



AEROSPACE INFORMATION REPORT

AIR4174™

REV. A

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Superseding AIR4174

(R) A Guide to Aircraft Power Train Monitoring

RATIONALE

The aviation industry uses available and emergent technologies for power train monitoring to affect flight safety, power train and aircraft reliability, availability, maintainability, life cycle cost, and mission effectiveness. This Aerospace Information Report (AIR) provides information and descriptions of common practices based on lessons learned. AIR4174A updates the information contained in the base document.

FORWARD

Power train monitoring has been utilized for some time through flight crew reports, periodic analysis of oil samples, vibration checks, borescoping, and cycle counting. Most of the effort was accomplished by the ground crew. With the advent of airborne monitoring systems, the collection of data and analysis can become automated resulting in a more thorough record of the condition of power train components.

With increased knowledge gained from the monitoring of aircraft, more applications in the monitoring of the power train components have been developed and implemented. The miniaturization of electronic devices has resulted in small lightweight computers mounted on board the aircraft. Such devices have made it possible to monitor the power train components, make computations, and record data for ground analysis as well as report in real time to the flight crew of any disparities. The data can also be transmitted to a ground station so the ground crew can be ready to take any necessary corrective action as soon as the aircraft lands and thus increase aircraft availability.

Preferably, the power train monitoring would be considered during the design stage. However, even as an add on, the system should be viewed as a part of an integrated condition/performance monitoring system on the aircraft and as a part of a total process involving flight safety, line maintenance, fleet management and configuration control.

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1. SCOPE

The purpose of this SAE Aerospace Information Report (AIR) is to provide management, designers, and operators with information to assist them to decide what type of power train monitoring they desire. This document is to provide assistance in optimizing system complexity, performance and cost effectiveness.

This document covers all power train elements from the point at which aircraft propulsion energy in a turbine or reciprocating engine is converted via a gear train to mechanical energy for propulsion purposes. The document covers aircraft engine driven transmission and gearbox components, their interfaces, drivetrain shafting, drive shaft hanger bearings, and associated rotating accessories, propellers, and rotor systems as shown in Figure 1. For guidance on monitoring additional engine components not addressed, herein (e.g., main shaft bearings and compressor/turbine rotors), refer to ARP1839.

This document addresses rotary and fixed wing applications for rotor, turboprop, turbofan, prop fan, and lift fan drive trains on both commercial and military aircraft.

Information is provided to assist in:

- a. Defining technology maturity and application risk
- b. Cost benefit analysis (Value analysis)
- c. Selection of system components
- d. Selection of technology
- e. Managing interface requirements
- f. Defining information flow requirements

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AIR46	The Preparation and Use of Chromel-Alumel Thermocouples for Aircraft Gas Turbine Engines
AIR65	Thermoelectric Circuits and the Performance of Several Aircraft Engine Thermocouples
AIR1828	Guide to Engine Lubrication System Monitoring
AIR1900	Guide to Temperature Monitoring in Aircraft Gas Turbine Engines
ARP1839	A Guide to Aircraft Turbine Engine Vibration Monitoring Systems
ARP4176	Determination of Costs and Benefits from Implementing an Engine Health Management System