

Attitude Instruments, Pitch and Roll
Part I
Minimum Performance Standard for Equipment

FOREWORD

This document has been declared "NONCURRENT". It is recommended, therefore, that this document not be specified for new designs. "NONCURRENT" refers to those documents which have previously been widely referenced and may continue to be required on some existing designs. "NONCURRENT" documents are available from SAE upon request.

1. PURPOSE:

This Aerospace Standard establishes the essential minimum safe operational performance requirements for gyroscopically stabilized pitch and roll indicating instruments for use with reciprocating and turbine engine powered aircraft.

2. SCOPE:

This Aerospace Standard covers two basic types of pitch and roll indicating instruments as follows:

Type I: Direct coupled to gyro

Type II: Electrical repeating

2.1 Applicable Documents:

The following documents shall form a part of this specification to the extent specified herein. In the event of conflict between these documents and this standard, the contents of this standard shall govern. The test procedures specified or referenced are satisfactory for use in determining the performance of this equipment under normal and extreme environmental conditions. Alternate approved test procedures that provide equivalent results may be used.

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SAE AS1162

2.1.1 Military Specifications:

MS33558 Numerals and Letters, Aircraft Instrument Dial, Standard Form of,

2.1.2 SAE Documents:

AS425 Flight Control Compartment Nomenclature and Abbreviations

ARP461B Synchros

ARP582 Lighting, Integral, for Aircraft Instruments, Criteria for Design

ARP798 White Incandescent Lighted Aerospace Instruments, Criteria for,

2.1.3 Other Documents:

NASA Tech Note D-822 Table of Airspeed, Altitude, Mach Number based on International Values for Atmospheric Properties and physical constants

US Std. Atmosphere, 1962 Altitude Reference

RTCA DO-138 Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments

ARINC Report 415 (ATA Report 112), entitled "Operational and Technical Guide Lines on Failure Warning and Functional Test"

3. GENERAL REQUIREMENTS:

3.1 Materials and Workmanship:

3.1.1 Materials: Materials shall be of a quality which experience and/or tests have demonstrated to be suitable and dependable for use in aircraft instruments.

3.1.2 Workmanship: Workmanship shall be consistent with high grade aircraft instrument manufacturing practices.

3.2 Identification:

The following information shall be legible and permanently marked on the instrument or nameplate attached thereto:

- (a) Name of instrument
- (b) FAA TSO number (or SAE AS number or equivalent approval identification)
- (c) Manufacturer's part number
- (d) Manufacturer's serial number or date of manufacture
- (e) Manufacturer's name and/or trademark
- (f) Range (if applicable)
- (g) Rating (electrical, pneumatic, vacuum, etc.) if applicable
- (h) Environmental categories
- (i) Aircraft identification (if applicable)

3.3 Environmental Conditions:

The minimum safe operational performance requirements specified in section 4 shall apply over the range of environmental conditions to which the instrument may be subjected as further specified in Part II hereto.

3.4 Power Variation:

The instrument shall function properly within the following applicable range:

DC voltage	- $\pm 15\%$
AC voltage	- $\pm 10\%$
Frequency	- $\pm 5\%$
Pneumatic pressure limit	- $\pm 30\%$

A temporary frequency variation of plus or minus 10% shall not result in permanent damage to the instrument. Normal performance shall be resumed when power frequency returns to within $\pm 5\%$.

3.5 Touch Temperature:

The instrument shall be designed so that surface exposed in the cockpit shall not exceed 120 F.

3.6 Radio Interference:

The instruments shall not be a source of objectionable interference under operating conditions at any frequencies used on the aircraft, either by radiation, conduction, or feedback in any electronic equipment installed in the same aircraft as the instruments, in accordance with RTCA report DO-138, Appendix A.

3.7 Magnetic Effect:

The magnetic effect of the instruments shall not adversely affect the performance of other instruments installed in the same aircraft.

3.8 Decompression:

When installed in accordance with the instrument manufacturer's instructions, the instrument shall function and not be adversely affected following exposure to cabin decompression.

3.9 Outgassing:

The instrument shall be so designed as to safeguard against hazards to the aircraft and crew, and/or malfunction of the instrument due to outgassing of organic compounds.

3.10 Interchangeability:

Instruments and components which are identified in accordance with 3.2 shall be directly and completely interchangeable.

3.11 Definitions:

Definitions shall be in accordance with AS425, Flight Control Compartment Nomenclature and Abbreviations, and as noted in the glossary of terms defined in paragraph 5.0 of Part II.

4. DETAIL REQUIREMENTS:

4.1 Equipment Functions:

4.1.1 Required Functions: The following functions shall be required of equipment identified as conforming to this Aerospace Standard:

4.1.1.1 Operating Range: The instrument shall be usable throughout maneuvers of 360 degrees in pitch and roll. Controlled precession where applicable may be employed to achieve the 360 degrees in pitch.

4.1.1.2 Indicating Requirements: The method of displaying pitch and roll attitude is specified below:

Pitch attitude shall be pictorially displayed so that a change between the aircraft's pitch attitude and the actual earth's horizon is clearly presented in the proper relationship over the range of indication. Roll attitude shall be pictorially displayed so that the true relationship between aircraft roll attitude and the actual earth's horizon is clearly presented over the range of indication.

Any combination of pitch and roll attitude shall be displayed so that the true relationship between the aircraft pitch and roll attitudes and the actual earth horizon is clearly presented over the range of indication.