### Product reliability: B777 engine-driven pump



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# Agenda

- 777 engine driven pump
  - Description
  - Improvements
  - Preventative maintenance
  - Improvements



# **Issue/application**

- Boeing 777/747-8 EDP/ADP
- P/N 972952 (Model: PV3-300-16D)
- Incorporation of SB 972424-29-05
- Recommended maintenance
- High time failures due to shaft failure or cylinder block sleeve migration can cause extensive pump damage and system contamination





# **Application**

#### Boeing 777/747-8 EDP/ADP

Inline pump with a one piece housing, plug-in valve plate, bronze half sleeved steel cylinder block, screw in attenuator, and a secondary shaft seal.

<ul> <li>Displacement (in3/rev)</li> </ul>	3.00
<ul> <li>Rated speed (rpm)</li> </ul>	4315
<ul> <li>Rated pressure (psi)</li> </ul>	3000
<ul> <li>Max Intmt Speed (rpm)</li> </ul>	5160
<ul> <li>Flow L (gpm)</li> </ul>	200 (53) @ 4315 rpm
<ul> <li>Rated Inlet Temperature C°(F)</li> </ul>	71(160)
<ul> <li>Dry weight kg (lbs)</li> </ul>	17.23 (38)



# **Opportunity summary**

### **Cylinder Block – Improved sleeve retention**

- Reduces migration of sleeve from cylinder block
  - Reduces critical failure mode of the housing failure
  - Improves overhaul pump reliability
  - Extends the soft time requirements
- Introduced in Service Bulletin
  - SB 972424-29-05 released 20 June, 2014
- Introduction of the soft-time overhaul kit
  - Overhaul kit P/N 914884
  - Soft-time kit P/N 914952 (Cylinder block & Overhaul kit)



### **Preventative maintenance**

### High time pump failures

- BER condition
  - Shaft failure
  - Cylinder block sleeve migration
- Costly system contamination



## Recommendation

### Monitor fleet

Establish maintenance interval

- Based on operator experience
- 25,000 30,000 hours or at scheduled engine removal

Information provided in service letter SL-29-972952-04



# Boeing 777 – Current EDP cost reductions

- 972424-29-01 Improved compensator spring to prevent spring set
- 972424-29-02 Introduction of PN 972952 with improved housing and compensator
- 972424-29-03 New valve plate incorporation to prevent cylinder block erosion
- 972424-29-04 Torque requirements for actuator sleeve (MX659137)
- 972424-29-05 New cylinder block with improved sleeve retention



P/N 972424/972952 Model: PV3-300-16C/-16D



### P/N 972952 (Model: PV3-300-16D) Engine driven hydraulic pump (EDP)

- Integral valve block/housing construction high pressure does not cross parting line
- Improved M-50 valve plate shaft bearing for improved alignment
- Viscous dampened balanced blocking valve for rapid response
- Straight blade boost impeller for higher flow capacity
- Shaft seal baffle prevents contamination of gearbox oil





### P/N 972952 (PV3-300-16D) - Flow schematic





## P/N 972952 reliability trend

P/N 972952 PV3-300-16D (EDP) Reliability Trend (B747/767/777)





## P/N 972952 shop findings





## Benefits of the Eaton EDP

#### Low inlet capability (3 psia)

Prevents noise and erosion

#### Extremely low noise levels

Located on wheel well bulkhead

#### High efficiency

- Rapid flow transfers in both directions
- Fast response times

#### Low vibration

Very stable at all required flows and temperatures

#### Easy maintenance

Components can be worked separately

#### Highly Reliable

- Robust proven component designs
- Improved cylinder block designs
- Increased fatigue strength

#### Weight reduction

Compact envelope size

#### Increased time on wing



# Warranty & support

#### Warranty

- Product warranty
  - 4 Years
  - 30,000 MTBF
- TAT Guarantee
  - 15 days

#### **Customer support**

- CSRM/TSRM support
  - Dedicated rep available
- Documentation
  - ATA 29-10-58
- Training
  - Available upon request



# **Commercial offering**

Price	Volume based pricing or PBH programs available
Retrofit programs	Incentive programs, reliability guarantees, extended warranty
Spares	Guaranteed availability, pricing discounts
Repair	Competitive flat rate programs to support your fleet, PBH available, TAT guarantees
Reliability guaranteed	Tailored reliability guarantees
Warranty period	36 month standard warranty, extended warranty programs available

Contact your Eaton representative for more information...



## Eaton value solution

Customer requirement	Eaton solution
Cost reduction	Discounted pricing with long term concessions
Increased reliability	Reliability improvements keep units on-wing
Simplified service	Minimize supply base with multi offering
Customer support	Dedicated CSRM/TSRM with immediate support
All inclusive service	Material, labor and repair









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