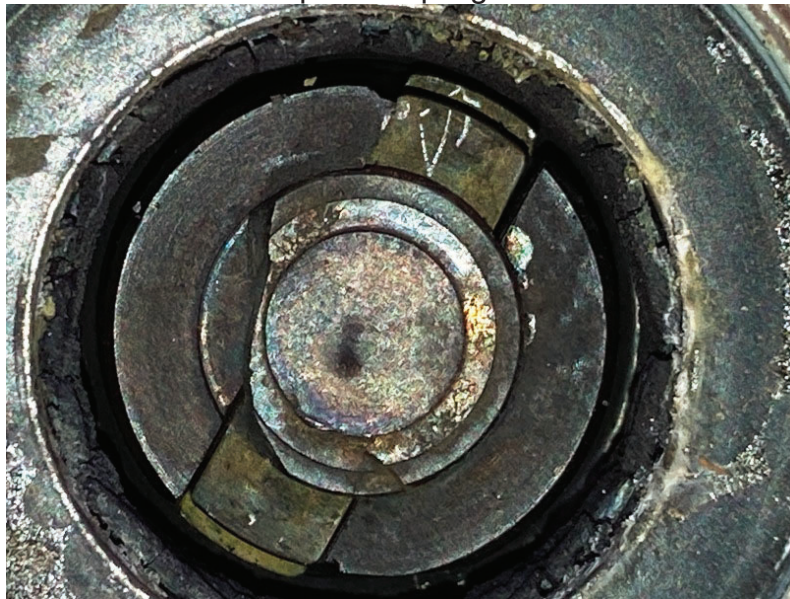


Photo #4 – Close-up of Coupling and Rotor drive end

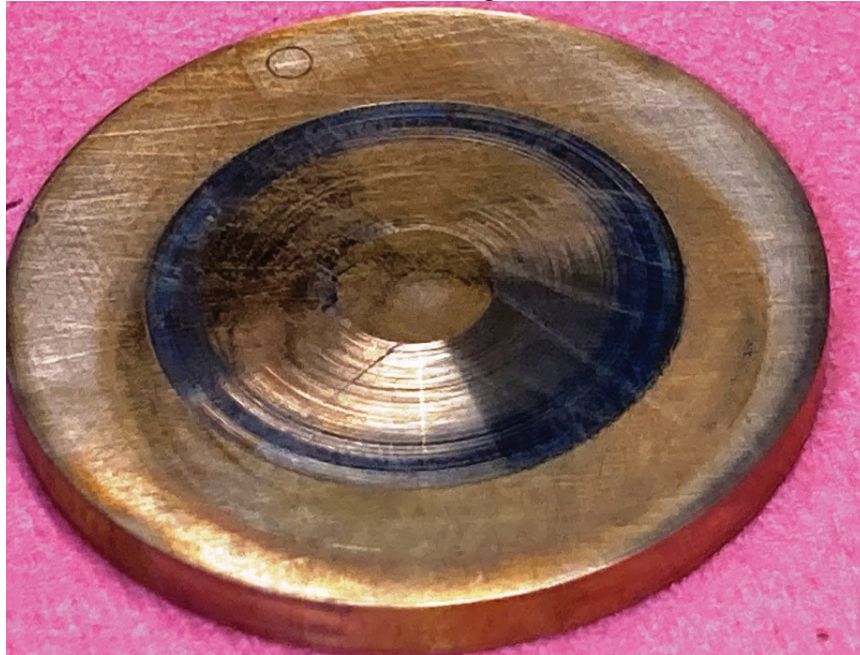


Disassembly

The pump was disassembled to exam the internal components for damage or malfunction that might indicate the cause of the pump seizure. The valve housing was removed and examined. The relief valve and bypass valve appeared intact, undamaged and functional.

When the Thrust Plate (Item 95) was removed there was remarkable rotational scoring and heat discoloration on the vane-side as shown in Photo #5.

Photo #5 – Rotational coring on the Thrust Plate



Rotational scoring was also seen on the Rotor top surface (Item 115) that abuts the Thrust Plate as seen in Photo #6. The Blades (Item 100) were intact and were removed easily from the Rotor slots, but had nicks/gouges on lower tip corners.

Photo #6 – Rotational scoring on the Rotor top surface



The rotor was bound tight in the Bearing bore (Item 145) and had to be forcefully removed with a hammer and malleable punch. And because the drive coupling fragment was lodged in the rotor slot, it also had to be driven through the Bearing and scored/plowed two channels in the carbo bearing material (seen as the darker, vertical channel in Photo #8). The Rotor shaft had rotational scoring and some fragments of Bearing material adhered to the rotor, and some bearing material flaked off as shown in Photo #7. There were various levels of heat discoloration along the entire length of the Rotor. The Bearing bore had rotational scoring and the Bearing body exhibited radial cracks from ID to OD with some bearing material missing adjacent to the Liner (Item 135) interface. There was also visible rotational scoring on the lower corner of the Rotor blade head and corresponding scoring in the Liner as shown in Photos #7 and #8.

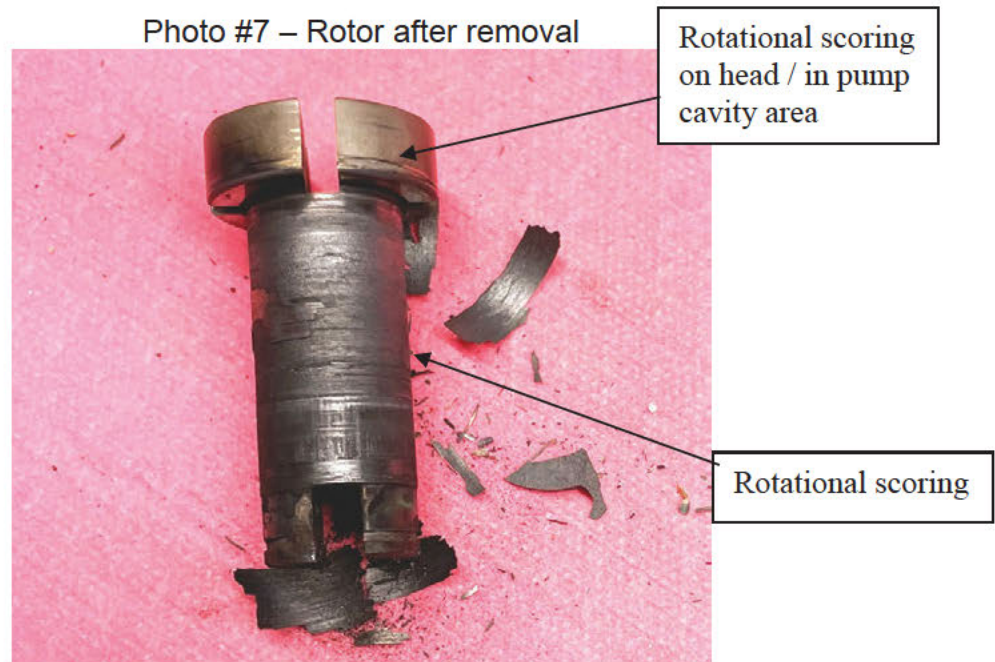
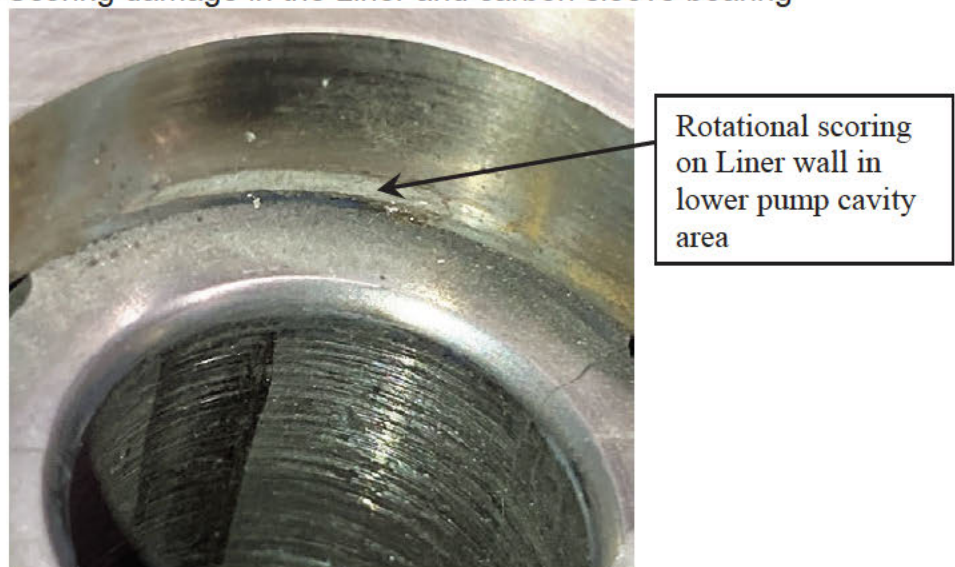


Photo #8 - Scoring damage in the Liner and carbon sleeve bearing

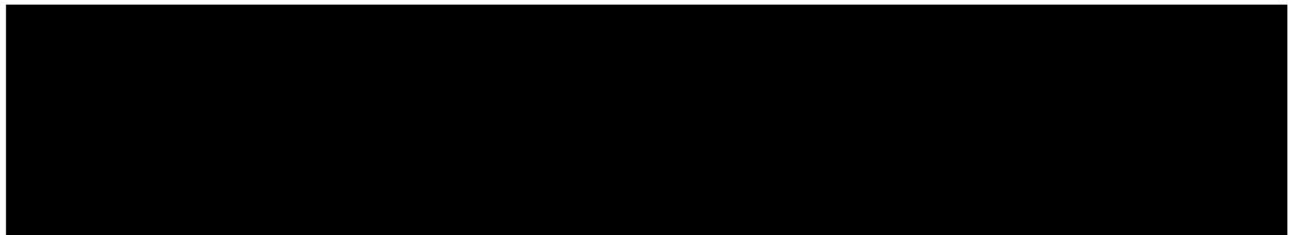


The examined fuel pump components, debris, and an exemplar core pump was boxed and shipped to the NTSB Materials Lab (Attn: Mike Budinski) for further material analysis as shown Photos # and #; UPS Tracking No. 1Z006E9W0162932819.

Photo #9 - Fuel pump components before closure



Photo #10 - Fuel pump components boxed for shipment to NTSB



Digitally signed by
Leslie A. Doud
Date: 2023.02.14
16:53:23 -05'00'

Les Doud
Quality Aircraft Accessories - Air Safety Investigator

O:
C:



FAA Approved Repair Station # QYIR334Y
Component Repair Traveler

Customer Name: Gibbs Service Center PO#: 718TB
Description: Fuel Pump WO#: 088054
Mfg. Name Leav Hornum Date: 5/18/2022
Part No. RG17980 P/M Serial No. B-5197

Mechanic Initial

Preliminary Inspection _____

Disassembly As Needed For Repair _____

Clean All Parts and Components As Required _____

Inspect Per. Manufacturers Instruction or other methods (See
Manual Below) _____

NDT (If Applicable) Method: N/A Date/Batch: N/A _____

Hidden Damage Inspect. (If applicable) _____

Work/Condition: ☐ Repair ☒ Overhaul ☒ Exchange ☒ Test _____

Run In (if required) Not Required _____

Final Test / Inspection Date 5/18/2022 _____

Maintenance Release Issue 8130-3 _____

Inspector's Signature _____ Date 5/19/22

Inspection Notes, Service Bulletins, and Airworthiness Directives

Manual: RG17980 Series

Revision: 6

Dated: 6/5/15

RPM Flow PPH Dischg. PSI

2650 230.0 28.0

650 9.5 25.0

No Leaks Noted, Hydrostatic Leak Test Passed



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WORK ORDER

Print Date : May-18-2022 10:10 AM

Printed By : Cody Hicks Print No. : 1

Cust P.O. : 718TB		Work Order : 088054		Pg:1/1
In-House W/O				
Quality Aircraft Accessories [REDACTED] Tulsa, OK United States		Quality Aircraft Accessories [REDACTED] Tulsa, OK United States		
Your P.O. No. : 718TB				
PartNumber : RG17980P/M				
Description : FUEL PUMP, LEAR ROMEC				
Serial No. : B-5797				
Qty : 1				
UM : EA				
Cond : CO				
Order Date : May-18-2022	Case # : SO# 097369			
S.O. No. : n/a	Fail Mode : NA	F.O.B. : ORIGIN		
		Orig Mech : Z1. Confirmed		

Work Requested : OVERHAUL
W/O Flat Rate Charge : \$ 0.00

			Sub Total:	\$ 0.00
			Total:	\$ 0.00

Cody Hicks,

WORK ORDER

Print Date : May-18-2022 1:26 PM

Printed By : Jonathan Garay Print No. : 2

Cust P.O. : 718TB		Work Order : 088054		Pg:1/2
In-House W/O				
Quality Aircraft Accessories [REDACTED] Tulsa, OK United States		QAA - WORKORDER Distribution [REDACTED] TULSA, OK 74115 United States		
Your P.O. No. : 718TB				
PartNumber : RG17980P/M				
Description : FUEL PUMP, LEAR ROMEC				
Serial No. : B-5197				
Qty : 1				
UM : EA				
Cond : OH				
Order Date : May-18-2022	Case # : SO# 097369			
S.O. No. : n/a	Fail Mode : NA	F.O.B. : ORIGIN		
		Orig Mech : Z1. Confirmed		
Work Requested : OVERHAUL				

Charges & Description	Quantity	Cond	Unit Price UM	Ext. Price
W/O Flat Rate Charge :				\$ 0.00
PARTS & MATERIAL [(I) Installed, (E) Exchanged, (R) Removed, (S) Scrapped]				
(I) [1] MS9137-01 FUEL PUMP MOUNTING GASKET Priority [BS]: BUILD AND SHIP Tag Info: INV I559576 MFG Lot: PS-00023257	1	EA NE ✓		
(I) [2] LR22450 PUMP MODIFICATION KIT Priority [BS]: BUILD AND SHIP Note: OVER & ABOVE Tag Info: INV 3647533 MFG Lot: 3647533 1253010	1	EA NE ✓		
(I) [3] RA5575 DATA PLATE Priority [BS]: BUILD AND SHIP	1	EA NE ✓		

Continued on next page...

WORK ORDER

Print Date : May-18-2022 1:26 PM

Printed By : Jonathan Garay Print No. : 2

Our Ref : SO# 097369
Warranty : NA

Status : Z1. Confirmed

Overhaul No. 088054 Page: 2/2
Work Order : 088054

Charges & Description	Quantity	Cond	Unit Price UM	Ext. Price
Tag Info: INV 78670 MFG Lot: INV 78670				
(I) [4] CFRD7779-4 COUPLING Priority [BS]: BUILD AND SHIP Tag Info: INV 0000045637 MFG Lot: 092221040	1	EA NE ✓		
(I) [5] 090F-0002 090F-0002, PLUG, 1/8-27 Priority [BS]: BUILD AND SHIP Tag Info: INV 679684 MFG Lot: 0669724-H1221	3	EA NE ✓		
(I) [6] CFRA7754 BEARING Priority [BS]: BUILD AND SHIP Tag Info: INV 0000045050 MFG Lot: 091321030	1	EA NE ✓		
(I) [7] CFRA6861 DRIVE SEAL Priority [BS]: BUILD AND SHIP Tag Info: INV 0000042470 MFG Lot: 060321060	1	EA NE ✓		
(I) [8] CFRA7791 ROTOR Priority [BS]: BUILD AND SHIP Tag Info: INV 0000045637 MFG Lot: 093021010	1	EA NE ✓		
(I) [9] MS16624-1062 RING, RETAINING, EXTERNAL Priority [BS]: BUILD AND SHIP Tag Info: INV 9313239147 MFG Lot: 7365710290	1	EA NE ✓		
Labor				

Sub Total: \$ 0.00

Total: \$ 0.00

Cody Hicks,

BILL OF MATERIALS

Page : 1 of 2

Orig Inv : Orig Inv Date : Install Date : Removal Date : Total Time : Aircraft Make : Aircraft Model : Engine Model : Registration # : Misc. :		W/O No. P/N S/N			
For Customer : Our Part		W/O Kind	Work Requested OVERHAUL		
		BOM Planner			
Cust P.O. : 718TB Case # : SO# 097369 Fail Mode : NA Part Cat. : Orig Mech : Z1. Confirmed Completed P/N : RG17980P/M		P/N : RG17980P/M Desc : FUEL PUMP, LEAR ROMEC S/N : B-5797 B-5199 MFG : Qty : 1 Cond : CO S/N As : Trace to : Tag Info : MFG Lot : Manual : Revision : Into Bin Loc : [w/h]:			
Company : 1 Order Date : May-18-2022		Division : 1 Received Date : May-28-2021	Department : Due Date : Print Date : May-18-2022		
Seq	EMP	Part Number & Description	Req	Used	Notes & Comments
1		MS9137-01 FUEL PUMP MOUNTING GASKET Discrepancy : Disposition : Revision : NSN: Alt:	1 EA	1	Note : Drawing : Figure : Module : ATA :
2		LR22450 PUMP MODIFICATION KIT Discrepancy : Disposition : Revision : NSN: Alt:	1 EA	1	Note : OVER & ABOVE Drawing : Figure : Module : ATA :
3		RA5575 DATA PLATE Discrepancy : Disposition : Revision : NSN: Alt:	1 EA	1	Note : Drawing : Figure : Module : ATA :
4		CFRD7779-4 COUPLING Discrepancy : Disposition : Revision : NSN: Alt:	1 EA	1	Note : Drawing : Figure : Module : ATA :

MS16624-1062 Snap Ring 1 Normal

BILL OF MATERIALS

W/O No. 088054

/ Page : 2 of 2

Seq	EMP	Part Number & Description	Req	Used	Notes & Comments
5		090F-0002 090F-0002, PLUG, 1/8-27 Discrepancy : Disposition : Revision : NSN: Alt:	3 EA	3	Note : Drawing : Figure : Module : ATA :
6		CFRA7754 BEARING Discrepancy : Disposition : Revision : NSN: Alt:	1 EA	1	Note : Drawing : Figure : Module : ATA :
7		CFRA6861 DRIVE SEAL Discrepancy : Disposition : Revision : NSN: Alt:	1 EA	1	Note : Drawing : Figure : Module : ATA :
8		CFRA7791 ROTOR Discrepancy : Disposition : Revision : NSN: Alt:	1 EA	1	Note : Drawing : Figure : Module : ATA :

1. Approving Civil Aviation Authority/Country: FAA/United States		2. AUTHORIZED RELEASE CERTIFICATE FAA Form 8130-3, AIRWORTHINESS APPROVAL TAG		3. Form Tracking Number: QAA# 088054	
4. Organization Name and Address: Quality Aircraft Accessories Inc. (QYIR334Y) Phone: [REDACTED] Tulsa, OK 74115 Fax: [REDACTED]		5. Work Order/Contract/Invoice Number: 088054			
6. Item:	7. Description:	8. Part Number:	9. Quantity:	10. Serial Number:	11. Status/Work:
1	FUEL PUMP	RG17980P/M	1	B-5197	OVERHAULED
12. Remarks: The work described in block 11 and subsequent inspections to the article(s) defined in blocks 7 through 10 were performed in accordance with current regulations of The Federal Aviation Administration and the article is approved for return to service. RECORDS OF WORK PERFORMED ARE MAINTAINED ON FILE AND WILL BE FURNISHED ON REQUEST. LEAR ROMEC MANUAL # RG17980 SERIES, REV 6 DATED 06/05/2015					
13a. Certifies the items identified above were manufactured in conformity to: ☐ Approved design data and are in a condition for safe operation. ☒ Non-approved design data specified in Block 12.		14a. ☒ 14 CFR 43.9 Return to Service ☐ Other regulation specified in Block 12 Certifies that unless otherwise specified in Block 12, the work identified in Block 11 and described in Block 12 was accomplished in accordance with Title 14, Code of Federal Regulations, part 43 and in respect to that work, the items are approved for return to service.		14c. Approval/Certificate No.: QYIR334Y	
13b. Authorized Signature:		13c. Approval/Authorization No.:		14b. Authorized Signature: [REDACTED]	
13d. Name (Typed or Printed):		13e. Date (dd/mm/yyyy):		14d. Name (Typed or Printed): Anthony Jimenez	
14e. Date (dd/mm/yyyy): 19/MAY/2022					
User/Installer Responsibilities					
It is important to understand that the existence of this document alone does not automatically constitute authority to install the aircraft engine/propeller/article. Where the user/installer performs work in accordance with the national regulations of an airworthiness authority different than the airworthiness authority of the country specified in Block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts aircraft engine(s)/propeller(s)/article(s) from the airworthiness authority of the country specified in Block 1. Statements in Blocks 13a and 14a do not constitute installation certification. In all cases, aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown.					