



*Filtration, Separation, Solution.<sup>SM</sup>*



## **Moving Towards Complete Cabin Air Filtration**

Filtering the Fresh Air Supply

David Stein

GCAQE Aircraft Cabin Air Conference  
September 2017



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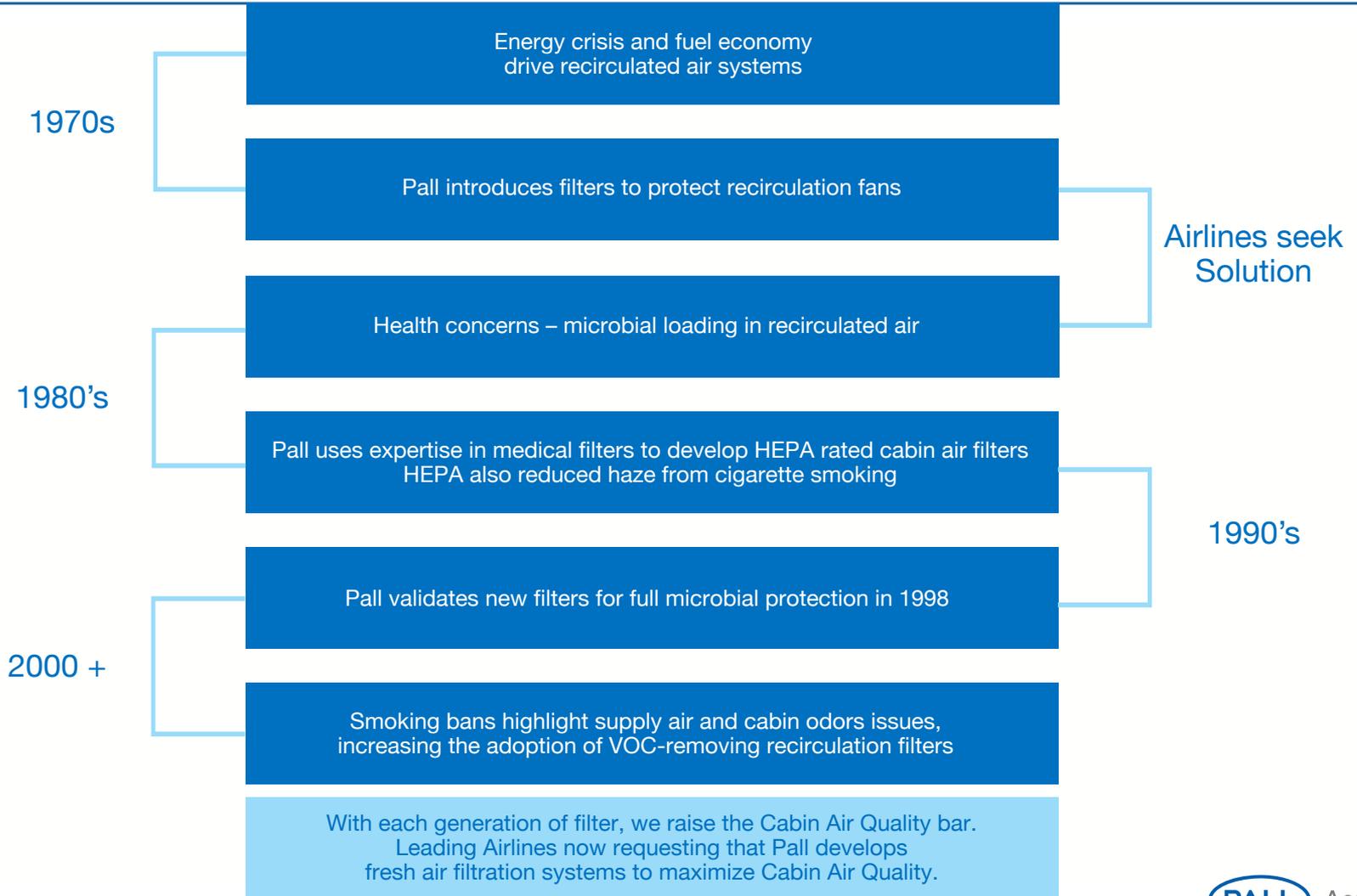
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Our customers guide us  
Our innovative spirit drives us



# History of Innovation



# Maintaining the Path of Continuous Improvement

Fume Events occasionally occur and contaminants can be present in the fresh air supply.

## **EASA report March 2017**

The results show that the cabin/cockpit air quality is generally of a good quality.

## **FAA Website**

Last year, about 100,000 flights took off around the world every single day. Aviation is still one of the safest ways to travel.



U.S. Department  
of Transportation

Federal Aviation  
Administration

AVIATION SAFETY, AVS-1

REPORT TO CONGRESS

Pub. L. No. 112-95, 126 Stat. 11 (2012)

FAA MODERNIZATION AND REFORM ACT OF 2012

SECTION 917

RESEARCH AND DEVELOPMENT OF EQUIPMENT TO CLEAN AND  
MONITOR THE ENGINE AND AUXILIARY POWER UNIT (APU) BLEED AIR  
SUPPLIED ON PRESSURIZED AIRCRAFT

PREPARED FOR: AQS

IN RESPONSE TO AVS LEGISLATIVE IMPLEMENTATION PLAN – SEC 917

PREPARED BY: AVP-300

As shown by the search summary, the occurrence of oil or hydraulic based contamination of bleed air is extremely low. In formulating the annual aviation safety research portfolio, the FAA evaluates the relative risk of aviation safety hazards and the potential for safety improvement. The FAA will continue to consider cabin safety risk and sponsor research in this area appropriate to the risk level.



*Industry and airlines working together  
for continuous improvement in passenger and crew comfort.*

# CURRENT STATUS



# Current Filtration Options

## Standard Fit on all Aircraft

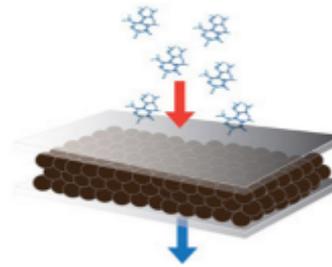


### Particulate

- Dust
- Microbial

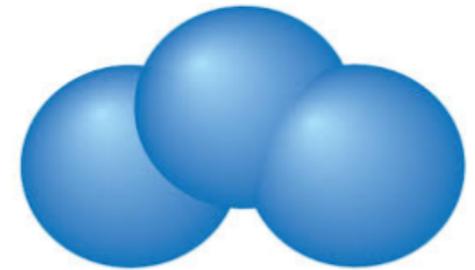
## Carbon/HEPA Option Increasingly adopted by Leading Airlines

### VOC and Odor Removal (Cabin Air Filters)



### VOCs

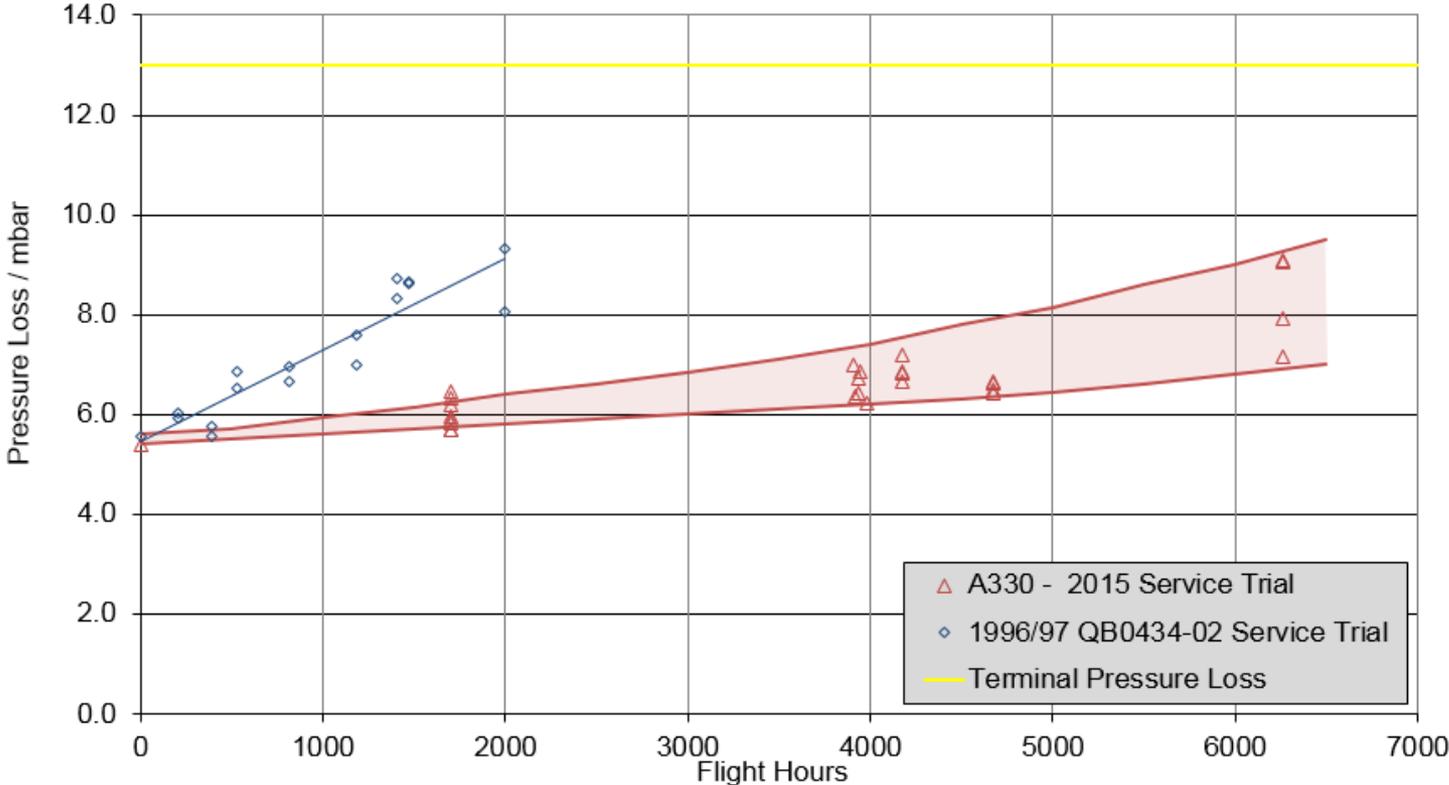
- Bleed air
- Airport pollution
- Galley/cabin
- Electrical



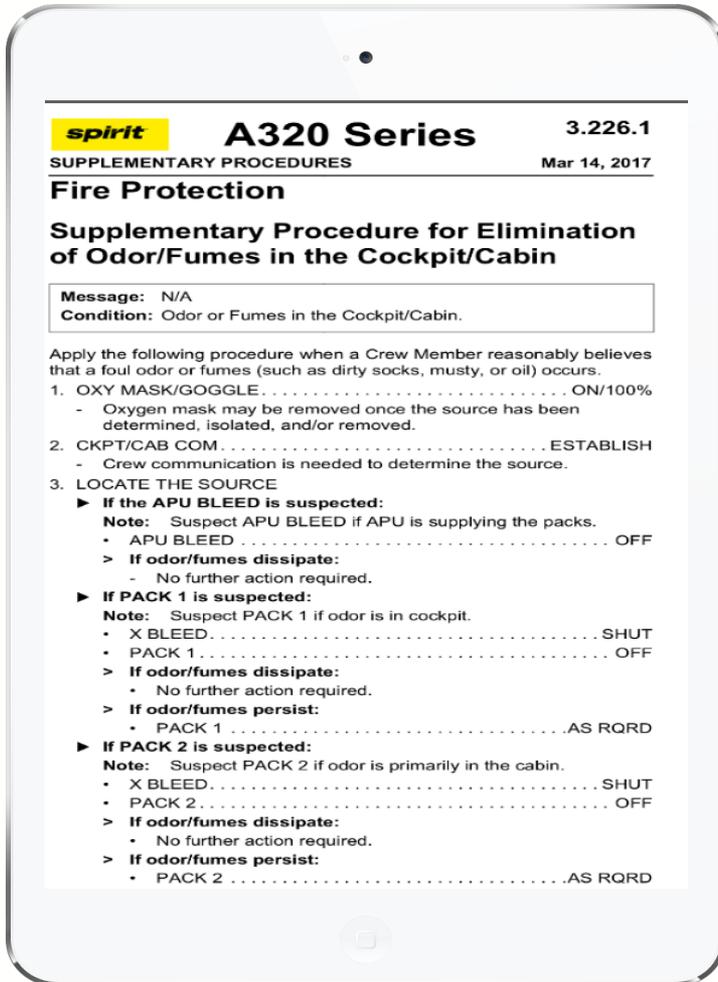
### Ozone

# HEPA Life Performance

A330 QB0434-02 Service Trial  
Flow vs Pressure Loss  
Flow Rate = 0.2475 m<sup>3</sup>/sec



# How Odor Removal Technology Improves Air Quality



In conjunction with suitable procedures:

## WILL

- ✓ Remove non persistent odors and fume from the cabin 3 to 4 times faster than a cabin without A-CAF
  - By calculation and trials on an aircraft; e.g. 1 minute vs. 9 minutes when new
- ✓ Reduce the number of reported incidents
  - Reduce lingering smells
  - Improve crew confidence in Air Quality
- ✓ Demonstrate the Airline is taking all available measures to improve Air Quality

## WILL NOT

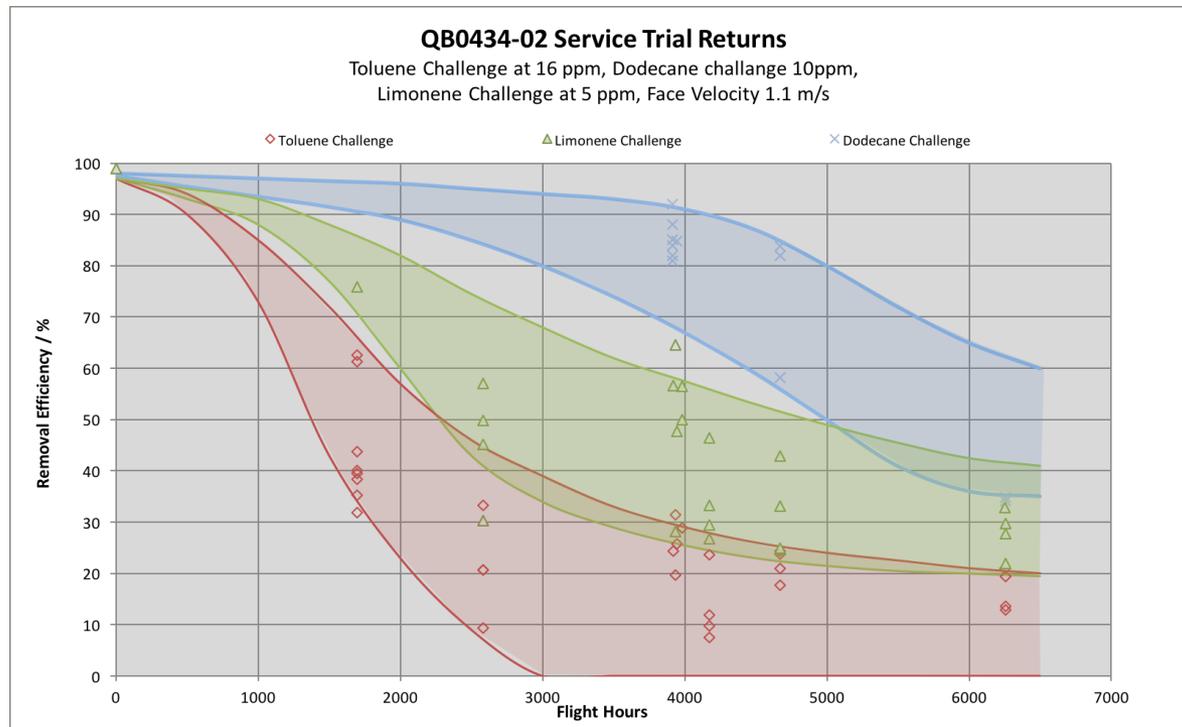
- ✗ Stop fume events (it is in the recirculation line only)
- ✗ Will not prevent odors

# Assessment of Adsorbent Filter Life

## ! Adsorbent filters are not absolute.

Unlike HEPA they do not have a 'terminal dP'

Efficiency and life depend on boiling points of VOC's



# MOVING TOWARDS **COMPLETE** CABIN AIR FILTRATION

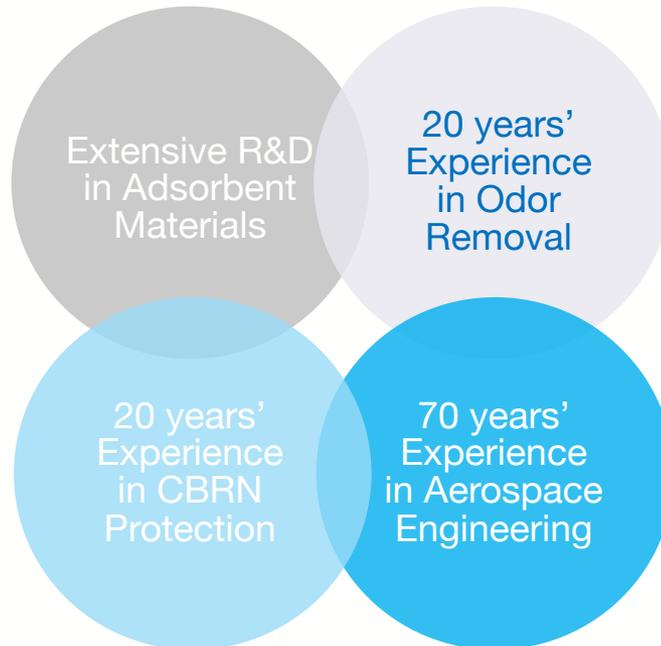


# Concept & Collaboration



## CONCEPT / MANDATORY ELEMENTS

- Filter all the air delivered to the cabin
- Retrofit existing systems
- Must be easily maintainable

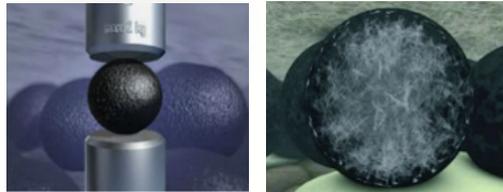
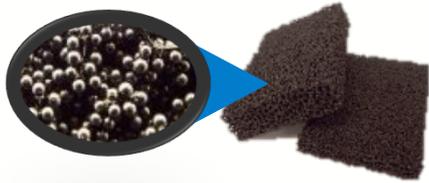


## COLLABORATION

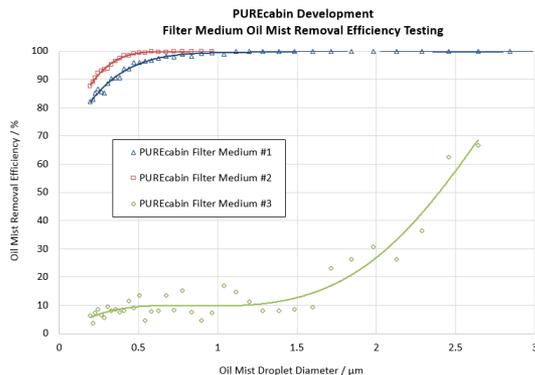
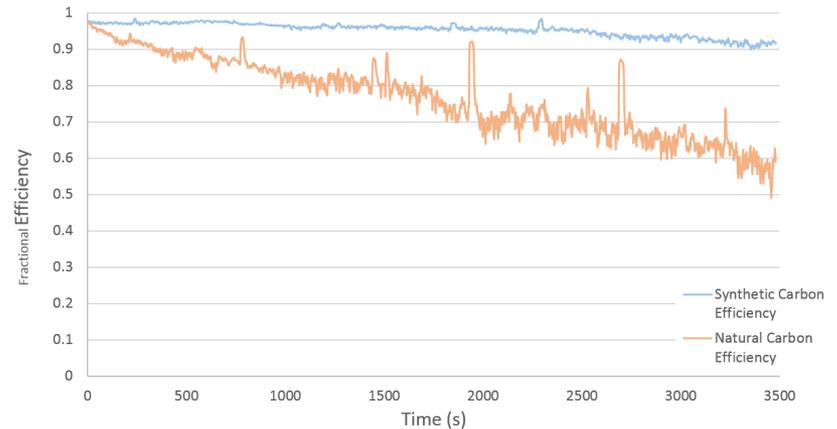
The support of Airlines and OEMs was and continues to be vital to the success of this initiative.



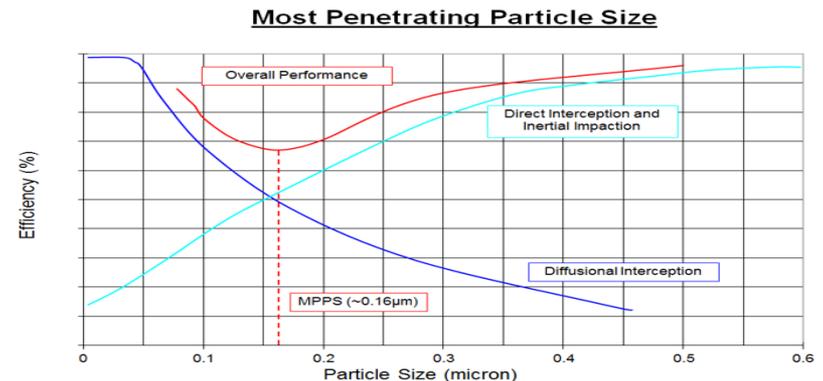
# Leveraging Bespoke, Innovative Technology



- the synthetic carbon matrix has a very low pressure drop and extremely high adsorbent capacity
- it is dust free, extremely durable and presents low sensitivity to humidity
- Incorporates treatment technology to optimise chemisorption



- Several media were tested for fractional efficiency and pressure drop, analytically and visually
- Oil mist in the most penetrating particle range
- HEPA performance not required to achieve required performance



# Proven Performance - 757 Cockpit Filter -



## Boeing 757 Cockpit Filter

- Developed by Pall to improve the cockpit air quality and reduce associated disruptions
- Confirmation from the operator (DHL) that the filter has made a significant difference
  - Improved Air quality
  - Reduced Disruptions
  - Intending to introduce this system on newly acquired aircraft
- Approved with an EASA STC and released with an EASA Form 1

# From Concept to Prototype

## PRODUCT REALIZATION

### Concept:

- Assess space claim
- Validate accessibility
- Generate conceptual design

### Feasibility:

- CFD Analysis
- Prototype build
- OEM input
- Installation Trials
- Feasibility Review

### Prototype and product:

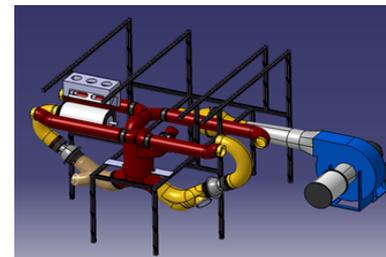
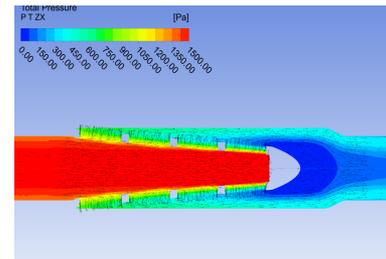
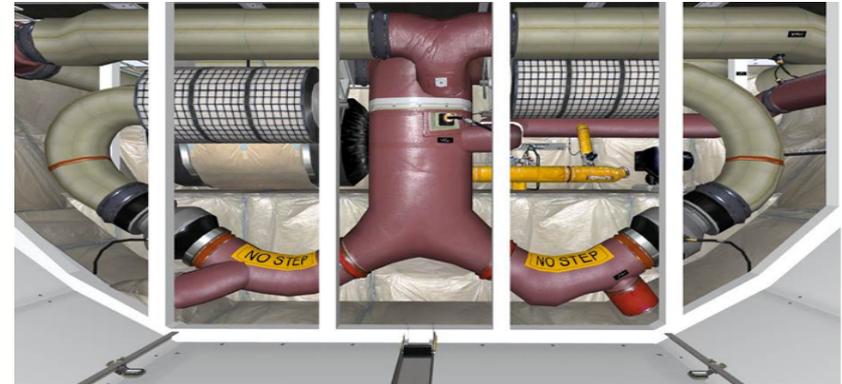
- Performance tests
- Ground tests
- Risk Reduction
- Selected as preferred A320 option

## AIRLINE SUPPORT

- Risk reduction
- DFMEA
- Opportunities for key measurements

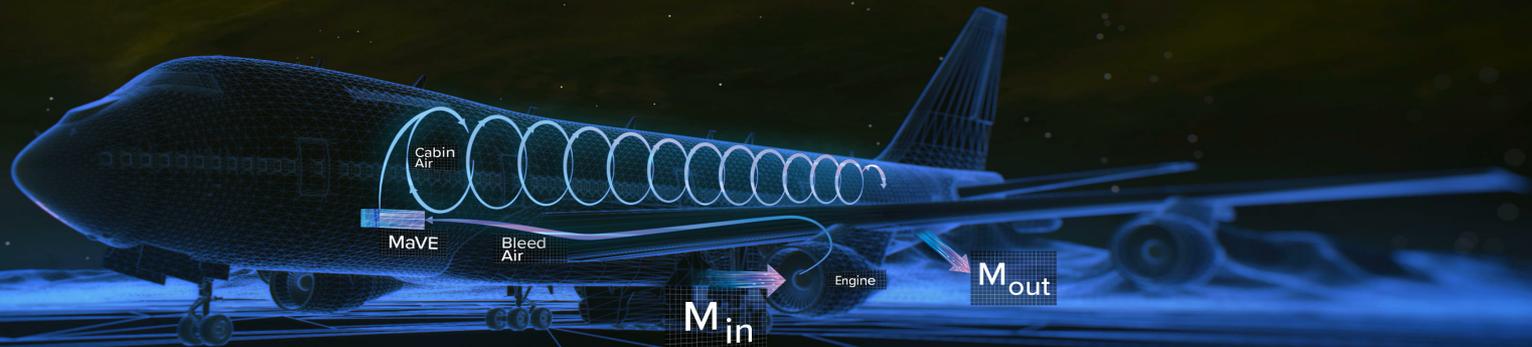
- Test fits
- Ground runs
- Championing with OEM

- Flight trials
- Timed filter returns for analysis of actual conditions



# Finally - True Cabin Air Filtration!

- Ground test for MaVE Q4 2017
- Ready to install on your A320 aircraft late 2018



Thank you! Any questions?

# THANK YOU



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