



AEROSPACE RECOMMENDED PRACTICE

ARP1256™

REV. E

Issued 1971-10
Revised 2023-04

Superseding ARP1256D

Procedure for the Continuous Sampling and Measurement of Gaseous Emissions from Aircraft Turbine Engines

RATIONALE

This SAE Aerospace Recommended Practice (ARP) provides a limited scope update regarding sampling probe information and the previous requirement that at least 80% of the total probe pressure drop be taken across orifices at the probe tips for multi-tip sampling probes where the samples are ganged together before measurement.

Now that the same probes used for gas may also be used for nvPM measurements (ARP6320), sample inlet requirements for the nvPM system can make this 80% pressure drop requirement challenging in some situations.

Both analytical and test data have shown that the 80% pressure drop is not necessary to achieve the goal of approximately equal flow through all sample ports, at the same probe inlet conditions thus achieving representative sampling. Other equally viable approaches, together with the carbon balance check, are recommended to achieve this goal.

The sampling probe section has also been updated to improve clarity and include examples.

Document formatting and editorial updates have been implemented to reflect current SAE standards for ARPs.

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1. SCOPE

This SAE Aerospace Recommended Practice (ARP) describes the continuous sampling and analysis of gaseous emissions from aircraft gas turbine engines. The measured gas species include carbon monoxide (CO), carbon dioxide (CO₂), nitric oxide (NO), nitrogen dioxide (NO₂), hydrocarbons (HC), and water vapor (H₂O). This ARP excludes engine operating procedures and test modes, and is not intended for in-flight testing, nor does it apply to engines operating in the afterburning mode.

It is recognized that there will probably be major advances in the gas analysis measurement technology. It is not the intent of this ARP to exclude other analysis techniques, but to form the basis of the minimum amount of conventional instruments (those in common industry usage over the last fifteen years) required for the analysis of aircraft engine exhaust. It is the responsibility of the analyst to demonstrate the alternative measurement technology has comparable (or better) performance than the techniques described in this ARP.

The measurement of other exhaust gas species is beyond the scope of this ARP.

It should be noted the measurement of oxygen (O₂) is generally accepted as essential for assessing data quality, but is not covered by this ARP. Sulfur dioxide (SO₂) is normally not measured using conventional systems but is calculated from fuel sulfur content. Again this is not covered by this ARP.

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.

ARP1533 Procedure for the Analysis and Evaluation of Gaseous Emissions from Aircraft Engines

2.2 Definitions and Terminology

2.2.1 ACCURACY

The closeness of agreement between a measured value and a true value.

2.2.2 AIRCRAFT GAS TURBINE ENGINE

Any gas turbine engine used for aircraft propulsion or power generation, including those commonly called turbojet, turbofan, turboprop, or turbo-shaft type engines.

2.2.3 CALIBRATION GAS

A certified and traceable gas mixture of specified and known concentration used for adjustment of the analyzer gain to establish the basis for interpretation of the values of quantities indicated by the measuring instrument and those values realized by the calibration gas mixture(s).

2.2.4 CERTIFIED AND TRACEABLE

Documentary evidence awarded to an instrument, process or gas mixture that defines the property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties.