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**Flight Directors
(Reciprocating Engine Powered Aircraft)**

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 essential minimum safe performance standards for Flight Director instruments primarily for use with reciprocating engine powered transport aircraft, the operation of which may subject the instruments to the environmental conditions specified in Section 3.3.

2. SCOPE:

This Aerospace Standard covers Flight Directors for use on aircraft to indicate to the pilot, by visual means, the correct control application for the operation of an aircraft in accordance with a pre-selected flight plan.

3. GENERAL REQUIREMENTS:

3.1 Material 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 practice.

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SAE WEB ADDRESS:

3.2 Identification:

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

- a. Name of instrument.
- b. SAE AS420B.
- c. Manufacturer's part number.
- d. Manufacturer's serial number or date of manufacture.
- e. Manufacturer's name and/or trademark.

3.3 Environmental Conditions:

The following conditions have been established as minimum design requirements. Tests shall be conducted as specified in Sections 5, 6 and 7.

- 3.3.1 Temperature: When installed in accordance with the instrument manufacturer's instructions, the instruments shall function over the range of ambient temperatures shown in Column A below, and shall not be adversely affected by exposure to the temperatures shown in Column B below:

<u>Instrument Location</u>	<u>A</u>	<u>B</u>
Heated Areas (Temperature Controlled)	-30 to 50 C	-65 to 70 C
Unheated Areas (Temperature Uncontrolled)	-55 to 70 C	-65 to 70 C

- 3.3.2 Altitude: When installed in accordance with the instrument manufacturer's instructions, the instrument shall function and shall not be adversely affected following exposure to a pressure and temperature range equivalent to -1000 to 40,000 feet standard altitude, per NACA Report 1235, except as limited by the application of paragraph 3.3.1. The instrument shall not be adversely affected when subjected to an ambient pressure of 50 inches mercury absolute.

- 3.3.3 Vibration: When installed in accordance with the instrument manufacturer's instructions, the instrument shall function and shall not be adversely affected when subjected to vibrations of the following characteristics:

<u>Instrument Location</u> <u>in Airframe</u>	<u>Cycles</u> <u>Per Sec.</u>	<u>Max. Double</u> <u>Amplitude (Inches)</u>	<u>Max.</u> <u>Acceleration</u>
Fuselage	5 - 500	0.036	5g
Panel or Rack (Vibration Isolated)	5 - 50	0.020	1.5g

- 3.3.4 Humidity: The instrument shall function and shall not be adversely affected following exposure to any relative humidity in the range from 0 to 95% at a temperature of approximately 70°C.

3.4 Radio Interference:

The instrument shall not be the source of objectionable interference under operating conditions, at any frequencies used on aircraft, either by radiation or feedback, in electronic equipment installed in the same aircraft as the instrument.

3.5 Magnetic Effect:

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

4. DETAIL REQUIREMENTS:

4.1 Indication:

4.1.1 Flight Director Indicator:

- 4.1.1.1 Lateral Steering Control Indication: When a means of indication for lateral steering control is provided, the sensing of this command presentation should be such that the aircraft is flown toward the indication to satisfy the command (i.e., consistent with "fly to needle" type of instrumentation sensing).

While not limited to the following signals, any one, or combination of these signals, shall produce an indication of the correct control application to maintain flight along a prescribed flight path.

- a. Angular displacement of the aircraft about the roll axis.
- b. Angular displacement of the aircraft in heading from a reference heading.
- c. Lateral displacement of the aircraft with respect to a selected course.

- 4.1.1.2 Vertical Steering Control Indication: When a means of indication for vertical steering control (pitch command) is provided, the sensing of this command presentation should be such that the aircraft is flown toward the indication to satisfy the command (i.e. consistent with "fly to needle" type of instrumentation sensing).

While not limited to the following signals, any one, or combination of these signals shall produce an indication of correct control application to maintain flight along a prescribed flight path.

- a. Angular displacement of the aircraft about the pitch axis from the (reference) Pitch attitude.
- b. Vertical displacement of the aircraft with respect to the glide slope.
- c. Vertical displacement of the aircraft from an altitude reference, whenever altitude control is provided in the equipment.

- 4.1.1.3 Attitude Indication: When attitude indication is included in the Flight Director presentation it shall conform to AS396B.