

# Eaton's Ducting and tubing repair station capabilities

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*Powering Business Worldwide*

## Pneumatic systems ducting, fuel and hydraulic tubing

- FAA XEPR787K – Ltd Airframe & Powerplant (issued 1994)
- EASA 145.5437
- CAAC
- C.A.S.E. approved and listed
- QA Manual in accordance with ISO 9001
- AS9100A certified
- NADCAP certified (heat treat, welding, EDM)
- Multiple OEM Supplier Qualifications and QMS Approvals (UTC / RR / GE / HON / etc.)



# Products repaired

World leader in breadth of product for flex and rigid ducting joints

## All ducting, tubing and piping

- **Environmental control system, ECS**
  - Cabin pressurization
  - Temperature control, heating and cooling
  - Ventilation
  - Electronic cooling
- **Engine bleed**
  - High pressure supply
- **Engine start**
  - Ground start
  - Cross start
- **Auxiliary power unit, APU**
  - Bleed and surge
  - Main engine starting
- **Thermal anti-ice, TAI**
  - Ice protection
- **Fuel & hydraulic tubing and flexible pipe**

Eaton is the largest supplier of ducting joints in the world



# Eaton Beltsville repair station

## FAA/EASA/CAAC Repair station number **XEPR787K / 145.5437**

### Mission

To apply Eaton's pneumatic systems engineering, manufacturing and test expertise in providing our customers with the highest quality service and fastest TAT for repair and overhaul, alterations, upgrades and/or modifications of ducting, tubing, slide and flexible joints, machined couplings, and fuel and hydraulic conveyance components.



Large, well-established Eaton facility near Washington DC



# Fabricating capabilities

- **Forming**
  - NC rolling
  - NC stretching
  - Bladder, die bulging
  - Bad Duben ring forming
  - Progressive dye
  - Rolling process
- **Plating (electroplating)**
  - Nickel, silver, gold,
  - Lead, indium, lead, tin
- **Welding, CNC machining centers, water jet cutting**
- **On-site heat treating**
- **On-site tool fabrication**



# Eaton Beltsville repair station

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- **TAT's < 30 days, Average 15 days**
- Capable of fast repair development, through DER and OEM licensed repairs
- Ducting repair customers include UAL, PWGSP, Rolls-Royce, SAESL, N3, Air France, Bombardier Learjet, numerous regional airlines
- Dedicated team includes Engineering, Customer Service and Quality

# Material competencies

## High temperature materials

- > 1200°F (648°C)

## High pressure pneumatic ducting

- > 600 psig (41 bar)

## Material capabilities

- Nickel and nickel base alloys
- Precipitation hardenable alloys
- Stainless steels
- Titanium alloys
- Aluminum alloys
- Silicon, RTV, Fire sleeves

## Duct wall thicknesses

- 0.017"(0.43 mm) – 0.120" (3.0 mm)

## Duct diameters –

- > .5" (12.7 mm)



# Services offered

Teardown and evaluation

Crack welding and repair

Dent removal

Section replacement

Joint replacement/upgrade

Insulation repair

Fire sleeve repair and replacement

Test and certification

Flat rate repairs offered

<15 Day TAT !

Manual specific and DER approved repairs available



**Full service repair facility, with new capabilities added upon request**



# Competencies

Flex and rigid joints: Eaton is the world leader in breadth of product line for ducting joints, therefore we can offer shortest TAT's and options for upgrades

Full capabilities to repair all types of damaged duct insulation

Fuel & Hydraulic tubing, hose and manifold repairs

We work closely with the FAA to develop DER approved repairs where requested. Very fast development turn around.

# Capabilities – ducting and tubing repair

## Repair & overhaul currently available

- PW4000
- GE90 PLA – **All GE90 Ducts and tubes**
- ATR 42 Pressure compensated duct (2 per aircraft)
- Trent 700, 800, 900, 1000 Ducting
- GTCP131-9 A&B Ducting (A320/B737)
- V2500 Ducting
- Fokker F100 APU Bleed duct flex joint
- DO328 Jet ducting
- RB211-524 / B747
- CFM56 PLA – **All CFM56 Ducts & tubes**
- All Boeing airframe ducting & tubing – Manual
- RB211-535
- Many others – More than 2200 part numbers



OP Spec and capabilities list revised quarterly — Eaton can repair ducts regardless of OEM

# Value proposition – Cost savings examples

## PW4000 12th Stage transfer tube

New price: USD\$ 91,000

Repair price: USD\$ 36,000

Savings: \$55,000!

## GE90 FWD Oil sump scavenge tube

New price: USD\$5,981 ea

Repair price: USD\$1,275 ea

Savings: \$4,706!



## V2500 NAI duct

New price: USD \$ 81,250

Repair price: USD\$15,000

Savings: \$66,250!

## Trent 700 Starter duct

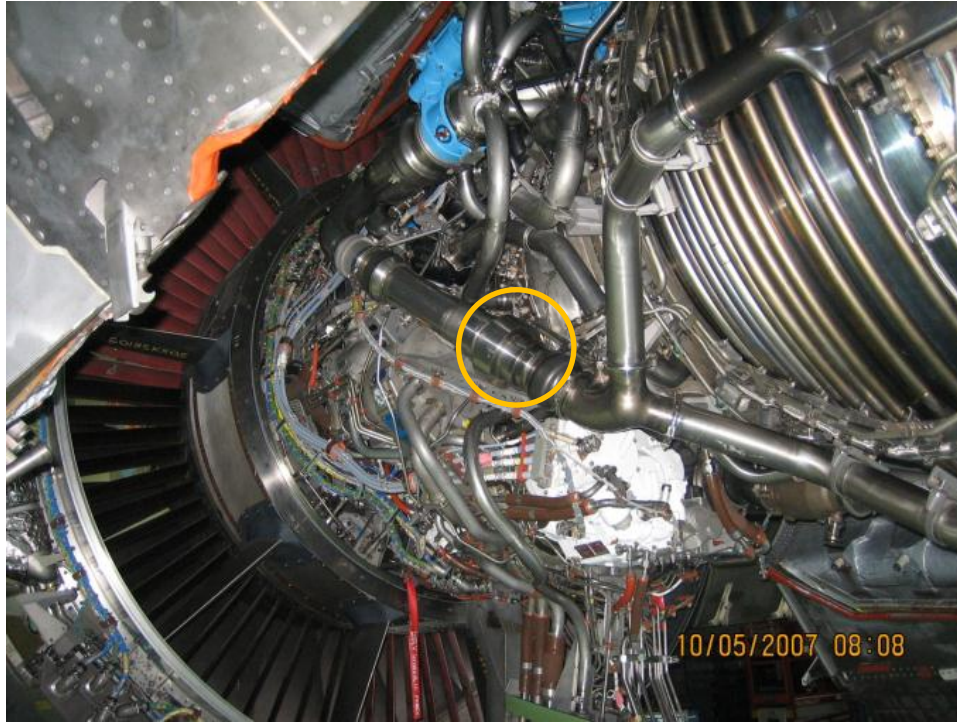
New price: USD\$91,090 ea

Repair price: USD\$39,870 ea

Savings: \$51,220!



# Examples - PW4000 112" Fan 12<sup>th</sup> Stg duct



# GTCP131-9 Ducting for B737 and A320

GTCP131-9 A, B & D APU pneumatic duct overhaul and repair

Ten part numbers involved shown on the right

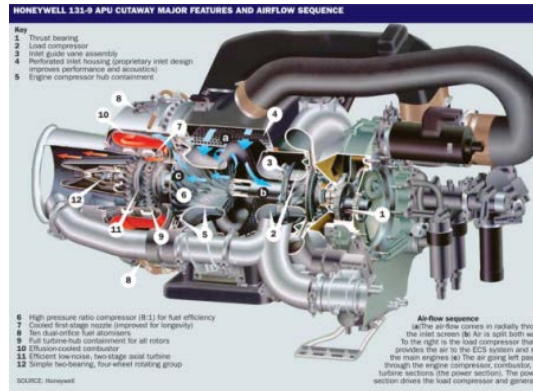
Eaton is the original designer, manufacturer and source to the OEM for these ducts

Eaton FED supplies overhaul and repaired units at a lower price than new parts from the OEM

TAT: 15 days

## Honeywell part numbers

<b>3885003-1</b>	Duct assy, surge
<b>3885003-2</b>	Duct assy, surge
<b>3885004-2</b>	Duct assy, bleed
<b>3885004-1</b>	Duct assy, bleed
<b>3884974-1</b>	Duct, surge
<b>3885007-1</b>	Duct assy, compressor discharge
<b>3885007-2</b>	Duct assy, compressor discharge
<b>3884988-1</b>	Duct assy, compressor discharge
<b>3885057-1</b>	Duct assy, surge
<b>3885057-2</b>	Duct assy, surge





# Trent 900 Pneumatic bleed ducting for A380

- Insulation repair and replacement
- Gimbal Joint repair and replacement
- Flange repair and replacement
- Tube damage repairs
- Upgrades to latest design standards
- Eaton is the original designer, manufacturer and source to the OEM for these ducts



<b>FRH500402V</b>	Duct -Starter -Fan Case
<b>FRH500412X</b>	Duct -High Pressure (HP6)
<b>FRH500414Z</b>	Duct -Intermediate Pressure
<b>FRH500415Z</b>	Duct -Tee (HP6-IP8)
<b>FRH500491V</b>	Duct -Starter -Starter to SA
<b>FRH500505V</b>	Duct -Starter -Pylon Supply
<b>FRH500521M</b>	Duct -Forward -TAI
<b>FRH500522M</b>	Duct -Centre -TAI
<b>FRH500523M</b>	Duct -Engine Offtake -TAI
<b>FRH500524M</b>	Stub Duct Eng Offtake -TAI
<b>FRH615015K</b>	Duct -Lower -Fuel Supply
<b>FRH615017K</b>	Duct -Upper -Fuel Supply
<b>RR02235-001</b>	Duct – Intermediate Pressure
<b>RR02275-001</b>	Duct – Centre - TAI

Plus all other ducts, tubes & hoses on Trent 900!

# V2500 A1, A5 and D5 Ducting

- Anti-ice ducting overhaul
- Used on Airbus A320 and Boeing MD90
- Part number (shown): 290-5074-503
- Estimated TAT: 15 days
- DER Repairs



# Rolls Royce RB211-535 Engine

## HP2 and HP6 Pressure compensated flex slide joint assemblies

- HP2/HP6 Pressure compensated flex slide joints
- Part Number: HP2 14J98-1(312N5306-1), HP6 16J08-1 (312N5321-7)
- We provide an overhaul for the HP2/HP6 joint assemblies
- Repair price saves the customer >\$30K compared with a new unit
- HP2 Mod From 1-Piece to 2-Piece as recommended per Boeing SB 757-36-0028
- HP2 Mod reduces man hours from 24 to 3 to remove duct with engine on airplane
- TAT: 21 days



Eaton is the original designer, manufacturer and source to the OEM for these ducts

# Military ducting repairs



Photo courtesy of DOD



Before



After

# Industrial gas turbine duct and joint repairs



Before



After



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# Questions/Comments



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