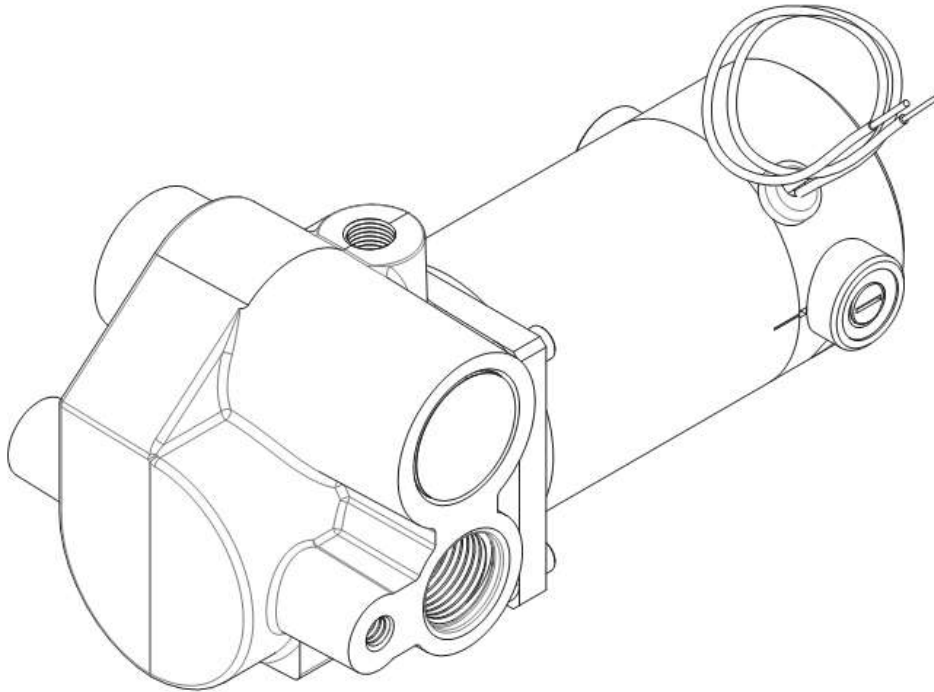




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**Evaluation of Auxiliary Fuel Boost Pump
Part Number: 2003-B, Serial Number: 103252
From Make: BR Legend LLC, Model: Turbine Legend, Aircraft: N42BR
for NTSB Case: ERA15FA221**




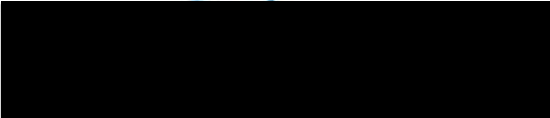
Evaluated 06/May/2016

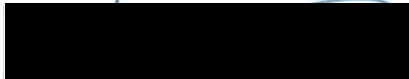
REV.	DATE	DESCRIPTION
IR	17/MAY/2016	Initial Release
A	18/MAY/2016	Replaced blurred images at figures VIII & IX with improved images. Relabeled figure X as X-A & added both figure X-B & XII.

WITNESSES

Inspection, evaluation, and testing of the auxiliary fuel boost pump from the Turbine Legend N42BR as documented in this report was witnessed by the following:

 5/18/2016
Steve Carpenter
Evaluation Technician
Weldon Pump

 18/May/2016
Dan Ramser
Chief Engineer
Weldon Pump

 MAY/19/2016
Sandor Janosy
Aviation Safety Inspector
FAA-MIDO Cleveland Office.

1.0 SCOPE

This report documents the evaluation and testing of the Weldon Pump model 2003-B serial number 103252 auxiliary fuel boost pump from the "BR Legend LLC, Turbine legend" aircraft with registration number N42BR. From the serial number this pump was factory new the 1st quarter of the year 2003.

All Figure references can be found in Appendix A of this report.

2.0 RECEIPT OF PACKAGE

The unit was received via hand delivery by Mr. Sandor Janosy from the FAA's CLE-MIDO Office.

3.0 EXTERNAL VISUAL INSPECTION

The unit was removed from packaging and visually inspected. The pump was supplied with some composite mounting structure and related fasteners still attached. Fluid lines and related fittings from the aircraft installation were present installed in the inlet, outlet, & one of the overboard drain ports. Also, an electrical connector was present & installed on the pumps lead wires.

The pump-motor assembly's configuration was quickly identified as that of a Weldon Pump "V4" series. The nameplate confirmed the pump as a Weldon Pump "V4" series of model number 2003-B.

Figure I shows non-Weldon supplied parts connected/installed to/on/in the pump-motor assembly:

- Inlet port fitting and flexible hose assembly;
 - Fitting body appearing to be AN815-8D or equal. Quantity one.
 - Fitting o-ring appearing to be AS568A-908 or equal of what appears to be brown Fluorocarbon elastomeric compound. Quantity one.
 - Section of 1/2" black fabric over braided flexible fluid line with aluminum crimp connections affixed to both ends.
- Outlet port fitting assembly (Note, installation instructions for this type of fluid port connection is defined within specification AND10064 titled "Fittings - Installation of Flared Tube, Straight Threaded Connectors");
 - Elbow, Flared Tube and Universal, 45° appearing to be AN837-8D or equal. Quantity one.
 - Nut, Tube, Bulkhead and Universal Fitting appearing to be AN924-8D or equal. Quantity one.
 - Fitting o-ring appearing to be AS568A-908 or equal of what appears to be brown Fluorocarbon elastomeric compound. Quantity one.
 - Section of 1/2" stainless steel over braided flexible fluid line with aluminum crimp connections affixed to both ends.
- Overboard seal drain port plugs and fitting;

- Plug appearing to be Weldon part number 8660 or equal. Quantity one.
- Elbow - Flared Tube and Pipe Thread, 90° appearing to be AN822-4D or equal. Quantity one.
- Nut, Tube Coupling, Short appearing to be AN818-4D or equal. Quantity one.
- Sleeve, Coupling appearing to be AN819-4D or equal. Quantity one.
- Section of 1/4" aluminum fluid line with 37° present on one end.
- Motor's lead wires had been shortened with the following electrical connector components installed.
 - Connector Housing appearing to be Tyco part number 1-480319-0 or equal. Quantity one.
 - Male Pin Terminals appearing to be Tyco part number 60620-5 or equal. Quantity two.

Observations of note concerning the external visual appearance and tactile condition beyond that mentioned above;

- Damage/abrasion/trauma to the motor assembly's commutation end frame on the brush holder boss located on the inlet side of the pump as illustrated in Figure II.
- One out of two of the motor's brush caps being of red material indicates that this article was last serviced/configured by other than the Weldon Pump Factory and/or Weldon Pump Factory Repair station utilizing factory supplied spare subcomponents as illustrated in Figure III.

PHYSICAL TESTING WITH INLET & OUTLET LINES AND FITTINGS AS SUPPLIED.

- A mating electrical connector was installed and the pump-motor assembly was checked, using an electrical meter, for short, none found.
- The Pump-motor assembly was then supplied 28 VDC momentarily and this determined it was freely turning and an acceptance test could proceed.
- All hardware, as previously defined, was removed from both of the Overboard seal drain ports to allow monitoring for the potential of a dynamic shaft seal leak during the acceptance testing. See Figure IV. Note, the overboard drain line was loose and could easily spin as supplied for this evaluation.
- The Pump-motor assembly was installed on Weldon's "L" style production test stand in order to perform the elevated inlet seal testing portion of the acceptance test. See Figure V. The pump was run with a 10 PSIG inlet & 25 PSIG outlet for 2:00 minutes while the overboard drain ports were monitored for signs of a fluid leak, no leak was present. The Pump-Motor assembly passed this test.
- The Pump-motor assembly was removed from the "L" style stand and moved to the test bench next to the "J" style stand for the remainder of the acceptance testing. See Figure VI. The Pump-motor assembly was provided 28 VDC and allowed to prime. Next the full relief was tested via the closure of a ball valve on the outlet. The full relief was measured at 23 PSIG @ 28 VDC & 3.25 amps. Note, Weldon's production test records show that this serial number pump left the factory with the full relief set at 30 PSIG @ 28 VDC & 3.9 amps. Next the valve on the

oulet was adjusted to the specified 15 PSIG operating pressure & the flow was recorded at 55 GPH @ 3.15 amps. Note, the minimum required flow at 15 PSIG for the 2003-B model is 105 GPH, therefore this pump had failed the acceptance test. In order to "rule out" that by testing with the lines and fittings that would not have been present during the original factory tests having caused a few PSI pressure drop & therefore the overall acceptance test failure the pump was then measured at 10 PSIG operating @ 72 GPH then at 5 PSIG @ 86.8 GPH both results still constitute a failure of the required flow. Finally vacuum was tested @ 28 VDC dry & found to be 10 in/Hg. With the pump wetted the vacuum would spike to 20 in/Hg then drop. The Vacuum was originally measured at 24 in/Hg when the pump was factory new.

PHYSICAL TESTING WITH SUPPLIED INLET & OUTLET LINES AND FITTINGS REMOVED.

- The Pump-motor assembly was removed from the test set-up and the inlet & outlet lines and fitting were removed. A slight crimp in the 1/2" stainless steel over braided flexible fluid line was more apparent although not of concern, see figure VII. Note, also at this time it was discovered that the outlet fitting, being of the universal type, was installed further/deeper than what is instructed within the AND10064 spec governing this type of interface. The end of the fitting had been contacting the Pump-motor assembly's valve poppet, see Figure VIII, Figure IX, Figure X-A, & Figure X-B.
- The Pump-motor assembly was again installed in the test bench next to the "J" style stand for retesting the failed portion of the acceptance testing. The Pump-motor assembly was provided 28 VDC and allowed to prime. Next the full relief was tested via the closure of a ball valve on the outlet. The full relief was measured at 23.5 PSIG @ 28 VDC & 3.35 amps. Next the valve on the outlet was adjusted to the specified 15 PSIG operating pressure & the flow was recorded at 109 GPH @ 3.05 amps. Note, the minimum required flow at 15 PSIG for the 2003-B model is 105 GPH, therefore this pump had passed this portion of the acceptance test. Finally vacuum was tested @ 28 VDC dry & found to spike to 24 in/Hg then settle back at 14 in/Hg. During this later testing it was noticed that the motor had an inconsistent/intermittent laboring sound.

EVALUATION SUMMARY

- As provided for this evaluation with the aircraft's lines & fittings the pump was less than 50% of the flow required per the acceptance test. With the lines and fittings removed the pump passed the volumetric flow requirement of the acceptance test. However, between the slight failure of the vacuum specification & the inconsistent/intermittent laboring sound the motor was emitting this pump would not have passed acceptance testing.

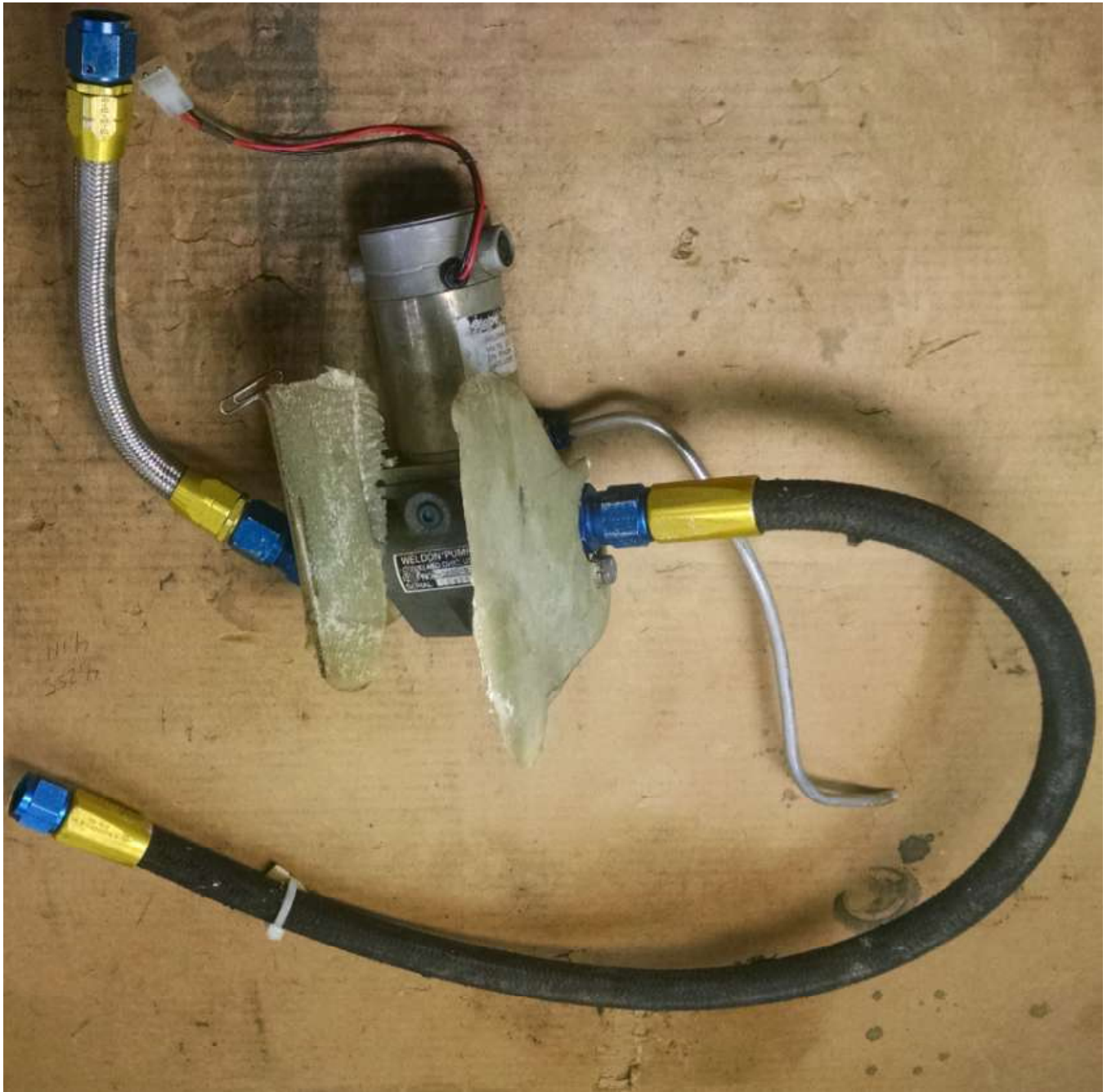


Figure I

non-Weldon supplied parts connected/installed to/on/in the pump-motor assembly



Figure II

Damage/abrasion/trauma to the motor assembly's commutation end frame on the brush holder boss located on the inlet side of the pump



Figure III

One out of two of the motor's brush caps being of red material indicates that this article was last serviced/configured by other than the Weldon Pump Factory and/or Weldon Pump Factory Repair station utilizing factory supplied spare subcomponents



Figure IV

All hardware, as previously defined, was removed from both of the Overboard seal drain ports

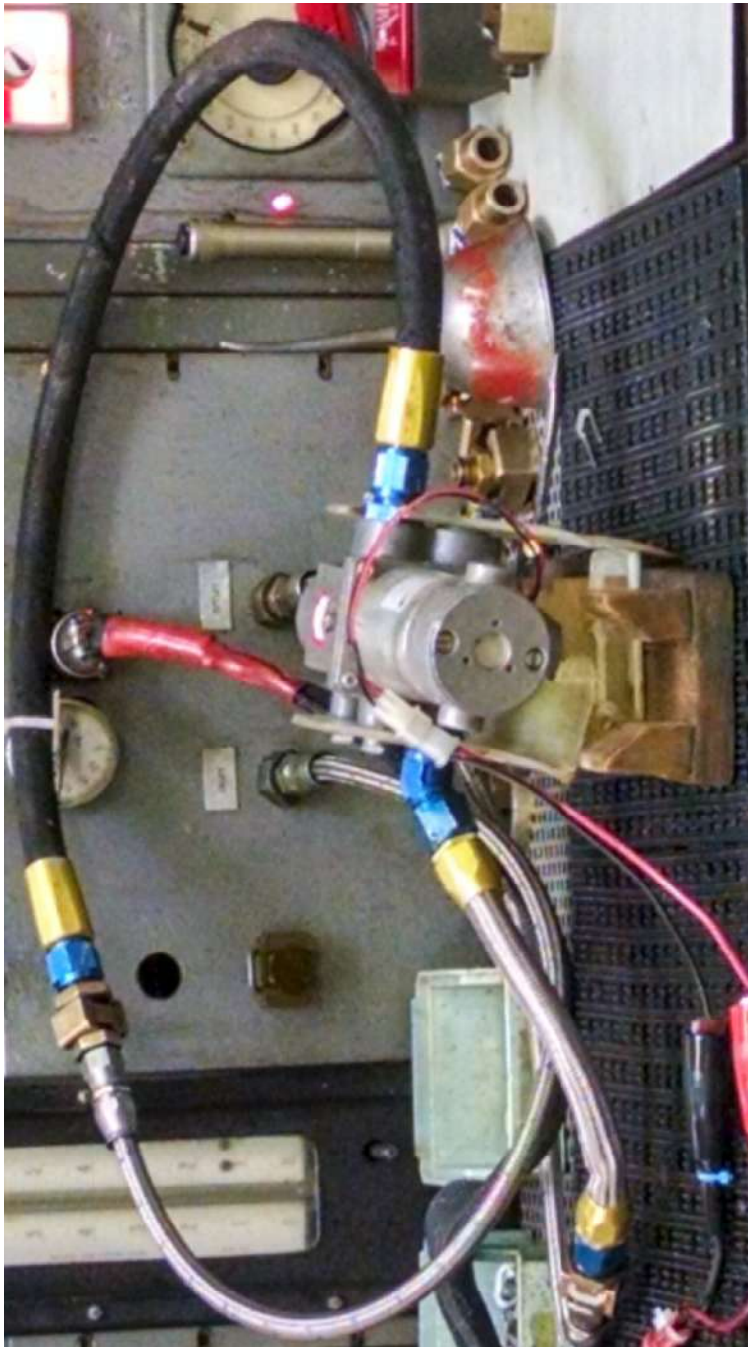


Figure V

The Pump-motor assembly was installed on Weldon's "L" style production test stand



Figure VI

The Pump-motor assembly installed on test bench next to the "J" style stand



Figure VII

Slight crimp in the 1/2" stainless steel over braided flexible fluid line



Figure VIII

1st The end of the fitting had been contacting the Pump-motor assembly's valve poppet



Figure IX

2nd The end of the fitting had been contacting the Pump-motor assembly's valve poppet



Figure X-A

3rd The end of the fitting had been contacting the Pump-motor assembly's valve poppet



Figure X-B

3rd The end of the fitting had been contacting the Pump-motor assembly's valve poppet

WELDON PUMP

JP4 FLUID FLOW 105 AT 15 PSI
 Full Relief 30 PSI Max VOLTAGE 28 AMPS 5 MAX. RPM -

2003-B MODEL NUMBER
 FLIGHT ESSENTIALS CUSTOMER

Seal Check - RUN STATIC
 Inlet 10 PSI for 2 MIN. Suction MIN. 18.5 in Hg

Unit Ser. No.	GPH at PSI 15	Amps	Suction in Hg	Full Relief / Amps	Seal Leak	Insp.	Date	Work Order
✓ 102549	133.0	4.0	24.0	30.0/4.2	⊖	⊙	12-18-02	37460
✓ 102550	127.0	4.4	24.0	30.0/4.7				
✓ 102551	129.0	4.2	24.0	30.0/4.6				
✓ 102552	131.0	3.9	24.0	30.0/4.1				
✓ 102553	130.0	3.8	24.0	30.0/4.0				
✓ 102554	131.0	4.0	24.0	30.0/4.3				
✓ 102555	133.0	4.0	24.0	30.0/4.6				
✓ 102556	134.0	4.1	24.0	30.0/4.7				
✓ 102557	132.0	3.8	24.0	30.0/4.0				
✓ 102558	133.0	3.6	24.0	30.0/3.9				
✓ 103081	133.0	4.2	24.0	30.0/4.6	⊖	⊙	1-31-03	37808
✓ 103082	130.0	4.2	24.0	30.0/4.5				
✓ 103083	134.0	3.7	24.0	30.0/4.1				
✓ 103084	132.0	4.0	24.0	30.0/4.4				
✓ 103085	133.0	3.9	24.0	30.0/4.4				
✓ 103251	132.0	3.4	24.0	30.0/4.0	⊖	⊙	2-13-03	37809
✓ 103252	133.0	3.6	24.0	30.0/3.9				
✓ 103253	132.0	4.4	24.0	30.0/4.7				
✓ 103254	134.0	3.9	24.0	30.0/4.3				
✓ 103255	132.0	3.7	24.0	30.0/4.1				
✓ 106431	128.0	3.9	24.0	30.0/4.3	⊖	⊙	10-21-03	38647
✓ 106432	135.0	3.0	24.0	30.0/3.6				
✓ 106433	131.0	3.7	24.0	30.0/4.0				
✓ 106434	128.0	3.7	24.0	30.0/4.1				
✓ 106435	127.0	4.0	24.0	30.0/4.3				
✓ 106436	130.0	3.9	24.0	30.0/4.2				
✓ 106437	133.0	3.9	24.0	30.0/4.2				
✓ 106438	130.0	3.8	24.0	30.0/4.0				
✓ 106439	134.0	4.0	24.0	30.0/4.2				
✓ 106440	132.0	3.7	24.0	30.0/4.1				
✓ 106441	132.0	3.8	24.0	30.0/4.0				

FORM 725 RP

Figure XII - Results from Original, Factory New, Acceptance testing.