



AEROSPACE STANDARD

AS4191™**REV. A**

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Superseding AS4191

(R) Gas Turbine Engine Performance Presentation for Computer
Programs Using Fortran

RATIONALE

This document has been revised to align with the creation of standard document AS6502 and updates to standard document AS681. Other minor changes were also made for clarification purposes

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1. SCOPE

This SAE Aerospace Standard (AS) provides a method for gas turbine engine performance computer programs to be written using Fortran COMMON blocks. If a “function-call application program interface” (API) is to be used, then ARP4868 and ARP5571 are recommended as alternatives to that described in this document.

When it is agreed between the program user and supplier that a particular program shall be supplied in Fortran, this document shall be used in conjunction with AS681 for steady-state and transient programs.

This document also describes how to take advantage of the Fortran CHARACTER storage to extend the information interface between the calling program and the engine subroutine.

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.

AS681 Gas Turbine Engine Performance Presentation for Computer Programs

AS6502 Aircraft Propulsion System Performance Nomenclature

2.2 Related Documents

The following publications are provided for information purposes only and are not a required part of this SAE Aerospace Technical Report.

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.

AS755 Aircraft Propulsion System Performance Station Designation

ARP4868 Function-Based API for Gas Turbine Engine Performance Programs

ARP5571 Gas Turbine Engine Performance Presentation and Nomenclature for Object-Oriented Computer Programs

2.3 Definitions

As per AS681.

3. GENERAL REQUIREMENTS

As per AS681.

4. PROGRAMMING PRACTICES

'Fortran' when used in this document refers to ANSI X3.9 1978 (Fortran 77). Features beyond this reference should only be used per agreement between user and supplier.

Fixed character data shall be held in the labeled character COMMON blocks CHRIN and CHROUT.

The program may provide an extra text interface in the character COMMON block CHREXP which contains information that is not available from CHRIN or CHROUT. The storage defined in CHREXP is quite large and, therefore, use of CHREXP must be coordinated between user and supplier.

(See Section 6 for details of CHRIN, CHROUT and CHREXP).

5. PROGRAM CAPABILITIES

5.1 Inlet Mode Selection (SIM)

The engine program will calculate performance when provided with any of the combinations described herein:

Table 1 - Inlet mode selection

SIM Number	Description
1	Selects altitude, free stream Mach number, deviation of ambient temperature from standard, and inlet ram pressure recovery, and a temperature increment for inlet heating to be added to the free stream total temperature: $T1(A) = T0 + DT1(A)$
2	Selects ambient pressure and temperature, total pressure and total temperature at the inlet/ engine interface, and a temperature increment for inlet heating to be added to the free stream total temperature: $T0 = T1(A) - DT1(A)$.
Other than 1 or 2	Other options, coordinated between user and supplier

5.2 Inlet Ram Pressure Recovery Selection (SERAM)

SERAM options 1, 2, and 3 are used for engine inlet average recovery, options 4, 5, and 6 provides the ability to differentiate primary and secondary stream recoveries. Table 2 briefly describes options 1 through 6, but more detail can be found in AS681.

Table 2 - Inlet ram pressure recovery options (SERAM)

SERAM	Description
Average Options	
1	Selects a specified inlet ram pressure recovery standard
2	Selects inlet ram pressure recovery input as the ratio of engine inlet total pressure to free stream total pressure.
3	Selects inlet ram pressure recovery from user supplied subroutine (ERAMX) and is a function of referred engine airflow and/or free stream Mach number.
Differentiated Primary and Secondary Stream Options	
4	Selects input values of primary and secondary stream ram pressure recovery
5	Selects input value of primary stream ram pressure recovery from ZERM1A and calls user supplied subroutine (ERAMX) for secondary stream ram pressure recovery.
6	Selects primary and secondary stream inlet ram pressure recoveries from user supplied subroutine (ERAMX).
(Note that SERAM options 1, 2, and 4 do not require a user routine to be supplied.)	