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Air Data Computers, MPS

FOREWORD

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PART I -- MINIMUM PERFORMANCE STANDARD (MPS)

1. PURPOSE:

This Standard recommends the minimum safe operational performance requirements for Air Data Computer equipment for use in Subsonic Turbine Powered Aircraft operating up to 50,000 feet of pressure altitude and 500 knots maximum indicated airspeed.

2. SCOPE:

This Standard covers air data equipment (hereinafter designated the instrument) which when connected to sources of aircraft electrical power, static pressure, total pressure and outside air temperature (singly or in combination) provides some or all of the following computed air data output signals:

Pressure Altitude*	Total Temperature*
Pressure Altitude (Reporting)	Altitude Rate
Baro-Corrected Pressure Altitude*	Overspeed Warning
Vertical Speed*	Altitude Hold
Computed Airspeed*	Airspeed Hold
Mach Number*	Mach Hold
Maximum Allowable Airspeed*	q _c (impact pressure)
Static Air Temperature (*when used as an alternate for total temperature)	True Airspeed
	Others

* See 2.1

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2.1 Limits:

- 2.1.1 Full scale outputs marked with an asterisk may supply required pilots flight instruments as specified in Federal Aviation Regulations (e.g., Part 25, paragraph 25.1303) and when so used, shall meet the minimum accuracy requirements of Paragraph 4 of this document (AS 417A). Other outputs of the same function, signal characteristic and similar usage such as flight recorder altitude may have an added "correspondence tolerance" which shall not exceed 50% of the minimum standard tolerance unless otherwise specified by existing Federal requirements.

Those outputs supplied to other subsystems for scheduling purposes are not the concern of this minimum performance specification but should be reviewed for compatibility in the particular installation.

- 2.1.2 The above outputs shall include correction for certified static source errors as provisioned and matched to the characteristics of the particular type and model aircraft in which the instrument is intended to be used. The tolerances expressed in Paragraph 4 include the allowance for static source error corrections up to ± 300 ft for any altitude-airspeed combination. Necessity for greater error correction requires special review and approval of tolerances based on the installation.
- 2.1.3 Those outputs intended for particular using subsystems and being either of a discrete, incremental, or rate characteristics and not covered by 2.1.1 above shall meet the specific requirements for the respective category of output as may apply in Paragraph 4 with no added correspondence allowance where accuracy is concerned for duplicate outputs.
- 2.1.4 The instrument shall not be damaged by having applied to its pressure fittings any of the following pressures singly or in combination: Static Pressure Fitting - Approximately 1.4 inch Hg Abs to 37 inch Hg Abs. Total Pressure Fitting - Approximately 0 inch Hg Abs to 50 inch Hg Abs, with the additional provision that the instrument shall not be required to withstand an excess of Total over Static Pressure of more than 19 inch Hg, nor an excess of Static over Total Pressure of more than 2 inch Hg.

In the event that the above limits are likely to be exceeded, Transducer over Pressure protection shall be provided by the user.

2.2 Documents Referred to in this Standard:

Altitude Reference - U.S. Standard Atmosphere, 1962.

Airspeed Reference - NASA TN-D822 Tables.

(Both of the above references are available from the Superintendent of documents, U.S. Government Printing Office.)

Environmental Conditions and Test Procedures - RTCA Document No. DO-138, June 27, 1968, by Radio Technical Commission for Aeronautics, 2000 K Street, N.W. Washington, D.C. 20006.

Federal Aviation Regulations - Available from Federal Aviation Administration, Distribution Section, HQ-438, Washington, D.C., 20553.

3. GENERAL REQUIREMENTS:

These requirements are related to aircraft instruments generally and are divided into two categories - Acceptance Criteria and Qualification Criteria.

3.1 Acceptance Criteria:

These establish the functional acceptability of each instrument for its intended use. Each instrument must meet the following requirements.

- 3.1.1 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: Shall be consistent with high grade aircraft instrument manufacturing practice.
- 3.1.3 Identification: The following information shall be legibly and permanently marked on the instrument or nameplate attached thereto:
 - a. Name of instrument.
 - b. Certification designation (if applicable).
 - c. Manufacturer's part number.
 - d. Manufacturer's serial number, date of manufacture and modification.
 - e. Manufacturer's name and/or trademark and address.
 - f. Range of altitude and airspeed.
 - g. Aircraft identification (if applicable).
 - h. Environment categories appropriate to the installation and aircraft requirements (see code in Appendix B of RTCA Paper DO-138).
 - i. Power requirement.
 - j. Weight.

- 3.1.4 Dielectric: Each instrument shall be capable of meeting the dielectric requirements of Paragraph 3.1.4.1 and 3.1.4.2.

This requirement is for electrical isolation only and shall not be impressed on circuits where the potential will appear across elements such as windings, resistors, capacitors, etc. Circuits that operate at or below a potential of 15 volts should not be subjected to overpotential.

- 3.1.4.1 Insulation Resistance: The insulation resistance measured at 200 v d-c for five seconds between all electrical circuits and the metallic case shall not be less than 5 megohms.
- 3.1.4.2 Overpotential: The electric circuits to metallic case insulation shall be resistant to an overpotential of a sinusoidal voltage of commercial frequency with an rms value five times the maximum rated circuit voltage but not to exceed 500 volts. The potential shall start from zero and be increased at a uniform rate to maximum required value. It shall be maintained at this value for five seconds, and then reduced at a uniform rate to zero.
- 3.1.5 Interchangeability: Instruments and components which are identified in accordance with Paragraph 3.1.3 shall be interchangeable.
- 3.1.6 Performance:
- a. Accuracy Requirements - At room temperature, scale errors shall not exceed 50% of the expressed tolerances for all full range outputs (Paragraph 4.1 through 4.6 as applicable).
 - b. Failure and Malfunction Monitoring - Paragraph 4.7
 - c. Dynamic Performance except Frequency Response (Paragraph 4.8 as applicable)
 - d. Leakage (Paragraph 4.9)
 - e. Balance (Paragraph 4.10)

3.2 Qualification Criteria:

These establish the general quality of the design and manufacture of the instrument, as identified in Paragraph 3.1.3. An instrument to be considered as qualified to this MPS shall: (1) Meet the requirements of the Acceptance Criteria, (2) Then as many instruments as the manufacturer considers necessary to demonstrate compliance shall meet the requirements of the Qualification Criteria to the tolerances presented in Part I, Paragraph 4 of this document.

These criteria are divided into three groups based on the nature of the errors produced, i.e., Tracking Errors, Offset Errors, and Interference and Safety Errors.

- 3.2.1 Tracking Errors: Those errors attributable to environmental procedures during operation which result in temporary or random aberrations in accuracy. These procedures and categories thereof (as identified in Paragraph 3.1.3 h) to which the subject instruments shall be resistant are as presented in RTCA-DO-138 and listed here.