SAE Aerospace
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AEROSPACE STANDARD

AS 8001

Issued 1975-09
Reaffirmed 2008-02

MINIMUM PERFORMANCE STANDARD FOR BANK & PITCH INSTRUMENTS

1. PURPOSE

This Standard specifies the minimum performance Standards for Bank and Pitch Instruments under standard and environmental conditions.

2. SCOPE AND DEFINITIONS

This Standard covers Bank and Pitch Instruments which measure and display the angular displacement of bank and pitch from a gyroscopic vertical reference. This reference may be pneumatically or electrically driven and be contained within the instrument display case or located remotely.

Unless otherwise specified, whenever the term "Instrument" is used, it is to be understood to be the complete system of gyro component, any auxiliary equipment and display.

3. GENERAL STANDARDS

3.1 Symbolic Presentation: The symbolic presentation of the bank and pitch angles shall under all conditions simulate the movement of the actual earth's horizon as viewed looking forward out of the aircraft.

3.2 Division of Tolerances: For components intended for use in remote indicating systems, the bank and pitch accuracies within the specified ranges shall be ±1.25 degrees for each vertical reference or indicating component, operated separately.

3.3 Operation of Controls: The design of the instrument shall be such that the controls intended for use during flight cannot be operated in any possible position combinations or sequences that would result in a condition detrimental to the continued performance of the instrument.

3.4 Accessibility of Controls: Controls which are not normally adjusted in flight shall not be readily accessible to flight personnel.

3.5 Effect of Tests: Unless otherwise stated, the application of the specified tests shall not produce a subsequently discernible condition which would be detrimental to the continued performance of the instrument.

3.6 Methods of Display: The method of displaying bank and pitch attitude shall be such that the indicator's symbolic horizon reference moves as the actual earth's horizon moves as viewed by the pilot. This shall apply for any combinations of bank and pitch attitude.

3.7 Operating Range: The instrument shall be capable of maneuvers through a range of 360 degrees in bank and pitch. Means shall be incorporated in the pitch axis which will produce a roll precession at some point beyond the pitch freedom range. Pitch axis rotations at a rate of 30 degrees per second through ±360 degrees, shall not damage the instrument nor degrade subsequent normal operation.

3.8 Indicating Range and Graduations: The pitch attitude display shall be marked so that the aircraft attitude in pitch can be readily interpreted throughout a range of at least ±50 degrees in both normal and inverted attitudes with markings to at least 20 degrees nose up and down. If the design of the instrument so allows, the markings shall include a suitable contrast between the sky and ground segments of the display so that the pitch up and pitch down attitudes are immediately recognizable. A bank index or pointer shall be installed that will indicate a full range of 360 degrees in bank with markings at least for zero and 30 degrees right and 30 degrees left bank.

3.9 Pitch Attitude Reference: A zero pitch reference shall be provided. An adjustable pitch reference marker or indicator may be provided to accommodate a range of pitch attitude trim.

3.10 Malfunction Indication: Means shall be provided to indicate failures and/or the existence of the following conditions:

(a) Gyro in fast erection mode, required of electrical instruments except manually caged indicators with automatic release.
(b) Loss of primary power to gyro, required of air and electrical instruments.
(c) Gyro operating at a speed below the minimum designated by the manufacturer for the instrument to meet the performance requirements herein. The requirement applies to electrical and remotely operated instruments.

Additionally, the indicator or display of the repeating or remote indicating type of gyroscopically stabilized instrument shall be provided with means to indicate the following failures:

(a) Loss of synchro excitation
(b) A mechanical obstruction in the indicator
(c) Primary power loss to the indicator or display
(d) Servo amplifier failure or power loss
(e) Electrical failure in the servo drive motor phases

The indicating means shall indicate the failure or malfunction in a positive and conspicuous manner.

3.11 Gyro Caging: If a gyro caging means is provided, it shall not be capable of inadvertently locking the gyro in a caged position. The normal operation of the caging mechanism and any failures which cause the gyro to be caged shall be indicated in a positive manner.

3.12 Reflectance: The total reflectance of the instrument cover glass including the integral lighting wedge, if applicable, shall not exceed 10% of the incident light. This reflectance applies over the visible light spectrum from 450 milli-microns to 600 milli-microns, and over an incident solid angle of 60° perpendicular to the viewing plane.

3.13 Fire Hazard: Except for small parts (such as knobs, fasteners, seals, grommets, and small electrical parts) that would not contribute significantly to the propagation of a fire, all materials used must be self extinguishing when tested in accordance with the requirements of Federal Aviation Regulation 25.1359(d) and Appendix F thereto, with the exception that materials tested may be configured in accordance with paragraph (b) of Appendix F or may be configured as used.

4. MINIMUM PERFORMANCE STANDARDS UNDER STANDARD CONDITIONS

The test conditions applicable to a determination of the performance of bank and pitch instruments are set forth in Appendix A of this Standard. All instruments shall be tested in accordance with the manufacturer's recommendations. The manufacturer shall conduct sufficient tests to prove compliance with this Standard.

4.1 Starting: The instrument accuracy specified herein shall be achieved within three minutes after normal rated power is applied. By application of 50% of rated vacuum for air operated instruments or 80% of rated voltage for electrically operated instruments, the gyro rotor shall start and continue to rotate. If the instrument incorporates a gyro speed monitoring device which provides a positive indication when the gyro speed is below that necessary to meet instrument performance, the starting time may exceed three minutes but shall not be greater than five minutes.