

# A320 hydraulic products

**John Schuerman**

Product support manager

Fuel and motion control division



*Powering Business Worldwide*

# Agenda

---

- A320 hydraulic products
  - P/N 3031863-001 Engine Driven Pump (EDP)
    - Solenoid Functional Issues (Spool sticking)
  - P/N 971600 Power Transfer Unit (PTU)
  - P/N 974540 A/C Electric Motorpump (ACMP)

# Opportunity summary A320 hydraulic equipment

- Proven Engine Driven Pump (P/N 3031863-001) (Replaces the Parker P/N 42054-01)
  - Proven reliability
    - Guaranteed reliability (15,000 hour MTBUR)
    - Proven field reliability (> 40,000 hour MTBUR)
  - Hoses are interchangeable between products
- Proven Power Transfer Unit (P/N 971600) (Replaces the Triumph P/N 4101002-9/-11)
  - Proven reliability
    - Guaranteed reliability (30,000 hour MTBUR)
    - Proven field reliability (> 50,000 hour MTBUR)
  - Hoses are interchangeable between products
- Proven AC Electric Motorpump (P/N 974540) (Replaces the Parker P/N 51154-03 /-04/-05)
  - Proven reliability
    - Guaranteed reliability (50,000 hour MTBUR)
    - Proven field reliability (> 80,000 hour MTBUR)
  - Hoses are interchangeable between products

# A320 Eaton hydraulic equipment



3031863-001  
Engine Driven Pump



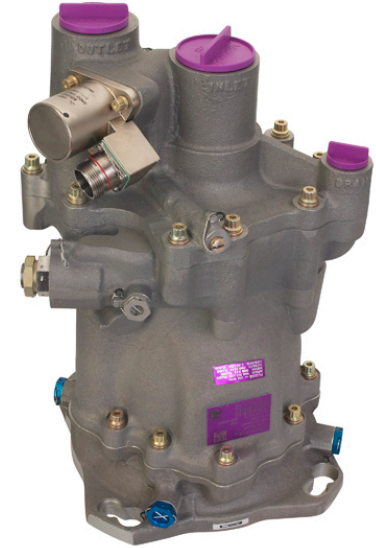
971600  
Power transfer unit



974540  
AC electric Motor pump

# P/N 3031863-001 (Model: PV3-240-10D) Engine driven hydraulic pump (EDP)

- Integral transfer tube between housing and adapter
- High pressure is controlled across parting line
- Timing optimized to reduce internal wear
- Quick disconnect mounting
- Proven rotating group



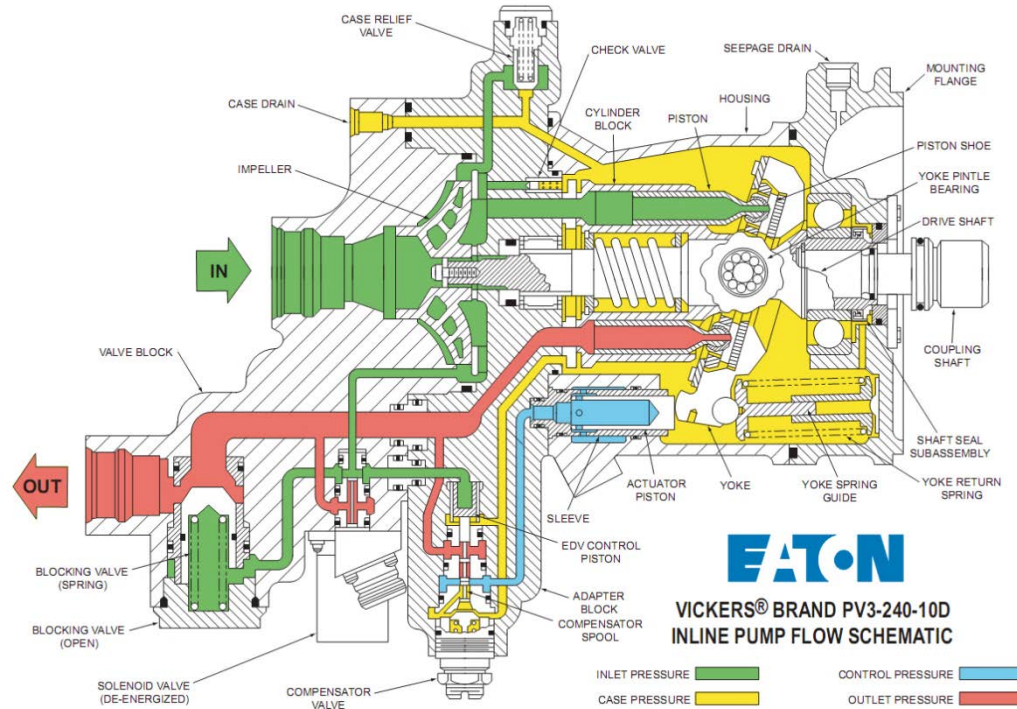
# P/N 3031863-001 (Model: PV3-240-10D)

## Engine driven hydraulic pump (EDP)

### Application - Airbus A320 EDP

- Inline pump with a transfer tube from housing to adapter, ductile iron cylinder block, coupling shaft with Vespel muff available.
  - Displacement (in<sup>3</sup>/rev) 2.40
  - Rated speed (rpm) 3700
  - Rated pressure (psi) 3025
  - Max Intmt speed (rpm) 5500
  - Min flow (gpm) 37.0 @ 3700 rpm
  - Rated inlet temperature C°(F) 71 (160)
  - Dry weight kg (lbs) 14.6 (32.2)
  - Wet weight kg (lbs) 14.8 (32.7)

# P/N 3031863-001 - flow schematic



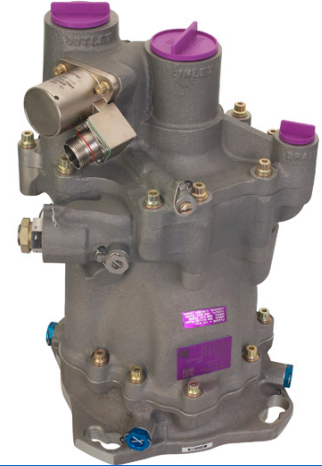
# Airbus A320 current EDP cost reductions

## 3031863-001-29-01 – Incorporation of the thick lift limiter

All product improvements are incorporated into the production configuration – to help ensure high reliability.

Incorporation of the polyimide coupling shaft muff available.

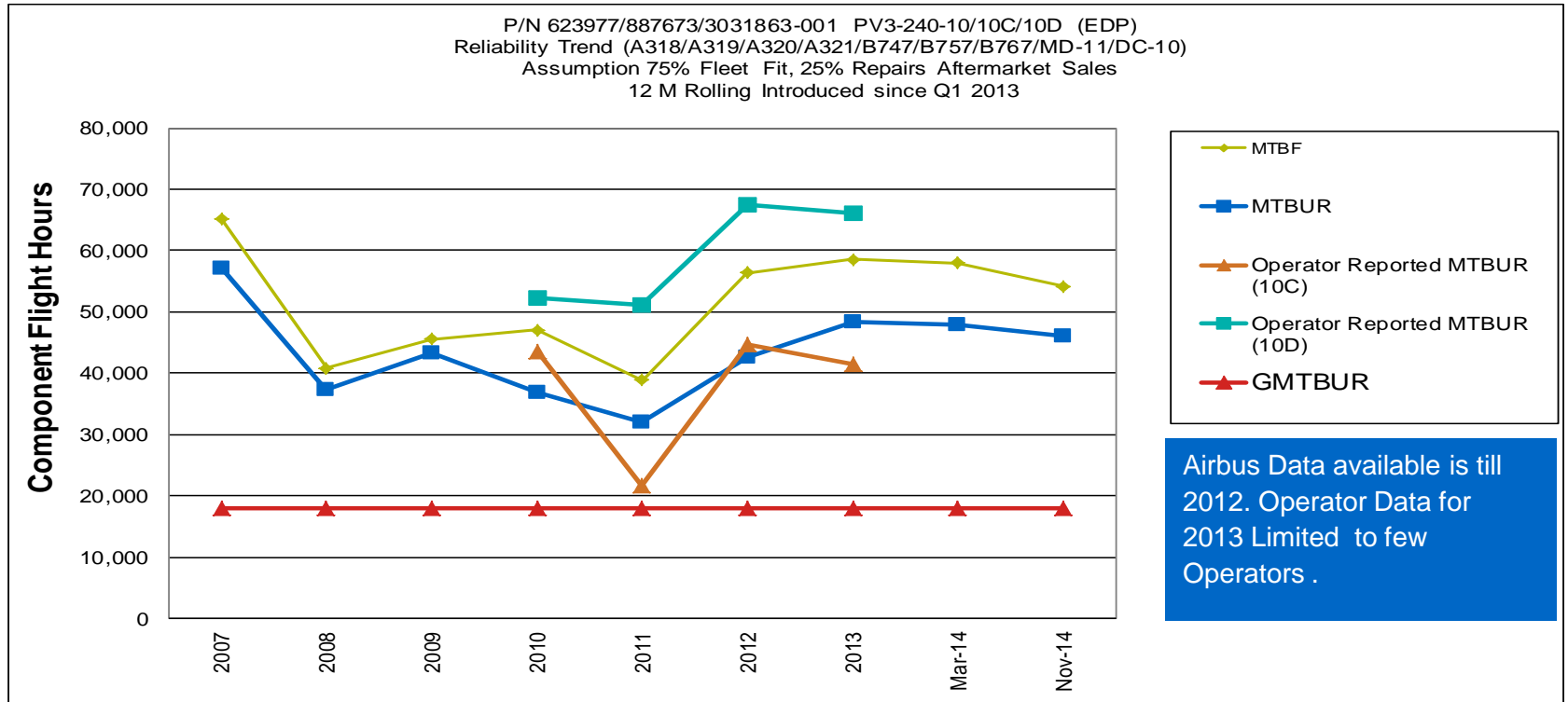
P/N 3031863-001



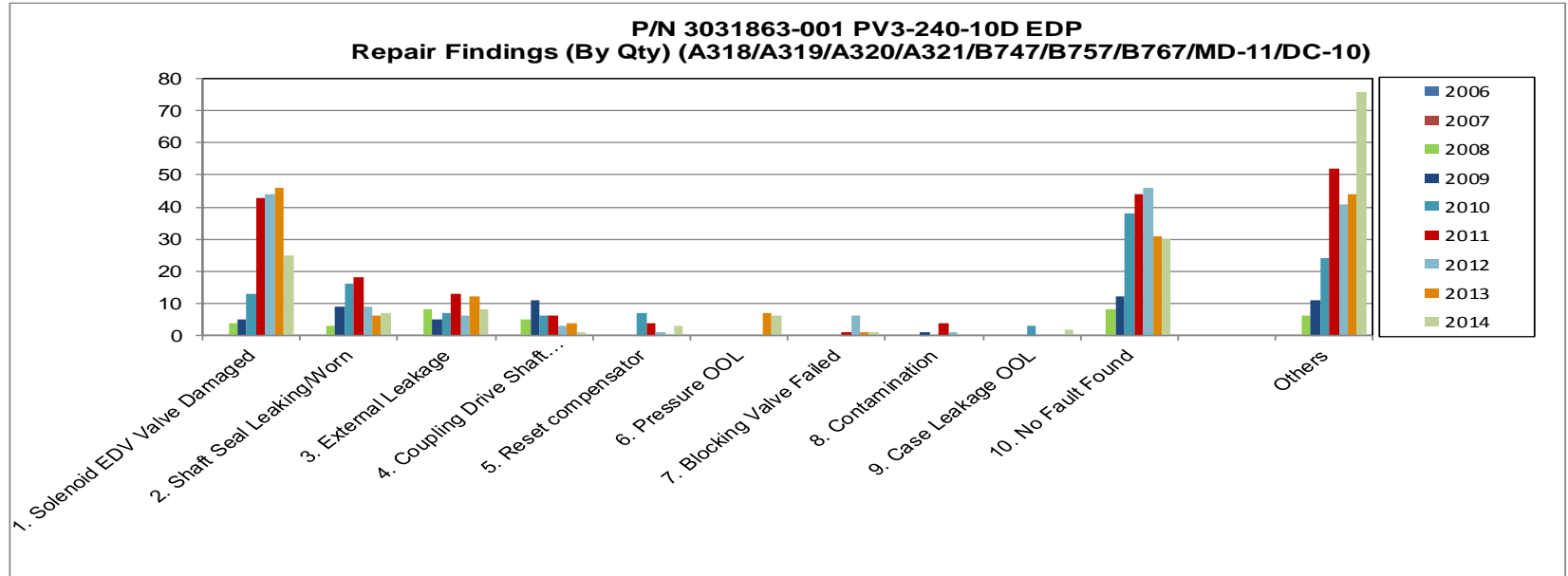
PV3-240-10D



# P/N 3031863-001 Reliability Trend



# P/N 3031863-001 Shop Findings



\* High Solenoid Valve Failures compared to Pre-Mod (158 since 2011)

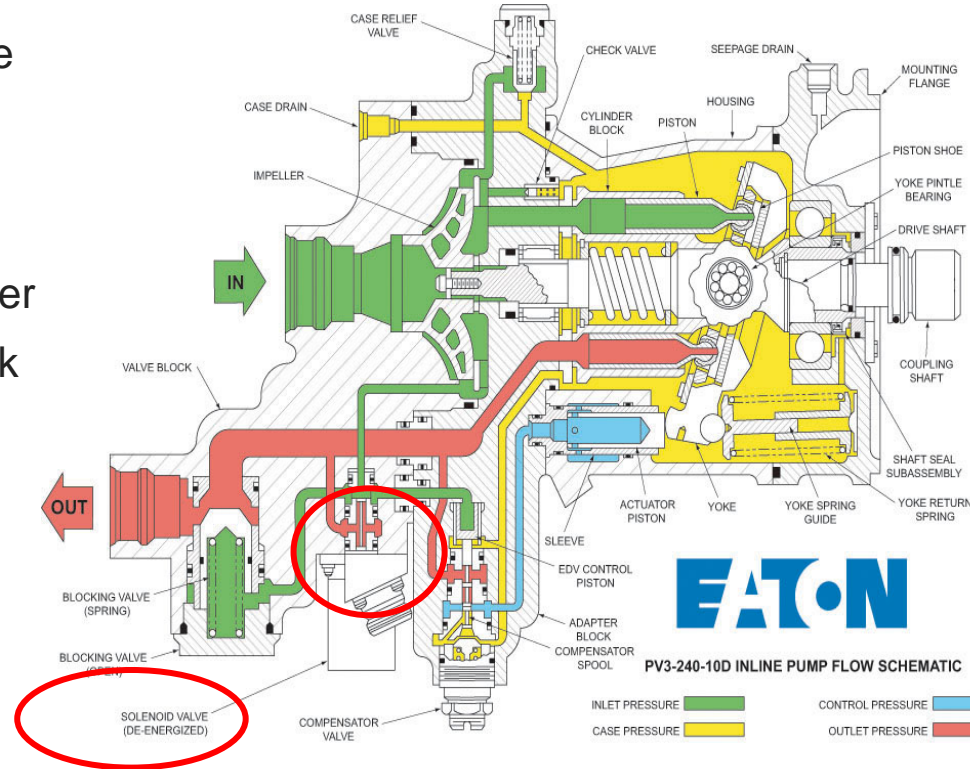
# Solenoid functional issues

- A320 aircraft
- No system depressurization
- Solenoid sticking
- Solenoid (P/N 887677)
- Pump outlet pressure fails to depressurize

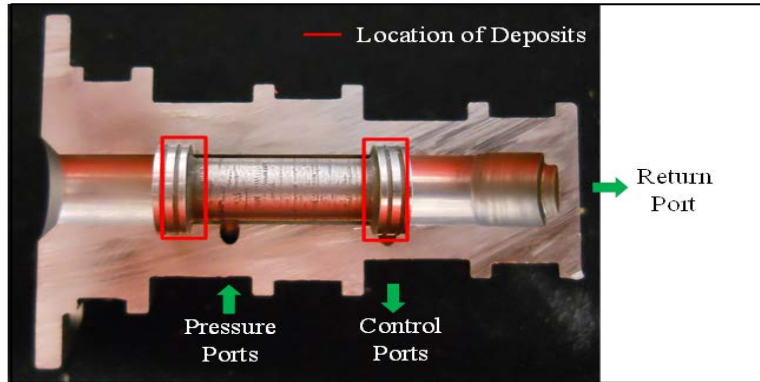


# Background

- Field failures: Failure to depressurize
- Found during the aircraft C-check which occurs every 4000 hrs
- Due to black debris found on the inner spool lands causing the spool to stick when the solenoid is actuated
- Majority of the failures occur in the yellow system of the A320 aircraft.



# Background



Sectioned valve body showing location of black deposits on spool lands

- Last valve design change: 1998 to reduce minimum internal leakage requirement from 150cc/min to 30cc/min



Black deposits on inside land of spool



Black deposits on inner land of spool

# Background – suspected cause

## Use of MCS 352B in assembly

- MCS 352B used to lubricate o-rings during assembly
- MCS 352B migrates into solenoid spool area and restricts fluid circulation
- Solenoid heats due to reduced circulation



# Solution - containment

1. Remove solenoid from pump
  - AMM identifies solenoid as LRU
  - Repair by cleaning or return to Eaton
2. Eaton disassembles & cleans spool
  - CMM identifies cleaning process
  - Returned as P/N 3032771-803
    - Contains backup & O-rings
3. Reinstall on aircraft and test per AMM instructions



# Solution

---

## Issues

- MCS 352B removed in July 2014
  - Initial production S/N MX780570
- Service letter updated to restrict the use of MCS 352B
- Monitoring returns to determine impact



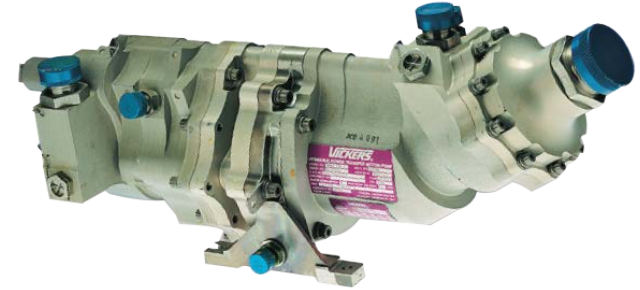
# Benefits of the Eaton EDP

---

- Low inlet capability (3 psia)
  - Prevents noise and erosion
- Low vibration
  - Very stable at all required flows and temperatures
- Easy maintenance
- Rotating components are proven on many applications
- Highly Reliable
  - Robust proven component designs
  - Ductile iron cylinder block designs
  - Increased fatigue strength
- Weight reduction
  - Compact envelope size

# P/N 971600 (Model: MPHV3-115-1C) Power transfer unit (PTU)

- MPHV3-115-1C (P/N 971600) Incorporates lessons learned from initial PTU (MPHF1-152-3A) and provides excellent reliability
  - Small diameter shaft seal reduces leakage into electric motor
  - Motor & pump on single shaft to reduce maintenance cost



# P/N 971600 (Model: MPH3-115-1C)

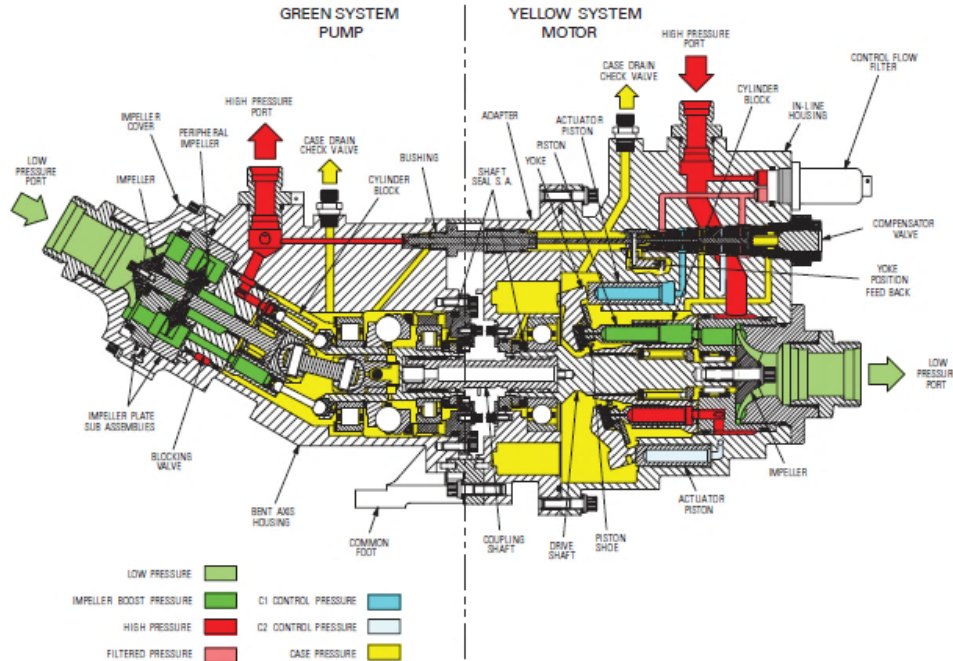
## Power transfer unit (PTU)

### Application - Airbus A320 PTU

- Proven fixed displacement bent axis hydraulic unit serving the aircraft's green system and a variable displacement inline hydraulic unit serving the aircrafts yellow system.
  - Displacement (in<sup>3</sup>/rev) 0.263
  - Rated speed (rpm) 7600
  - Rated pressure (psi) 3000
  - Flow (gpm) 8.5 @ 2175 rpm
  - Rated inlet temperature C°(F) 71 (160)
  - Dry weight kg (lbs) 14.5 (31.98)
  - Wet weight kg (lbs) 14.7 (32.50)

# P/N 971600 – Flow schematic

Flow Reversal at Constant Pressure — Flow Schematic

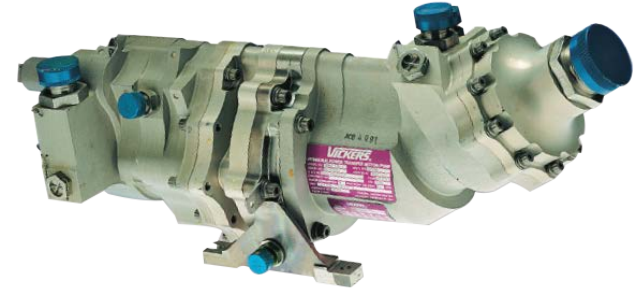


# Airbus A320

## Current power transfer unit (PTU) improvements

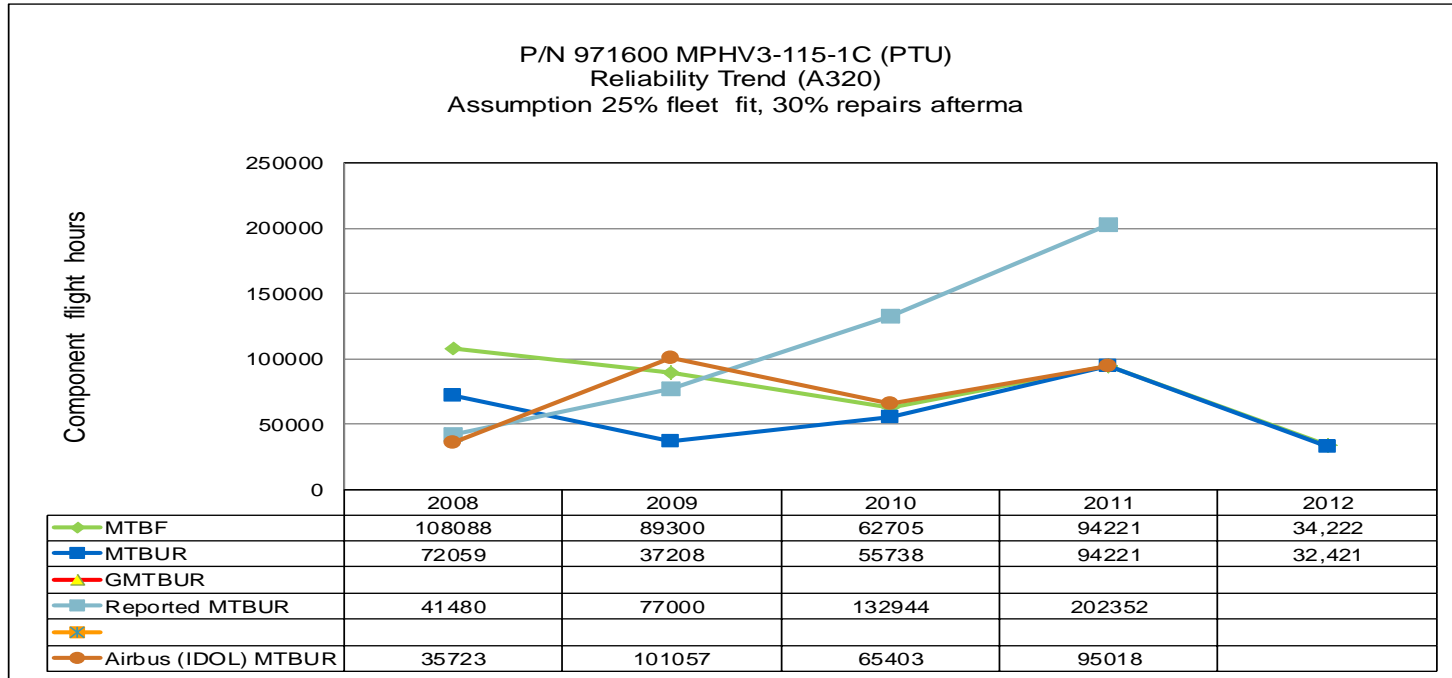
All product improvements are incorporated into the production configuration – to help ensure high reliability.

P/N 971600

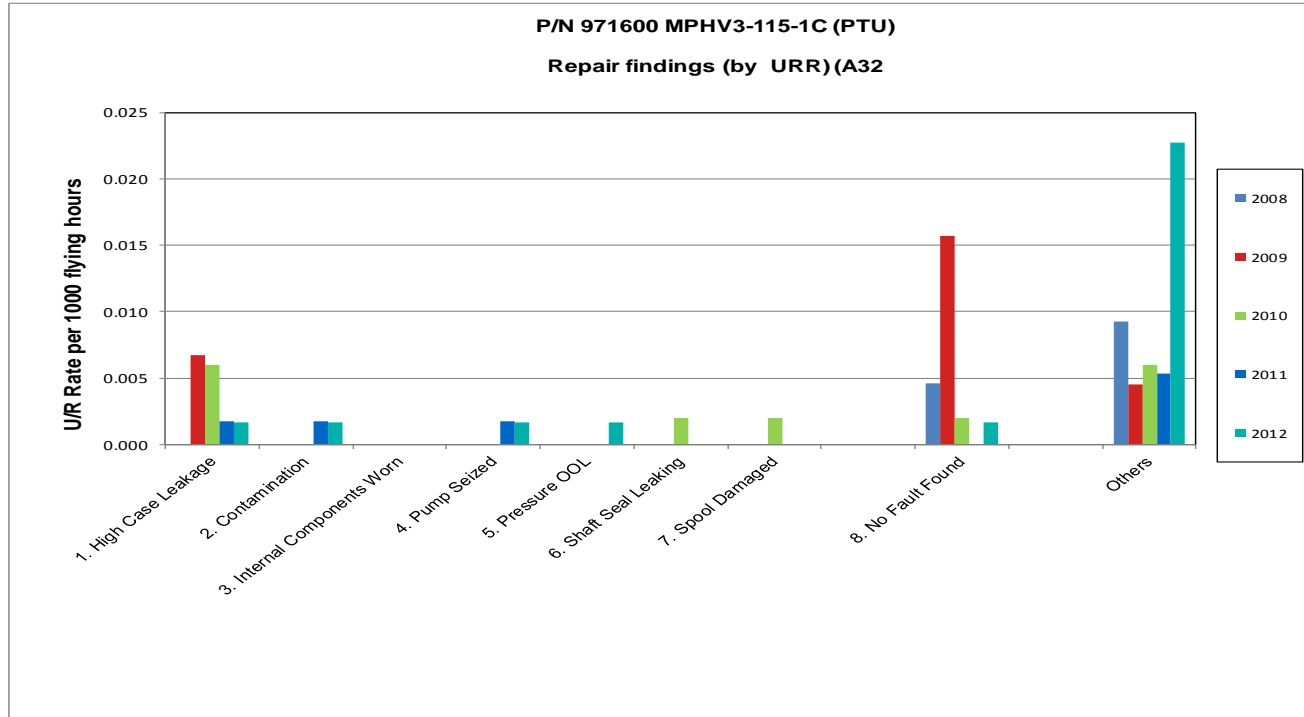


MPHV3-115-1C

# P/N 971600 reliability trend



# P/N 971600 Shop Findings



# Benefits of the Eaton PTU

- 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
  - Ductile iron cylinder block designs
  - Increased fatigue strength
- Weight reduction
  - Compact envelope size



# P/N 974540 (Model: MPEV3-032-15) AC Electric Motor pump (ACMP)

- MPEV3-032-15 (974540) Incorporates lessons learned from initial ACMP (MPEV3-032-10B) and provides excellent reliability
  - Small diameter shaft seal reduces leakage into electric motor
  - Motor & pump on single shaft to reduce maintenance cost

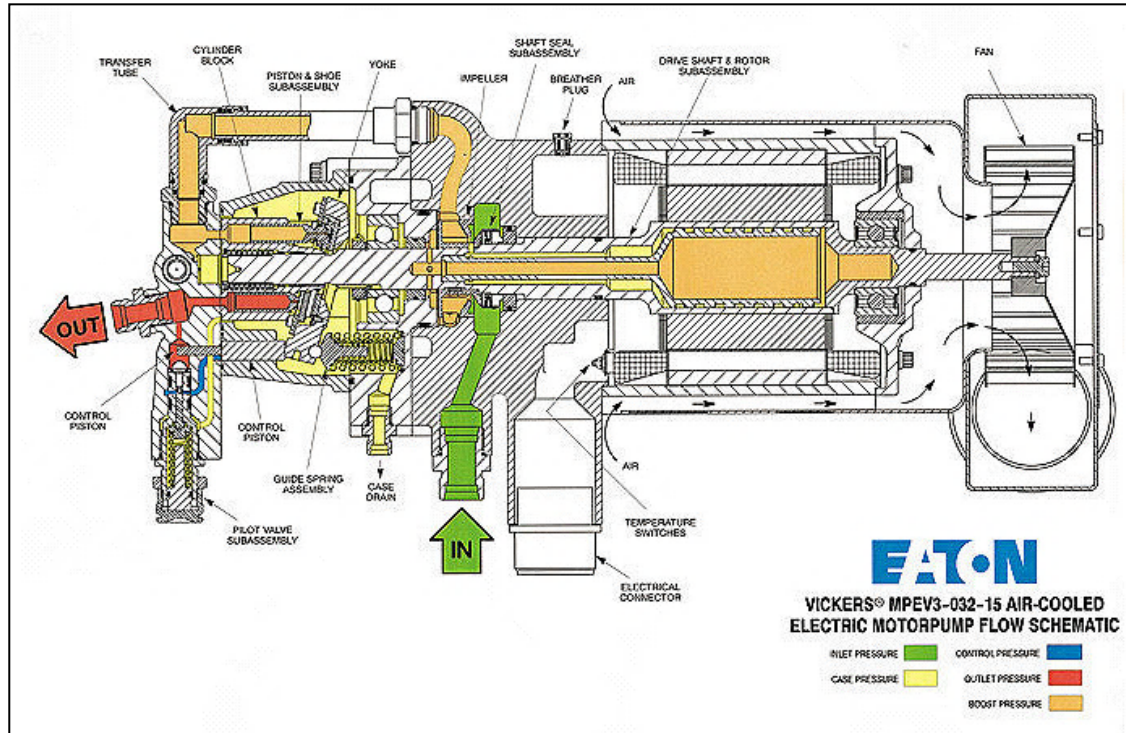


# P/N 974540 (Model: MPEV3-032-15) AC Electric Motor pump (ACMP)

## Application - Airbus A320 ACMP

- Proven variable displacement inline pump integrated into the electric motor drive shaft to reduce cost and improve reliability.
  - Displacement (in<sup>3</sup>/rev) 0.263
  - Rated Speed (rpm) 7600
  - Rated Pressure (psi) 3000
  - Flow (gpm) 8.5 @ 2175 rpm
  - Rated inlet temperature C°(F) 71 (160)
  - Dry Weight kg (lbs) 14.5 (31.98)
  - Wet Weight kg (lbs) 14.7 (32.50)

# P/N 974540 (MPEV3-032-15) – Flow schematic



# Airbus A320 current ACMP improvements

974540-29-01 – Screw change

P/N 974540

974540-29-02 – Improved tail bearing

974540-29-03 – Drive shaft contamination issue

974540-29-04 – Elimination of external leakage

974540-29-05 – Replacement of washer

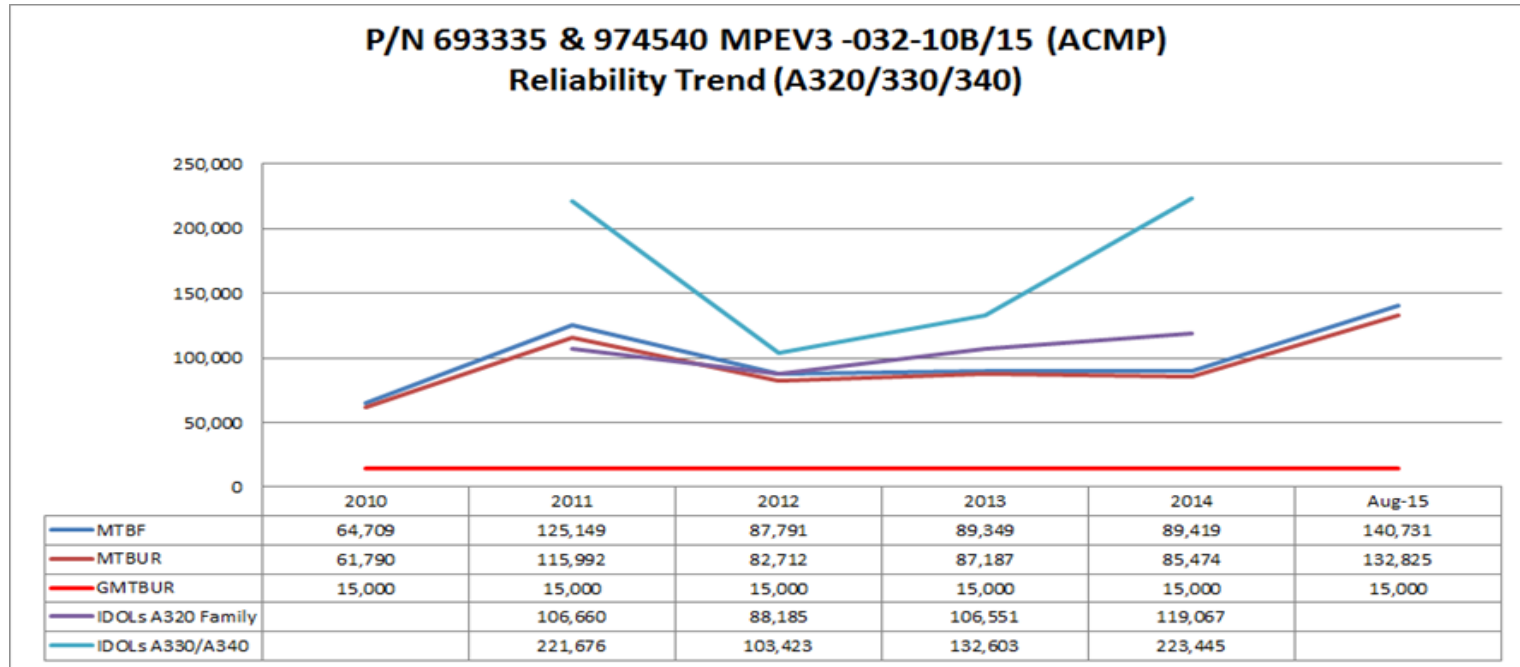
974540-29-06 – Inspection of compensator sleeve



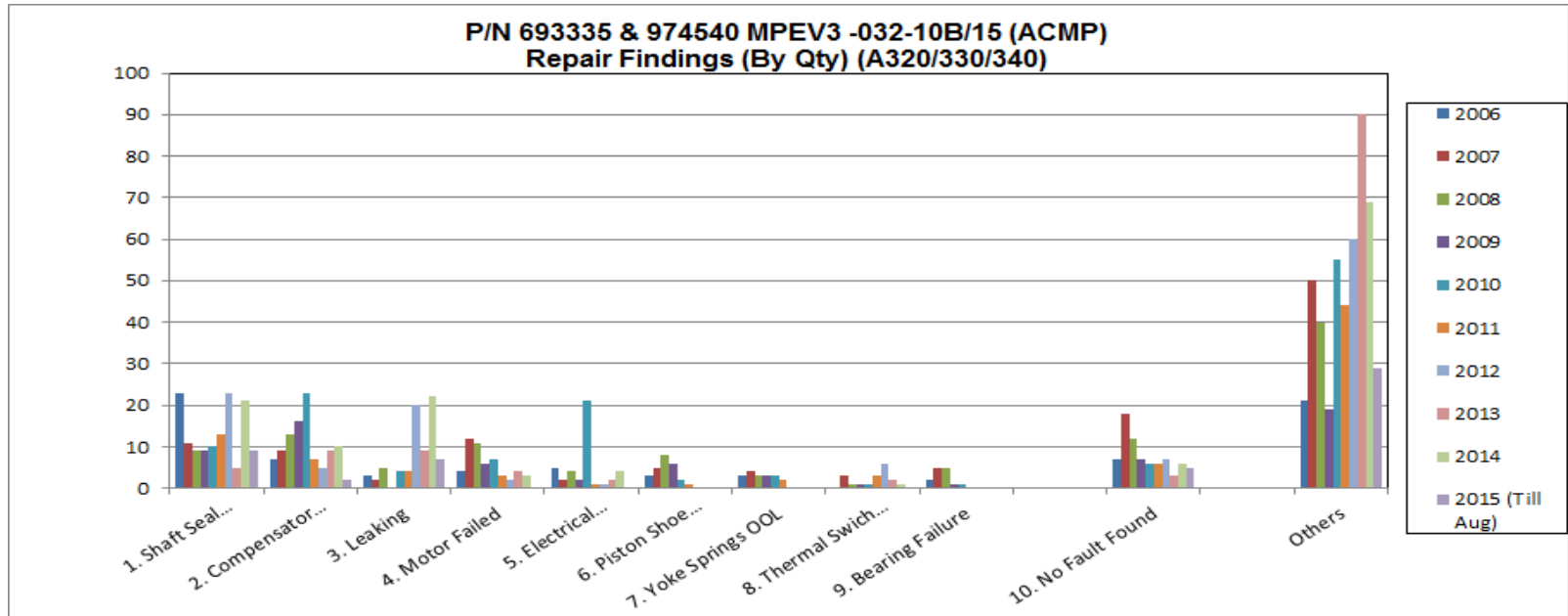
MPEV3-032-15

All product improvements are incorporated into the production configuration – to help ensure high reliability.

# P/N 974540 reliability trend



# P/N 974540 shop findings



# Benefits of the Eaton ACMP

- 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
  - Ductile iron cylinder block designs
  - Increased fatigue strength
- Weight reduction
  - Compact envelope size

# Eaton value solution

## Customer requirement

Cost reduction

Increased reliability

Simplified service

Customer support

All inclusive service

## Eaton solution

Discounted pricing with long term concessions

Reliability improvements keep units on-wing

Minimize supply base with multi offering

Dedicated CSRM/TSRM with immediate support

Material, Labor and Repair



# Warranty & support

## Product warranty

- P/N 3031863-001 (EDP)
  - 4 Years
  - 30,000 MTBUR
- P/N 971600 (PTU)
  - 4 Years
  - 50,000 MTBUR
- P/N 974540 (ACMP)
  - 4 Years
  - 50,000 MTBUR

## Customer support

- CSRM/TSRM support
  - Dedicated rep available
- Documentation
  - ATA 29-11-34
  - ATA 29-10-57
  - ATA 29-10-72
- Training
  - Available upon request
- TAT Guarantee
  - 20 days

# 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...

---



# Questions/Comments



*Powering Business Worldwide*