IMPLEMENTATION OF ENGINEERING SOLUTIONS THROUGH PMA

Gorham Conference 2009

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AGENDA

- CORPORATE OVERVIEW
- USING PMA FOR COMMERCIAL REASONS
- USING PMA TO IMPLEMENT ENGINEERING SOLUTIONS
  - IMPROVED RELIABILITY
  - AD AND SERVICE BULLETIN COMPLIANCE
  - ALTERNATE PATH TO THE AFTERMARKET FOR OEM COMPONENT SUPPLIERS
- CONCLUSIONS
- QUESTIONS

SEAL DYNAMICS - BUSINESS PROFILE

- Since 1976 Seal Dynamics has been supporting customers world-wide with logistics management and technical support.
- Core strengths are in product development, technical sales, and logistics management.
- Ninety-Five (95) Team Members world-wide.
- Four (4) strategic global sales/warehouse/office locations (NY, Tampa, London, Singapore)
- New Product Development Group located in Tampa, FL.
- Acquired by HEICO Aerospace in November 2005 providing financial backing for even greater growth.
- Quality Assurance:
  - AS9100 Rev B and ISO9001:2000 Certified
  - AC00-56A Compliant
  - Member of the Aviation Suppliers Association (ASA)

STRATEGIC PARTNER NETWORK

Parker Aerospace

Donaldson. Filtration Solutions

EATON

Parker Chomerics

Le Bozec

HARCO

Parker Prädifa

AERO DESIGN TM

Triumph Controls, Inc. A Triumph Group Company

COX & COMPANY

RADIANTPOWERCORP a HEICO company

Sofrance SAFRAN Group

MEGGITT

HEICO

USING PMA FOR COMMERCIAL REASONS

- Lower acquisition costs
- Improved lead-times
- Availability of parts world-wide
- OEM leverage

COST SAVINGS

- AeroStrategy has presented on numerous occasions that the available PMA market is in the $1B to $1.5B range.
- AeroStrategy has also reported that they estimate a 3% to 5% market penetration by PMA suppliers at this point in time.
- This is steadily increasing as nearly all airlines, in all parts of the world, accept PMA in some form at this time.
- Many airlines save over $1M annually and some as much as $10M annually by using PMA parts.
- Savings are obtained by direct cost savings and by the indirect savings obtained by the response of OEMs to pressure from PMA suppliers.

USING PMA TO IMPLEMENT ENGINNERING SOLUTIONS

- The development of alternative parts to reduce on-going operational and maintenance problems.
  - Improved reliability of individual components
  - Improved reliability of aircraft systems
- The development of alternative parts to respond to Airworthiness Directives (AD) and Service Bulletins (SB).
- The development of alternative parts to provide new paths to the aftermarket for OEM component suppliers who have improvements that the TC holder will not implement.

USING PMA TO IMPLEMENT ENGINNERING SOLUTIONS

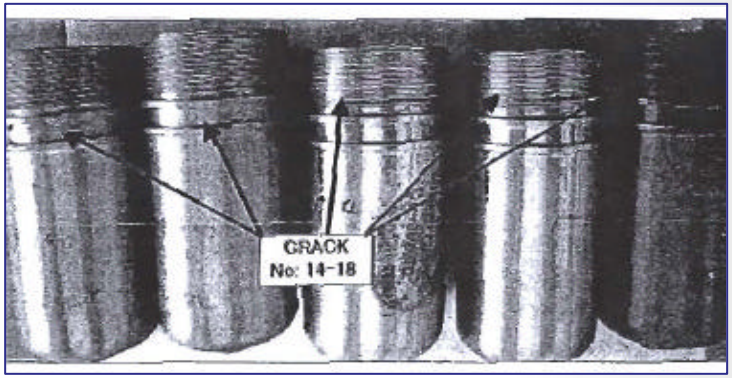
- The development of alternative parts to reduce on-going operational and maintenance problems.
  - ➢ Improved reliability of individual components

ACMP Pressure and Case Drain Housing – 767 & 777

Problem:
OEM Position (767-SL-29-039 Filter Bowl): Despite field failures, "Cost/Benefit analysis has determined that cost impact is insufficient to justify production changes."

Service Letter 767-SL-29-039 suggests FPI of 271T0045-3 after an initial 21,000 cycles and every 3,000 cycles thereafter.

Solution:
HEICO produced an improved product which included a material change that resulted in:



Predicted LCF Life: Threads

p/n 271T0045-3: 160,000 cycles
p/n JA271T0045-3T > 4,000,000 cycles

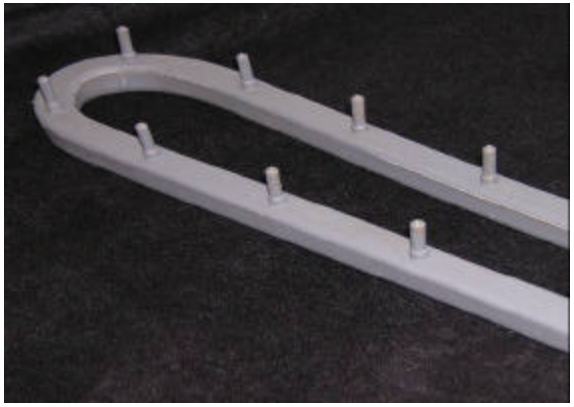
HEICO obtained PMA for regulatory approval. Alternate ICA issued.

Innovative Solutions to "age old" problems

OUTBOARD PYLON AND STABILIZER SEALS – CRJ200

PROBLEM:

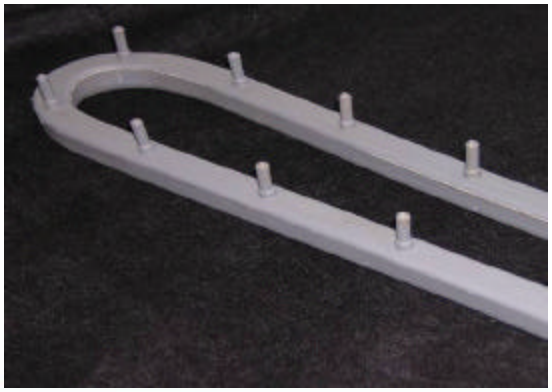
- Exterior pylon and stabilizer seals were lasting only 200 - 300 flight hours.
- Part displacement during engine operation, risking a possible FOD situation, was causing flight turn-backs and gate delays.



OUTBOARD PYLON AND STABILIZER SEALS – CRJ200

SOLUTION:

- Seal reinforcement technology was applied along with an internal strength enhancing additive.
- Also added were common seal components such as Open Weave Dacron fabric to the basic compound.
- The seals now last between scheduled heavy maintenance checks.
- Delays, cancellations, turn-backs and unscheduled maintenance have been significantly reduced increasing the revenue for these airlines.



Problem: Incandescent Technology

Technology – Incandescent component performance is degraded by vibration, temperature cycles, etc. resulting in frequent, premature lamp and fixture failures.

Accessibility – Wing tip lamp replacement requires lengthy open-up time. Tail lamp replacement requires man-lift device. Eighteen screws to remove the lens.

Reliability – Delays and cancellations and pilot reports.

Solution: LED Technology

Technology – Plug & Play installation. Greatly improved shock and vibration resistance – no filaments, glass bulbs, etc. to burn out or break. Current draw reduced 66%, more efficient / safer to operate. Low heat output prolongs life of acrylic lens covers. No EMI or RMI interference. Improved visibility – LED's are brighter. 20% lighter than incandescent assemblies. Unit base machined from single aluminum billet, eliminates possibility of two-piece base fracture seen on Grimes unit.

Accessibility – Reduced manpower costs associated with unscheduled maintenance of incandescent units.

Reliability – Reduction in delays and cancellations, and Pilot Reports;
ICA: 15,000 hours on aircraft. Currently undergoing flight testing.

USING PMA TO IMPLEMENT ENGINNERING SOLUTIONS

- The development of alternative parts to reduce on-going operational and maintenance problems.
  - Improved reliability of individual components
  - Improved reliability of aircraft systems

AUTOMATIC TOILET FILL SHUTOFF VALVE

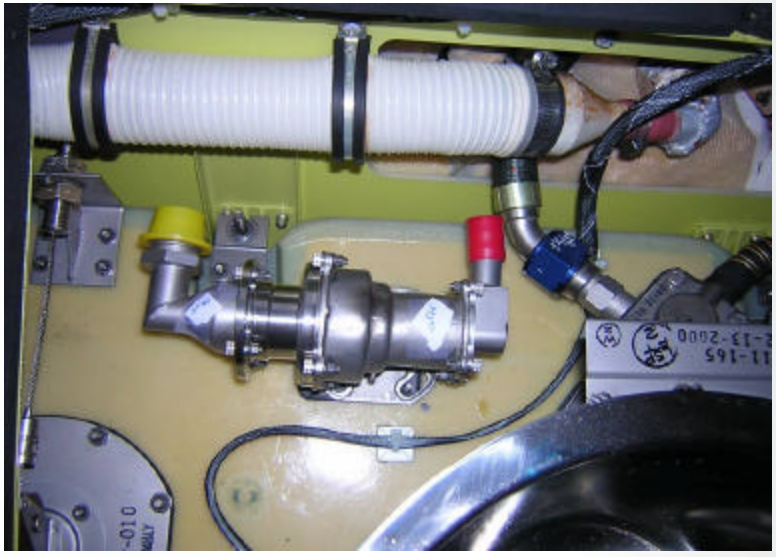
PROBLEM:

- Mechanics overfill lavatory causing corrosive chemicals to leak throughout the cabin and onto sensitive flight-critical electronics.
- Major 737 operator asked us to develop a solution because there was an AD pending that was going to be very expensive.
- AD solution was costly and required significant modifications to the aircraft.

AUTOMATIC TOILET FILL SHUTOFF VALVE

SOLUTION:

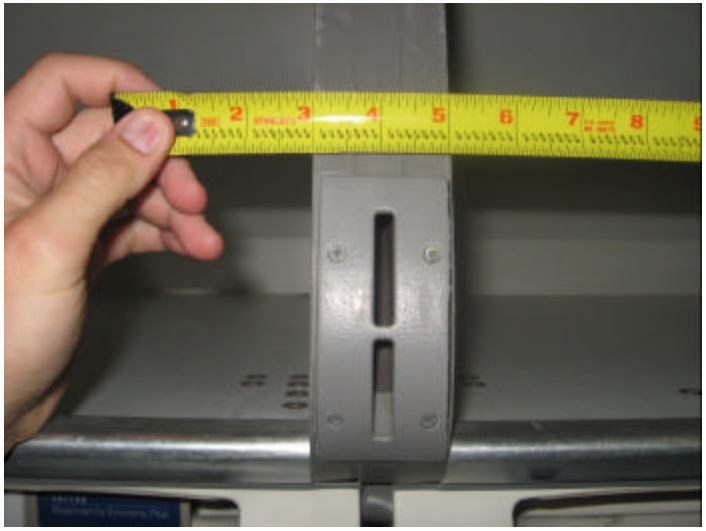
- A valve was developed that automatically shuts off when the tank reaches the pre-charge level.
- This mechanical solution requires no electrical power and can be installed at an overnight check.
- Significant reduction of aircraft grounded for unscheduled maintenance resulting in significant savings to many airlines.
- Retrofitted ERJ, CRJ, 737 & MD80 fleets. STC & PMA for all these aircraft types.



AIRBUS TEMPERATURE SENSOR FILTER

Problem: Temperature Sensor Failures

- The front and rear cabin temperature sensors are fouling due to in cabin debris that is drawn into the ducting and is clogging the sensor element.
- The sensor is buried back in between the luggage bins and cannot be accessed without major disassembly.
- Only a panel bezel (shown below) exists currently over the opening, with no filter.
- The mechanics would rather not have to remove the bezel to avoid stripping the threads.



AIRBUS TEMPERATURE SENSOR FILTER

Solution: Addition of a new bezel and removable filter

- Implement a removable filter over the opening that can be easily removed and replaced.
- Adding a filter requires a STC for this modification. STC and PMA near completion.
- This design has been patented.
- This retrofit will save the airline thousands of dollars in unscheduled maintenance and improve customer comfort.

Existing Inlet Plate (No Filter Media)

HEICO Design (Note Filter Media)

HEICO Design (Stow Bins Closed)

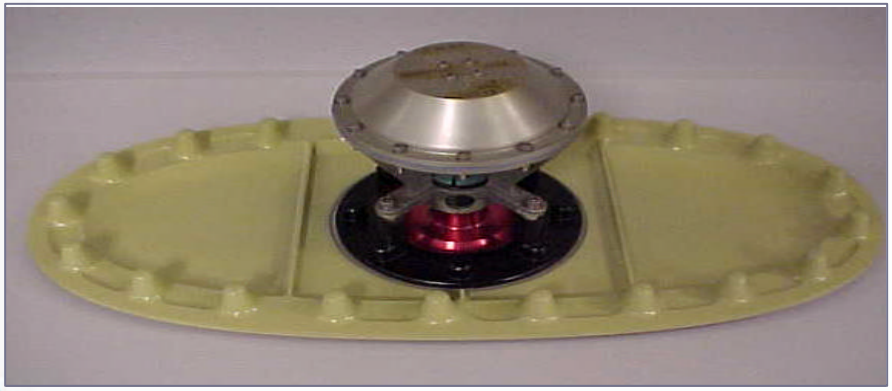
USING PMA TO IMPLEMENT ENGINNERING SOLUTIONS

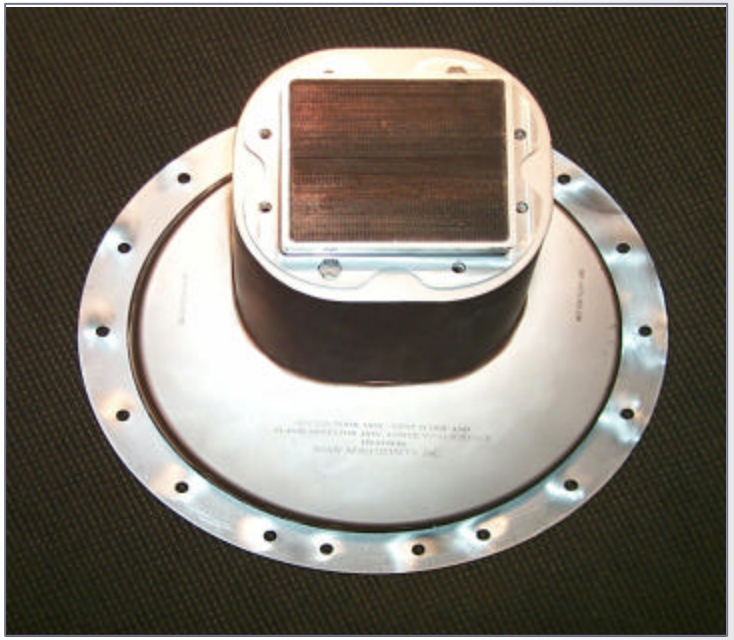
- The development of alternative parts to reduce on-going operational and maintenance problems.
  - Improved reliability of individual components
  - Improved reliability of aircraft systems
- The development of alternative parts to respond to Airworthiness Directives (AD) and Service Bulletins (SB).

737 FLAME ARRESTOR KIT

Problem:

- AD issued in response to TWA 800 and other center tank explosion incidents.
- HEICO, and our strategic partner, was approached by a large 737 operator to produce an alternative solution.
- Boeing was the only source mentioned in the AD at a cost of $30K per kit.
- Requirements were to provide the following for all 737-200/-300/-400/-500 aircraft. Kit included:
  - NACA scoop with flame arrestor
  - Surge tank fuel access panel with pressure relief valve

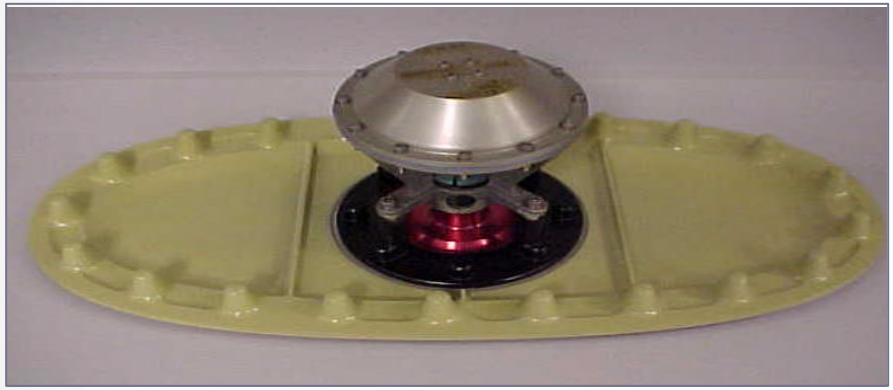


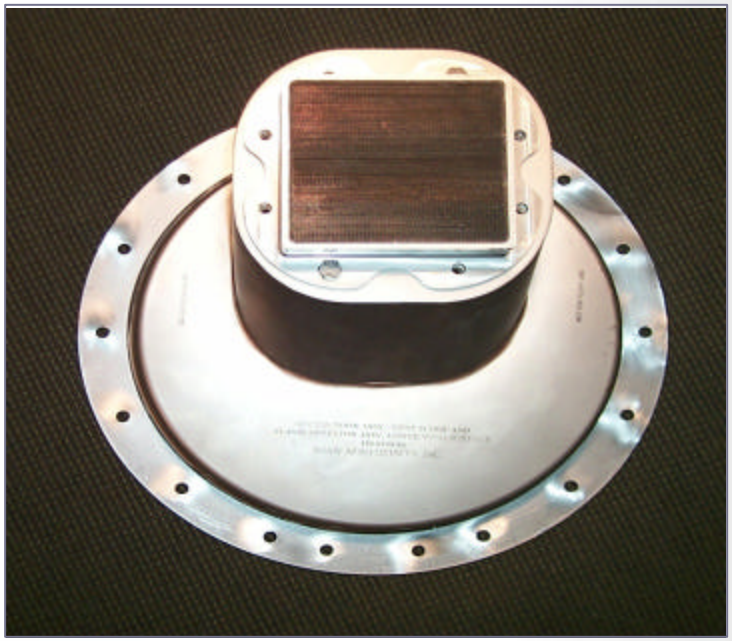


737 FLAME ARRESTOR KIT

Solution:

- STC, PMA & AMOC obtained in less than 4 months.
- Over 600 flame arrestor kits sold to airlines world-wide at a savings of over $10K/Kit equating to millions of dollars in savings.
- Airlines in North/South America, Europe, UK, and Asia purchased the kits.
- STCs obtained through the Civil Aviation Authorities in each region of the world.





LANYARD & BRACKET KIT – 737 & 757

Problem:

- FAA issued an AD calling for the installation of safety lanyards on overhead ducts of certain aircraft.
- 600 reports of air conditioning ducts leaking on 500 737 & 757 aircraft.
- Action is necessary to prevent loosened or disconnected overhead ducts from causing ceiling panels to drop below the minimum height, which could result in inadequate height for safe exit in the event of an emergency evacuation.
- Cost for the kits in the Boeing Service Bulletin is $10K.

LANYARD & BRACKET KIT – 737 & 757

Solution:

- An alternative solution was developed at the request of several large 737/757 operators.
- STC/PMA/AMOC approval was obtained.
- Kits sold to airlines in North America, Europe, the UK and China.
- STCs were obtained through the Civil Aviation Authorities in each of these regions.
- Current savings to all airlines exceeds $2 Million.

USING PMA TO IMPLEMENT ENGINNERING SOLUTIONS

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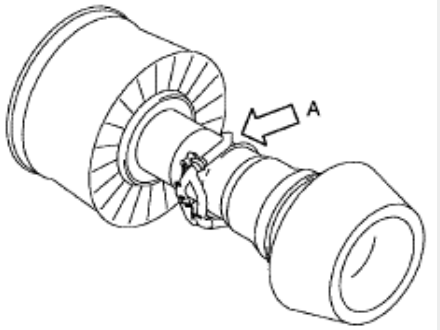
V2500 Bleed Air Supply Sense Line Modification

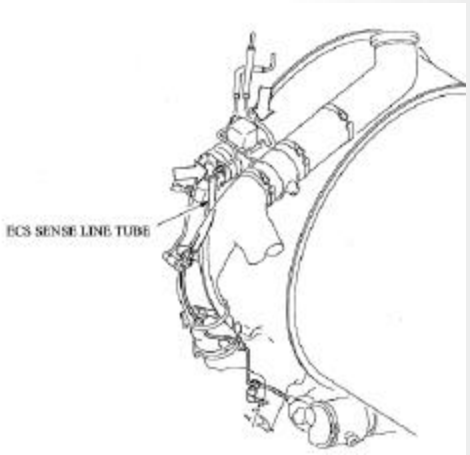
Problem:

- Long experienced reliability issues.
  - No, Low, Fluctuating Pressures at low power settings
  - Degraded Bleed system operation = deferral, single pack operation
  - Operational restrictions (non-icing, possible single pack op's, etc.)
- Airbus / Liebherr launch **Bleed Improvement Program (BIP)**
  - Key components within the system (HPV, PRV, TCT) modified in an effort to improve performance.
  - HPV-PRV sense line modification is one of the final stages of the BIP.



- Proposed modification in the Airbus SB A320-36-1040 / IAE SB V2500-ENG-36-0007 had a cost of $14K/engine.

- Airlines were not benefiting from the modification and the component OEM was not making sales.



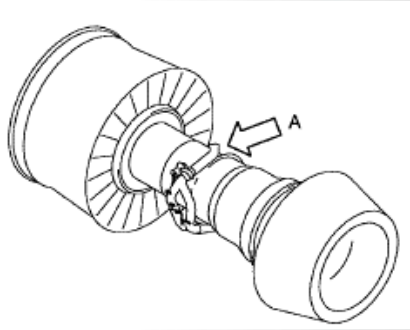
V2500 Bleed Air Supply Sense Line Modification

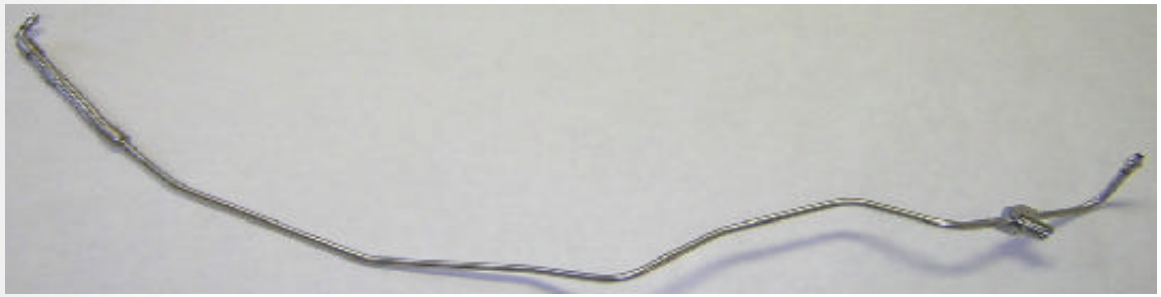
Solution:

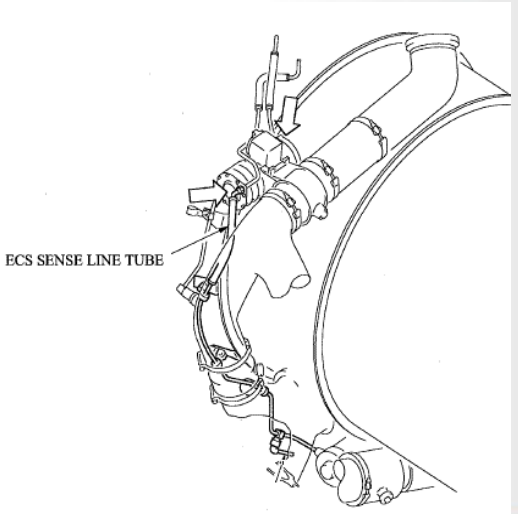
- The existing 3-piece sense line is replaced by a single piece line and is routed to allow for use of the relocated connection ports on post BIP HP/PR valves.

- PMA obtained by HEICO allowing the component OEM to sell directly to the airlines.

- The airlines were able to make a performance enhancing modification at a significant savings. Unscheduled maintenance was eliminated.



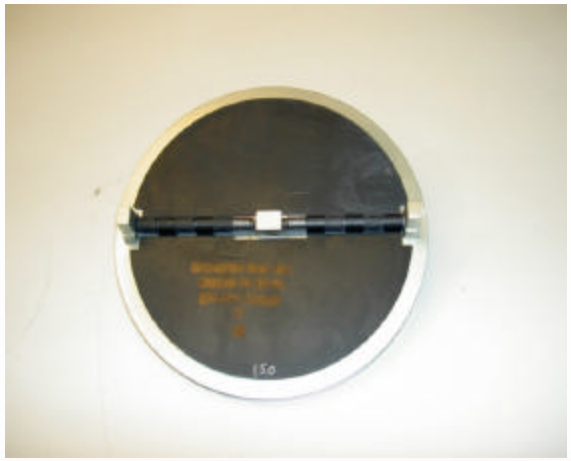




CRJ-200 Bulk-Head Check Valve

Problem:

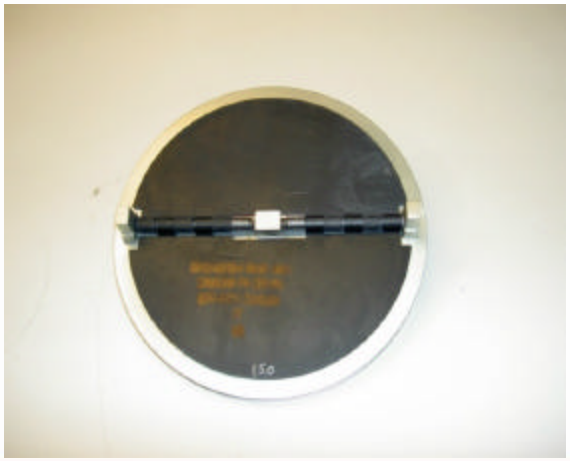
- Instances of cabins depressurizing due to failed bulkhead check valves.
- Three failure modes: Spring, flappers hinges crack and fail, and flappers deform.
- An FAA Airworthiness Directive was issued.
- Bombardier would not support the component OEM's efforts to qualify an improved part and offer it through their support centers.



CRJ-200 Bulk-Head Check Valve

Solution:

- Re-design on the bulkhead check valve to address the spring and flapper issues.
- New features – Stronger spring and increased flapper thickness.
- PMA was obtained.
- Terminates the AD allowing the airline to eliminate the mandated inspections and improves the aircraft system's performance.
- The component OEM makes a sale and solves a problem.



SUMMARY

There are many reasons to use PMA parts besides lower part cost and improved part availability. The reasons include:

- Reduce on-going operational and maintenance problems through:
  - Improved reliability of individual components
  - Improved reliability of aircraft systems
- Respond to Airworthiness Directives (AD) and Service Bulletins (SB) with an alternative solution.
- Provide an alternate path to the aftermarket for OEM suppliers who have improvements that the TC holder will not implement.

Thank You For Listening!

HEICO