Society of Automotive Engineers, Inc.
29 West 39th Street
New York City

AERONAUTICAL STANDARD AS 397

DIRECTION INDICATOR, NON-MAGNETIC, STABILIZED TYPE (Directional Gyro)

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Revised

1. PURPOSE: To specify minimum requirements for non-magnetic gyroscopically stabilized direction indicators for use in aircraft.

2. SCOPE: This specification covers two basic types as follows:

Type I - Air Operated.
Type II - Electrically Operated.

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.

3.2 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 feed-back, in radio sets installed in the same aircraft as the instrument.

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

(a) Name of Instrument.
(b) SAE Spec. AS 397.
(c) Rating (Electrical, Vacuum, etc.).
(d) Manufacturer's Part Number.
(e) Manufacturer's Serial Number or date of Manufacture.
(f) Manufacturer's Name and/or Trade-Mark.

3.4 Environmental Conditions:

3.4.1 Temperature: The instrument shall function over the temperature range -30 C to +50 C and shall not be adversely affected by exposure to temperatures in the range -65 C to +70 C.

3.4.2 Humidity: The instrument shall function and not be adversely affected when exposed to a relative humidity up to and including 95 percent at a temperature of approximately 32 C.

3.4.3 Altitude: The instrument shall function and not be adversely affected when subjected to a pressure range equivalent to -1000 feet to +40,000 feet standard altitude.

3.4.4 Vibration: The instrument shall function and not be adversely affected when subjected to vibration of 0.005 inch maximum amplitude at frequencies of 150 - 3000 cycles per minute. The instrument shall withstand vibration, at higher frequencies, having acceleration values not to exceed 0.8 g.

4. DETAIL REQUIREMENTS:

4.1 Indicating Method: One of the following methods of indication shall be employed

Method I. - Horizontal drum dial with fixed lubber's line. Graduations move to the right for right turns.

Method II. - Rotating vertical dial with fixed lubber's line at the top. Dial rotates counterclockwise for right turns.

Method III. - Rotating pointer with fixed graduated dial. Pointer rotates clockwise for right turns.

4.2 Operating Limits: The instrument shall indicate throughout the 360 degree scale range, during dives, climbs or banks up to at least 55 degrees displacement from level flight.

4.3 Dial Markings:

4.3.1 Increments: Degree graduations shall be provided at intervals not to exceed 5 degrees with major graduations at 10, 20, 30, etc., degrees and with legible numerals at intervals not greater than 30 degrees throughout the scale range of 360 degrees. In the numerical marking the last digit (zero) shall be omitted. (Thus, 6 at 60 degrees, 9 at 90 degrees, etc.)

4.3.2 Visibility: Index and dial markings shall be visible from any point within the frustum of a cone the side of which makes an angle of 30 degrees with the perpendicular to the dial and the small diameter of which is the aperture of the instrument case. At least two numerals shall be simultaneously visible.

4.3.3 Finish: Unless otherwise specified, luminescent material shall be applied to major graduations and numerals.

4.4 Course Setting Provisions: A means shall be provided for manually setting the directional indicator dial (or pointer) indication to any heading desired.

4.5 Gyro Caging Provisions: Unless the gyro assembly has unrestricted freedom of operation in the pitch and roll axes, means shall be provided for caging and releveling the gyro should it become upset by operation beyond its limits. A conspicuous warning device shall indicate when the instrument is caged, except when it is not possible to leave the instrument in caged condition.

4.6 Power Indication: Suitable internal or external means shall be provided for operating a device to indicate whether the instrument is receiving power.

5. TEST CONDITIONS:

5.1 Atmospheric Conditions: Unless otherwise specified, all tests required by this specification shall be made at an atmospheric pressure of approximately 29.92 inches of mercury and at an ambient temperature of approximately 22 C. When tests are made with the atmospheric pressure or the temperature substantially different from these values allowance shall be made for the variation from the specified conditions.

5.2 Vibration: Unless otherwise specified all tests for performance may be made with the instrument subjected to a vibration of 0.002 to 0.005 inch amplitude at a frequency of 1500 to 2000 cycles per minute. The term amplitude as used herein indicates the total displacement from positive maximum to negative maximum.

5.3 Power Conditions: Unless otherwise specified all tests for performance shall be conducted at the power rating recommended by the manufacturer.

6. INDIVIDUAL PERFORMANCE TESTS: All Type I and Type II instruments shall meet the requirements of the following individual tests where applicable.

6.1 Type I Requirements:

6.1.1 Starting: The gyro rotor shall start to rotate and continue to run on a suction not to exceed 50 percent of rated value. Rated instrument performance speed shall be reached within two minutes after normal rated suction is applied.

6.1.2 Roll, Pitch and Yaw: The instrument shall be mounted on a test platform which is adjusted to oscillate in roll, pitch and yaw, with a total amplitude of 3 degrees about each axis, at a frequency of 5 to 7 oscillations per minute. With the platform level, and the gyro operating at equilibrium speed and uncaged, the dial (or pointer) reading shall be noted. The platform shall then be started in its roll, pitch and yaw movement. At the end of a ten minute period the oscillation shall be stopped, the platform realigned to its starting position, and the instrument dial (or pointer) reading noted. The amount of drift of the dial (or pointer) in either direction during the ten minute test period shall not exceed 4 degrees.

6.1.3 Heading Stability: The instrument shall be mounted on a turn table, tilted 54 (±1) degrees from the vertical and the reading noted. The turn table shall be rotated one complete revolution about its vertical axis at 360 (±30) degrees per minute and the drift of the dial (or pointer) shall not exceed two degrees. The test shall be repeated rotating the turn table in the opposite direction.

6.2 Type II Requirements:

6.2.1 Starting: The gyro rotor shall start to rotate and continue to operate at a speed sufficient for proper performance of the instrument on an applied voltage not to exceed 80 percent of the rated voltage. This speed shall be reached within two minutes after application of this voltage.