

PRODUCT OVERVIEW

MetalSCAN MS1000 OIL DEBRIS MONITORING SYSTEM



Trusted. Accurate. Intelligent insight.



MetalSCAN Benefits

- Eliminate in-flight events
- Avoid unnecessary repair costs
- Eliminate operational delays due to false chip light indications
- Reduce maintenance and support costs by enabling condition-based maintenance
- Extend maintenance free operating period
- Enable robust condition indicators
- Improve reliability



Condition Indicators

MetalSCAN MS1000 Series - Real-time Prognostics for Critical Oil-wetted Components

- Detect the onset of damage
- Measure health status
- Avoid in-flight events and false indications

The State-of-the-Art Alternative to Ensure Mission Success

MetalSCAN is the alternative to the notoriously unreliable chip detection systems that can fail to prevent in-flight events, unsafe operations, and mission abort events. Gastops originally developed MetalSCAN for the F-22 Advanced Tactical Fighter engine. Today, MetalSCAN is available for a wide range of military and commercial aircraft applications.

100% Particle Detection Enabling Condition-based Maintenance Decisions

MetalSCAN by Gastops is a real-time, online, full-flow oil debris monitoring system which can be readily applied to engines, gearboxes and transmissions of existing and new aircraft platforms. MetalSCAN detects the earliest onset of damage to oil-wetted components (i.e. bearings, gears, seals, etc.) and quantifies the degree of damage as it progresses. This provides reliable advanced warning of impending events and an assessment of the remaining safe operating life of critical drivetrain components.



100% Coverage of Oil-Wetted Components

"In 13 years at this job, my proudest achievement is developing the ODM trending limits after analyzing data from a failure. It was fielded along with corresponding changes for chip collector inspection limits in 2009, and we haven't missed a detectable failure since then. We caught over 30, and each would have been an in-flight shutdown."

Customer Support Engineer, Fault Isolation Subject Matter Expert, Military Customer Support & Services, Aircraft Engine OEM

Condition-based Maintenance

Industry-leading MetalSCAN technology provides the most reliable method for assessing bearing and gear damage at the earliest stage, serving as a vital input to a condition monitoring system.

Case Study

The following is a case study of an aero-derivative Gas Turbine Engine. The failure mode in this example is the 1B Bearing.

- MetalSCAN provides the earliest detection of the onset of damage after 12,500 operating hours
- The engine remains in-service and operational with monitoring provided by MetalSCAN
- Captured debris from the filter is sent off for Filter Debris Analysis (FDA)
- Debris is confirmed to be M50 bearing steel indicating bearing spall failure
- Planned maintenance is scheduled based on condition as provided by MetalSCAN
- The Electric Chip Detector (ECD) on engine did not trigger an alarm until after critical damage had occurred

Conclusion: The operator was able to begin planning for the eventual engine shutdown and replacement at this very early stage, with an estimated 96 hours of forced outage avoided.



MetalSCAN MS1000 Oil Debris Monitoring System Product Overview

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MetalSCAN Oil Debris Monitoring System (ODMS)



Sensor Integration

The MetalSCAN sensor is installed in the full flow or through a bypass flow of the engine, gearbox or transmission lubrication system in a suitable location upstream of the system filter.



In-line

The sensor can be integrated in-line of a standard oil line or integrated with other lube system components such as the oil tank, de-aerator, gearbox casting, filter or pump housing.



Plug, Cross-Flow



Plug, Axial-Flow

Electrical Integration

The MetalSCAN stand alone Signal Conditioning Unit (SCU) is installed on the aircraft and transmits the recorded data directly to the onboard flight data acquisition system (FADEC, EMU, VMU, HUMS). The MetalSCAN electronics can also be directly integrated into the on-board system through a MetalSCAN Integration Module System.



Specifications

Sensor Performance

Sensor Bore	1/4″	3/8″	1/2″	3/4"	1″	
Minimum Detectable Particle (sphere)	126µm Fe 388µm NFe	171µm Fe 455µm NFe	209µm Fe 515µm NFe	276μm Fe 619μm NFe	350µm Fe 716µm NFe	
Minimum Detectable Particle (ESD)	85µm Fe 260µm NFe	115µm Fe 305µm NFe	140µm Fe 345µm NFe	185µm Fe 415µm NFe	235µm Fe 480µm NFe	
Particle Type Discrimination		Ferron	Ferromagnetic (Fe)/non-ferromagnetic (NFe)			
Particle Size Reporting		C	Configurable bins for both Fe / NFe			

Sensor Environment

Oil Operating Pressure (psia)	10 to 500	10 to 500	10 to 500	10 to 500	10 to 500
Operating Temperature Range (°F)	-40 to 375	-40 to 375	-40 to 375	-40 to 375	-40 to 375
Oil Flow (USGPM)	0.05 to 5	0.05 to 5	0.1 to 23	0.5 to 70	1 to 90
Oil / Air Mixture	Capable				
Vibration	RTCA/DO-160, MIL-STD-810 fixed and rotary wing				

Sensor Mechanical Interface

Integration Options	(Customizable integration through standard oil fittings or static face seals				
Weight	0.4 lb	0.5 lb	0.7 lb	1.3 lb	2.2 lb	
Envelope - In-line (Ø x L)	Ø1.2 x 2.5″	Ø1.3 x 3.0″	Ø1.6 x 3.4″	Ø2.3 x 4.0"	Ø3.0 x 5.0″	
Envelope - Plug, Axial-flow (Ø x L)	Ø0.9 x 2.7″	Ø1.3 x 3.2″	Ø1.6 x 3.8″	Ø2.3 x 5.0″	Ø3.0 x 6.0″	
Envelope - Plug, Cross-flow (Ø x L)	Ø1.8 x 1.5″	Ø2.3 x 2.2"	Ø2.6 x 2.2″	Ø3.4 x 2.5″	Ø4.2 x 2.5″	





Specifications

Standalone SCU Specifications

Envelope (L x W x H)	5.4" x 3.7" x 2"
Weight	1 lb
Certification	Certifiable up to DO-178C/DO-254 DAL-A
Communications	ARINC429, RS422, Pulse, GPIO's, Visual
Input Power	18 to 30 VDC
Inrush Current	0.2 Amps
Power Consumption	<< 5 Watts
Operating Temperature Range (°F)	-40 to 230
Vibration	RTCA/DO-160, MIL-STD-810 fixed and rotary wing
Altitude	-2,000 to 50,000'
Mounting Location	Engine or Airframe



MetalSCAN's Proven Pedigree

MetalSCAN has over 40,000 sensor installations and 1 billion hours of operation on commercial, military, and industrial gas turbines and gearboxes. Some of the prominent installations include:

Engine OEM	Aircraft/ Engine Model	Main Shaft Bearings	Accessory Gearbox	Main Gearbox
P&W	F-22 Raptor / Pratt & Whitney F119 Engine	~	~	
P&W	F-35 Lightning II / Pratt & Whitney F135 Engine	~	 ✓ 	
RR	F-35 Joint Strike Fighter / Rolls Royce LiftFan			~
Eurojet	Eurofighter Typhoon / Eurojet EJ200 Engine	~	 ✓ 	
P&W	Airbus A320neo / Pratt & Whitney PW1100G-JM Engine	~	 ✓ 	~
P&W	Airbus A220 / Pratt & Whitney PW1500G Engine	~	 ✓ 	~
P&W	Embraer E175-E2 / Pratt & Whitney PW1700G Engine	~	 ✓ 	~
P&W	Embraer E190 & E195-E2 / Pratt & Whitney PW1900G Engine	 ✓ 	~	~

MetalSCAN Also Available for Aircraft Test Stands

New production or aftermarket overhaul of aircraft engines and transmissions requires ground testing in a purpose-built facility. MetalSCAN confirms, in real time, that the equipment is "clean", assembled properly, and ready to ship to the customer.

Additionally, MetalSCAN has proven to be a valuable complement to the extensive test instrumentation used during engineering and development programs as well as a quick way to isolate damage during troubleshooting investigations.

About Gastops

Gastops is the world's leading provider of intelligent condition monitoring solutions used in Aerospace, Defence, Energy, and Industrial applications to optimize the availability, performance, and safety of critical assets. We offer peace of mind to our customers with innovative online monitoring sensors, at-line analysis, complex modeling and simulation, world-class laboratory testing, engineering, design, and MRO services that predict performance to enable proactive operating decisions. Gastops has been providing powerful insights into the condition of critical equipment since 1979.



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