Dry Air / Vacuum Pump Examination Notes from May 16, 2013
N5714W
NTSB Case # ERA13FA088
Parkton, North Carolina

1) ACCIDENT:

Location:	Parkton, North Carolina
Date:	December 16, 2012
Time:	About 1532 EST / 2032 UTC
Aircraft:	Piper PA-28-160
Registration:	N5714W

2) EXAMINATION PERSONEL:

Rapco, Inc.

- John L. Wicht
- Larry Cudzewicz
- Mike Lotzer

FAA

- Michael Pieczynski
- Peter Corrao

Location of Inspection:
Rapco, Inc.
[redacted]
Hartland, WI [redacted]

3) ARTICLE INFORMATION:

Article Nomenclature:	Dry Air Pump / Vacuum Pump
Model:	RA215CC (As identified by maintenance log book entry)
Serial Number:	A9749 (As identified by maintenance log book entry)
Production Date:	7/7/2013 (New Production FAA-PMA Approved)
Service Instructions:	Pump is recommended to be replaced in accordance with Rapco Service Letter # RASL-2005.

Note: All article information was noted in the aircraft maintenance logs. No data plates were present on the subject article.

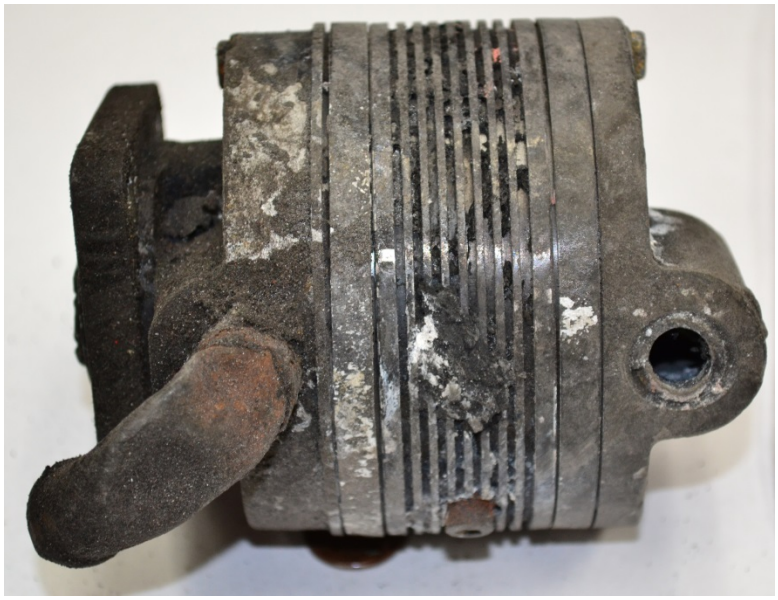
4) ARTICLE INSPECTION

- Removed subject article from open box as delivered by the FAA representatives.
- Pump was in plastic evidence bag which was sealed.

- Visual inspection of article shows significant heat damage.
- No data plates or labels were able to be identified.

- Visual inspection of the article drive end showed that the external drive gear and shear coupler are damaged beyond recognitions due to heat damage.

- Inlet fitting of vacuum pump was damaged.
- Outlet fitting was sheared at the attach flange.



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- Rear end of vacuum pump shows signs of corrosion, heat, and impact damage.
- Rear end bolts were found to be tight.
- No torque seal was noted on rear end bolt heads. (Bolt heads are marked with blue torque seal when manufactured as new FAA PMA approved from Rapco)

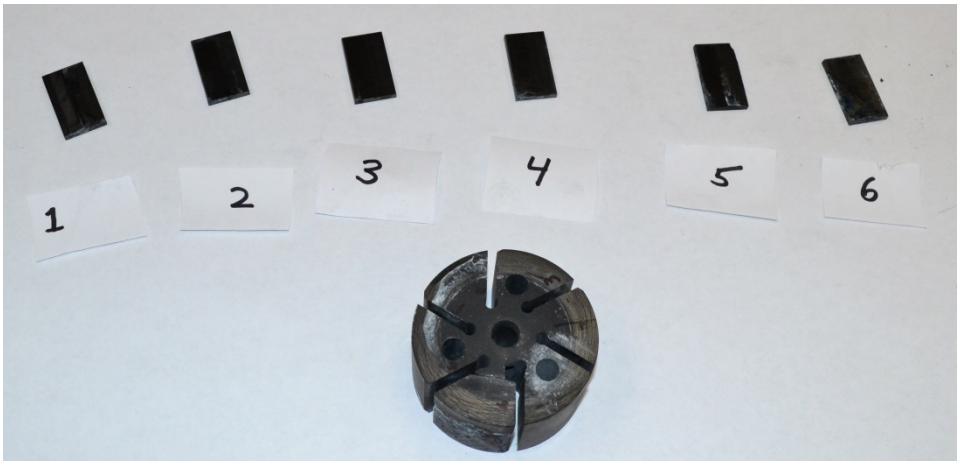
- Visual inspection of front end shows deformation due to impact.

- Visual inspection of vacuum pump shows rotor cracked and one vane chipped (Vane later identified as Vane 5 was chipped).

- Visual inspection of cavity shows signs of deformation due to impact.

- Visual inspection of rotor and vanes after removal showed a single crack through the center hole of the rotor, which resulted in a segment separating from the rotor.
- Visual inspection of the rear face of the rotor and vane assembly showed heat damage.

- Each vane and vane slot were marked with a permanent ink marker to identify where it was matted.
- Vanes were removed from rotor.



- Conducted dimensional inspection of vanes. Results were as follows:

Vane Number	Width	Thickness	Height
1	.710	.121	1.313
2	.707	.121	1.308
3	.710	.121	1.307
4	.704	.120	1.309
5	.705	.120	1.313
6	.712	.120	1.307

- Height of rotor 1.307

- Visual inspection of cavity shows damage to coating resulting from excessive heat.
- No apparent scratches or gouges were detected on the internal cavity wall.

- Visual inspection of rear end showed debris lodged in outlet port of rear end.
- Debris appears to be the missing part of the chipped vane (Vane 5).

- Visual inspection of the front end after disassembly showed no signs of the sponge as a result of heat damage.
- Internal gear was damaged beyond recognition as a result of heat.
- Measured small O.D of 3 finger drive and found it measured at 0.722”.

- Additional inspection of 3 finger drive indicates some corrosion and galling.
- Galling features on 3 finger drive mate with rotational scratches in bearing.

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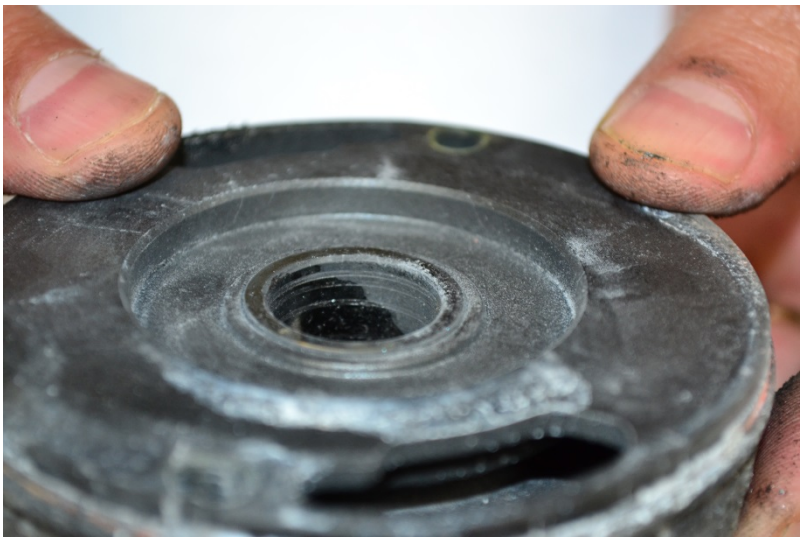
- Visual inspection of bearing showed some deep rotational scratches.
- Measured I.D of drive bearing. I.D of drive bearing measured at 0.723 – 0.726".



- After inspection, the vacuum pump components were packages separately and returned to the FAA for return to the NTSB.

A couple comments to consider:

Page 1. Have them add the date the pump was manufactured, and whether it had been to their facility for overhaul, repair, etc. Added date and noted that subject pump was new production.
Page 1. Add life limits of pump, etc. The subject article has no life limit. It has a recommended replacement time. Noted Rapco service letter that this shall be accomplished with.
Page 4. Note whether the bolts were tight/loose, etc. Done: Tight
Page 4. Note whether anti-slippage compound noted on bolts Done
Page 4. Add note whether they used anti-slippage compound on the bolts at manufacture or overhaul Done
Page 5. Suggest adding what vane # was chipped, and where was it chipped Done
Page 5, Is there a way to dimensionally prove this or was it just made by visual observation? No
Page 7. Dimensions of the vanes are provided, but with no reference to new or service limits for width, thickness, or height are provided. Suggest adding new and serviceable limits for all dimension of the vanes required for this pump. As Rapco does not have the production records for the subject article, we cannot be sure what drawing revision the components were manufactured to in the subject article. Thus I cannot insure that this information is factual.
Page 7. The rotor height is provided but again without new or service limit dimension provided. Suggest adding new and serviceable limits for rotor height. As Rapco does not have the production records for the subject article, we cannot be sure what drawing revision the components were manufactured to in the subject article. Thus I cannot insure that this information is factual.
Page 7. Suggest adding a note that the rotor was also marked to correspond with the vane positions. Done but it is on page 6.
Page 7. Suggest adding a note indicating what the debris lodged in the outlet port was (chipped vane, rotor, etc.) Done
Page 7. Suggest adding information about the cavity surface condition.Was there any scratches, gouges, etc. Done. None noted
Page 8. Suggest adding new and service limits for 3 finger drive OD Page 9. Suggest adding new and service limits for ID of drive bearing. As Rapco does not have the production records for the subject article, we cannot be sure what drawing revision the components were manufactured to in the subject article. Thus I cannot insure that this information is factual.

I would also like to get a copy of the engineering drawing(s) for this pump. Illustration, and parts list. As Rapco does not have the production records for the subject article, we cannot be sure what drawing revision the components were manufactured to in the subject article. Thus I cannot insure that this information is factual.

Was the correct engineering terminology used throughout this report? Yes it was

FAA Inspector Statement
Michael J. Pieczynski
NTSB Case #ERA13FA088
Dry Air Vacuum Pump Examination

May 16, 2013 this inspector was present and observed the tear down and examination of a Dry Air / Vacuum pump Model RA215CC serial number A9749 removed from N5714W a 1963 Piper PA-28-160.

The teardown and examination was conducted by personnel of Rapco, Inc. a 14 CFR 145 repair station rated to maintain and overhaul the dry air / vacuum pump. The findings were documented on a Rapco Inc. report dated May 16, 2013.

This inspector has read Rapco, Inc. factual report and concurs with the findings.

[redacted]

Michael J. Pieczynski
Principal Maintenance Inspector
MKE FSDO
[redacted]