Comparative Vacuum Monitoring (CVM™)

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Structural Monitoring Systems plc (SMS) has licensed and engaged its wholly owned subsidiary Anodyne Electronics Manufacturing Corp. (AEM) to provide all R&D, sales, manufacturing, and installation support for CVM™.

CVM™ is the first technology to become commercially available, and FAA certified, to reduce span time and maintenance costs for commercial airline operators, by redeploying certain structural inspections from dedicated major heavy and out-of-sequence check visits to the gate environment.

Comparative Vacuum Monitoring (CVM™) technology has been designed and developed for more than 15 years, working in partnership with several major industry airlines and OEMs.

It’s the first application available to the market for monitoring structural metal fatigue on RONs, or at the gate.
WHY CVM™?

LESS DOWNTIME MEANS MORE FLIGHT REVENUE

Comparative Vacuum Monitoring (CVM™) smart sensors minimize the time and labor maintenance crews spend inspecting aircraft surfaces for cracks. In what used to require days in the hangar now takes minutes on the RON, or at the gate.

Significantly reduces or eliminates costs associated with inspections at heavy and out-of-sequence checks, maximizes scheduled maintenance program efficiencies, reduces span time, and restores thousands of flight hours across your entire fleet network.

- REPLACES HANGAR TIME WITH AT-THE-GATE INSPECTIONS
- RESTORES VALUABLE FLIGHT HOURS TO THE NETWORK
- SHIFT TO CONDITION-BASED MAINTENANCE PROGRAMS
- CVM™ OPTIMIZED MPD SIGNIFICANTLY REDUCES SPAN TIME
**HOW DOES IT WORK?**

CVM™ technology involves installing sensors to known or suspected surfaces of an airframe where damage is expected to occur, such as a wi-fi antenna support structure or an Aft Pressure Bulkhead.

Using a PM200 handheld diagnostics device, maintenance staff simply connect to the aircraft’s CVM™ sensor array to monitor and detect if surface imperfections exist or if there’s a loss of structural integrity.

**CONFIRMING AIRWORTHINESS HAS NEVER BEEN EASIER**

Once CVM™ sensors are placed on the inside of a high-stress area of an airframe surface, negative air pressure is applied to the sensor using the PM200.

If vacuum pressure is sustained, then no structural crack exists; however, if there is a loss of vacuum pressure then structural health could be compromised, and a crack may exist.

When a crack develops, it forms a leakage path between a sensor’s atmospheric and vacuum galleries, producing a measurable change in the vacuum level. If no flaw is present, the vacuum will remain at a stable level.
HOW DOES IT WORK?

CVM™ SENSORS USE VACUUM PRESSURE TO DETECT THE EARLY SIGNS OF METAL FATIGUE

A sensor has a matrix of separated alternating galleries a Vacuum (red) gallery and an Ambient (blue) gallery.

These galleries are open to the surface to which the sensor is adhered to.

The structure surface becomes an integral part of the sensor system.
DELTA AIR LINES INSTALLED CVM™ APB SENSORS ON 21 OF ITS B737NG AIRCRAFT

- More than three years of operational testing
- Extensive engineering and statistical testing undertaken by AEM Corp. under supervision of Boeing

CONNECTING SLS LEADS AND RUNNING PM200 MONITORING DEVICE TO CHECK SENSOR NETWORK

LOGGING INSPECTION COMPLETION AT AIRCRAFT GATE
CVM™ SENSORS ON B737NG APB FITTINGS

TOTAL OF 21-23 SMART SENSORS USED TO MONITOR UP TO 47 FASTENERS PER APPLICATION
### CERTIFICATIONS

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✔️ The FAA published an Issue Paper (IP) on Structural Health Monitoring that identifies the use of CVM™ to reliably detect airframe damage for compliance. The IP, in conjunction with our pending APB certifications, pave the way for future aircraft applications.
COMMERCIAL BENEFITS: APB PROGRAM

*SOURCE: DELTA AIR LINES

ACTIVE B737NG AIRCRAFT IN FLEET

71

MAINTENANCE AVOIDANCE

Avoid pulling the aircraft out of service for one (1) day to run LFEC inspection every 1,200 cycles

Reduce HFEC inspections on ~10-15% of the fleet

~950 FLIGHT HOURS RESTORED ACROSS FLEET PER ANNUM

111 FLIGHT DAYS GAINED
KEY TAKEAWAYS

☑️ Airline operator adoption of CVM™ technology is underway and in use today

☑️ CVM™ is proven to restore thousands of flight hours across entire fleet networks

☑️ CVM™ effectively reduces span time on stand alone inspections or can optimize a fleet MPD

☑️ Maintenance programs using CVM™ can significantly reduce operating costs associated with required structural inspections at heavy and out-of-sequence checks

NEXT STEPS

☑️ Initiate discussions on a CVM™ program tailored to your fleet and requirements

☑️ Secure our technical and commercial support for fleet analysis to determine total opportunity

☑️ Submit interest in partnering to develop future CVM™ airframe applications
[Q&A]

VISIT US AT BOOTH #4244
Find out more: CVM.aero