AgustaWestland AW139

Donaldson Inlet Barrier Filter (IBF) System
AgustaWestland AW139
(STC and AgustaWestland Factory Option)
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Donaldson IBF Benefits

- Maximum engine debris/FOD protection which allows consistent flight operations and extends engine time on wing. Improved protection over an inertial design and significantly better protection than a FOD screen.

- Pleated barrier filter element provides improved air flow versus inertial separation vortex/swirl tubes typical with EAPS.

- Return on Investment (ROI):
  - Less premature engine removals, meet expected engine TBO.
  - Long-life filter assemblies, 4,500 hour (15 - 300 hour intervals).
  - Reduction in corrosive salt air entering engine.
  - Engine overhaul cost reduction due to elimination of erosion and contamination on all rotating and pneumatic components.
  - Reduced maintenance time with improved plenum access.
  - Common Line Replaceable Units (LRU) for mixed IBF fleets.
  - Bleed air system maintenance eliminated with IBF.
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Donaldson IBF Benefits

- Operational Considerations:
  - Improved power margin for high/hot operations and confined landing zones. Certified for operation with basic inlet charts.
  - Engine performance retention after barrier filter installation.
  - Inlet air bypass system backup not available with EAPS for added safety margin.
  - Certified for flight in falling and blowing snow IAW helicopter manufacturers flight manual requirements. Interchangeable with FIPS components.
  - Lower drag profile than EAPS.
  - AFS IBF environmental cover included with kit.
  - Approved for Category A operation.
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Donaldson IBF System Considerations

- EAPS utilize traditional inertial particle separation technology, barrier filter uses current technology and state of the art integration.
- Barrier filter does not require the use of engine bleed air as the EAPS does which reduces engine power available.
- Inertial separation vortex/swirl tubes routinely become clogged with straw, leaves and bugs degrading performance, barrier filter is immune to this type debris and operates without degradation.
- Barrier filters have significantly higher separation efficiency than inertial separators. Barrier filter typically >99% capture efficiency on ISO Coarse & Fine dust, inertial separator typically <96% capture efficiency on ISO Coarse dust and far less on ISO Fine dust.
- Barrier filters are effective regardless of engine power setting, inertial separators only effective when they have adequate engine bleed air typically available above flight idle power setting.
- Significant decrease in fine sand ingestion reduces engine erosion damage, offsite landings in unprepared sites no longer a concern.
- Engine bleed air system maintenance eliminated along with chance of engine stall margin reduction from leaking valves and lines.
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Donaldson IBF Features

- **Key Features:**
  - Sealed plenum design composed of sheet metal, machined aluminum and superformed aluminum parts.
  - IBF replaces Engine Air Particle Separator (EAPS), or FOD screen assemblies.
  - Inlet housings mount to aircraft engine door structure similar to IPS.
  - Actuator driven dual bypass doors, actuator common with Donaldson Bell 407 and 206L-3/4 IBF.
  - Optional FOD screen configuration interchangeable with barrier filter assemblies.
The AFS AW139 Inlet Barrier Filter (IBF) system is mounted onto the engine cowlings, and consists of a Left-Hand (L/H) and Right-Hand (R/H) assembly that seal to the engine inlet and provide clean, filtered engine air.

The IBF System consists of an external structure skeleton required to modify the existing production cowlings providing an interface to mount the filters, filter assemblies, an aerodynamic forward and aft fairing with a cockpit indicating system and a pilot activated bypass system. Cockpit annunciation alerts the pilot of filter restriction and the bypass system provides unfiltered air to the engines.
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AW139 IBF Components

L/H IBF Assembly
The Forward and Aft Fairing Assemblies will provide a clean aerodynamic shape for the IBF system. These fairings will accommodate the requirements for engine compartment cooling and are state of the art super plastic formed aluminum components.
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AW139 Engine Cowling Modification

The AW139 engine cowlings (Agusta PN's 3G7106P03631 & 3G7106P03531) must be modified by removing the existing main air intake screen and modifying the aft stiffener to accept the IBF structure.
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IBF Adapter Structure

The AW139 adapting structure is made up of corrosion and erosion resistant sheet metal and machined aluminum parts. This structure will provide mounting provisions for the (2) per side main filters assemblies, bypass system, delta pressure switch and the filter maintenance aid. The system is designed with a lower aerodynamic drag profile than the existing IPS.
AgustaWestland AW139 IBF Bypass System

Donaldson AW139 IBF Bypass System consists of a pilot-activated 28VDC electro-mechanical actuator that opens a bypass door which swings inboard.

In event of inlet obstruction, Bypass System allows free flow of air to enter the engine plenum. (Similar configuration as certified for the MD 900 and the Bell 429).
The AW139 Cockpit Indication System provides pilot indication of filter restriction (particles have been captured and potential engine damage avoided), allowing the pilot the option of opening the bypass door which allows unfiltered air to enter the engine inlet.

A delta pressure switch is mounted on the adapter structure that measures the pressure across the filters. When the delta pressure reaches a defined setting, a signal activates the cockpit indicator. Upon annunciation of inlet generated pressure loss, the pilot may open the bypass doors which will reduce the inlet pressure loss to a safe level.
AgustaWestland AW139 IBF System Cockpit Switch


- Easily viewed and accessed cockpit annunciator/switch for bypass operation.

- LED illuminated, momentary push button (Optional NVIS Yellow Class B compatible).

- “FILTER” - indicator illuminated based on signal from differential pressure sensor, Caution - high pressure drop indication.

- “BYPASS” - illuminates whenever the bypass door is open based on door position switch, Caution – Bypass is open.

- “FILTER” - indicator will also extinguish once door opens and pressure drop has been reduced, redundant indication for pilot.
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IBF System Filter Maintenance Aid (FMA)

- Pre and Post flight indication of filter contamination level, maximum pressure drop.

- Allows flexibility for mission planning with predictable service cycles, particularly in high tempo desert environments.

- Verification of post cleaning effectiveness.

- Provides the capability for “On Condition Maintenance,” between established cleaning intervals, eliminating unnecessary service.

- Measures plenum pressure versus ambient, across the filter system.

- Similar FMA used on other Donaldson IBFs for the Bell 205A, 206B, 206L-1/3/4, 407, 430, AgustaWestland AW119, AW139, Eurocopter AS350, EC130, MD Helicopters MD500.
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Donaldson IBF System Operators

- Los Angeles City Fire Department, California
- Government Air Transport Services, Africa
- GVX, North America
- Duquesne Aviation, US
- GE Corporate Air Transport, US
- Pfizer, US
- Solairus, US
- Saudi Aramco
- Maryland State Police
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