PAI-700
VERTICAL CARD MAGNETIC COMPASS
INSTALLATION AND COMPENSATION

INSTALLATION INFORMATION

For proper operation of the Vertical Card Magnetic Compass, it is important for the installer to understand the basic design differences of the "Wet Magnetic Compass" and the PAI-700 Vertical Card Magnetic Compass.

"WET MAGNETIC COMPASS"

The magnetic sensing element consists of bar magnets attached to a float or other device in such a manner as to create a pendulous assembly which sits on a pivot in a jeweled cup, free to tilt and rotate. The azimuth card is attached to said device in such a manner as to be viewed through the instrument lens.

The complete assembly is submerged in fluid, which acts as a damper, and is free to react to the earth's magnetic lines of force, horizontal and/or vertical, as well as other forces - gravity, kinetic, and centrifugal.

"PAI-700 VERTICAL CARD MAGNETIC COMPASS"

The magnetic sensing element consists of a somewhat more massive magnet with the additional torque required for rotating the vertical azimuth card. The sensing magnet is mounted on a shaft which rotates on jeweled bearings in a vertical housing affixed to the compass case assembly. Thus, the sensing magnet is maintained in a captive plane in relation to the aircraft. The rotation of the sensing magnet is transferred through miter gears and a shaft rotating on jeweled bearings in a horizontal housing to the vertical azimuth card. The design utilizes eddy-current damping (magnetic), and contains no fluid. Overswing is minimized or eliminated.

When level, the sensing magnet reacts to the earth's horizontal lines of force, and when not level, to some product of the earth's horizontal and vertical magnetic lines of force. The reaction of the sensing magnet to the forces present - gravity, kinetic, and centrifugal - is reduced due to the absence of pendulosity.

INSTALLATION

The afore-mentioned design details - shafts, jewels, gears, massive magnet, etc. - make it necessary to install the PAI-700 Vertical Card Magnetic Compass with adequate vibration damping. When installed too solidly, it is possible that a resonant vibration transmitted directly to the compass case may cause undue magnet and dial card movement. The best way to think of the mounting is to "gently" hold the compass in place - as in the palm of your hand.

Panel mounting is not recommended. The magnetic influences in this area may cause proper compensation to be difficult or impossible.

COMPENSATION INFORMATION

Each aircraft has its own inherent magnetic pattern and no two are alike, even of the same assembly line. The inherent magnetic pattern of an aircraft is a product of magnetic influences, physical presence in ferrous metal used in structure or components, induced, by electrical circuits of varying strength and location, and the earth's magnetic field.

From the above, one realizes that it is highly desirable to have the aircraft as close to flying configuration as possible, or flying, as the compensation procedure is followed. Known magnetic headings may be obtained for ground compensation by the use of a compass rose, master compass, or transit-pelorus. For taking each reading, the engine rpm should be at normal cruise and electrical and radio equipment should be in the flying norm. A directional gyro is a convenient azimuth reference with frequent rechecks of the original known magnetic heading to check possible drift. It is a good policy to confirm all ground compensations in flight.

On a smooth air day the compensation procedure may be followed in flight using the directional gyro azimuth with frequent rechecks of the original known magnetic heading to check possible drift. A known magnetic heading may be from a runway, section lines (with magnetic variation figured), or the "old iron compass" - a railroad.

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IMPORTANT

The compensator is in neutral when the dots on the adjusting screws are aligned with the dots on the compensator face - NINE O'CLOCK. MAXIMUM compensator correction is attained when the adjusting screw is rotated - clockwise or counter-clockwise - 180°, or to THREE O'CLOCK. DAMAGE to the compensator mechanism will occur if the adjusting screws are forced beyond 180° in either direction.

COMPENSATION PROCEDURE

The poly-plane compensator used on the PAI-700 VC Magnetic Compass has a deviation correction range of approximately plus or minus twenty degrees on the cardinal headings. The readings in quadrants between cardinal headings are products of the adjacent cardinal headings corrective adjustments.

Use a non-magnetic screw driver for making adjustments.

1. Starting with the aircraft on a known magnetic heading of North, use the N-S adjusting screw to remove all deviation so the compass indicates North. The N-S adjusting screw is the LH screw on the compensator.

2. Rotate the aircraft to a known magnetic heading of East, use the E-W adjusting screw to remove all deviation so the compass indicates East. The E-W adjusting screw is the RH screw on the compensator.

3. Rotate the aircraft to a known magnetic heading of South. Note the degrees of deviation. Using the N-S adjusting screw, remove one half of the deviation.

4. Rotate the aircraft to a known magnetic heading of West. Note the degrees of deviation. Using the E-W adjusting screw, remove one half of the deviation.

5. Return the aircraft to the known magnetic heading of North to confirm its relation to South. The deviation should be the same. In some aircraft "fine tuning" adjustments and rechecks are necessary.

6. Return the aircraft to the known magnetic heading of East to confirm its relation to West. The deviation should be the same. In some aircraft "fine tuning" adjustments and rechecks are necessary.

7. On completion of the preceding procedure, the aircraft is rotated to each 30 degree known magnetic heading thru 360 degrees and the deviation is recorded on the compass correction card.

8. The compass correction card should be installed close to the compass and convenient for the pilot to read.

SHOULD the preceding procedure fail to produce satisfactory results, here are some suggestions:

Use a magnet to check hardware in the proximity of the compass. Steel screws and nuts can be replaced with brass or aluminum in some uses. Steel shake proof lockwashers will hold magnetism.

Some radio navigational instruments with meter movements have been the problem when they have no magnetic shield. This is a physical problem and not an electrical problem.

If the problem is electrical, manipulation of the switches should point out the site. On some rare occasions, it has been necessary to reroute some wiring.

Relocation of the compass is sometimes the answer. Sometimes only slight relocation can be the answer.

PAI MAGNETIC BALANCING BALLS - PART NO. PBB 475

The PAI Magnetic Balancing Balls are additional compensation aids. They are used in some aircraft to overcome compensation problems that resist all else. They are used successfully in many steel frame aircraft - Mooney, Ballanca, etc. Major deviation errors can be adjusted with the PAI Magnetic Balancing Balls and "fine tuning" is accomplished with the poly-plane compensator.