



(This Service Bulletin is FAA D.O. Authorization SW-1 Approved)

**SUBJECT:** Compass Maintenance

**MODELS AFFECTED:** All

**INTRODUCTION:** Basically, the compass is a piece of magnetized material hung so that it is free to turn and stay aligned with the earth's magnetic field.

Large masses of ferrous (iron) metals, such as the aircraft engine, tubular fuselage structure, or landing gear actuating handle, can distort the earth's magnetic field causing the compass to give an erroneous reading. Small adjustable magnets, called compensators, allow much of this type of error to be adjusted out of a properly installed compass. However, if the airframe, engine, or gear handle has become magnetized accidentally, the effect of this magnetic field on the compass may be greater than can be handled by the compensators. These large ferrous masses can be magnetized easily by accident.

**TIPS ON COMPASS CARE:**

Simple as the compass and its operating principle may be, certain precautions must be observed if the full benefit of this vital instrument is to be realized.

DON'T use electric motors (AC or battery powered DC) such as buffers, drills, or vacuum cleaners in or around the cockpit. These motors generate magnetic fields that may induce magnetism into the aircraft structure.

DON'T route wires carrying high currents along with or parallel to tubes of the fuselage structure. Improperly routed wiring can induce large magnetic fields in the airframe.

DON'T use ferrous metal tools to adjust the compass compensators. A common screw driver or knife will change the fields created by the compensators. A brass screw driver is suggested.

DON'T drape any kind of AC power cord over any part of the aircraft structure.

DO swing the compass periodically. Replacement, addition, and/or removal of the engine, gear handle, gear motor, radio, navigational aids, or electronic autopilot also requires that the compass be swung.

DO place the aircraft on a compass rose when performing the compass swing.

DO be cautious when using electric powered service units such as engine heaters, oil immersion heaters, or battery chargers in or around the cockpit. These units may also induce magnetism into the structure, especially if their power cords are in contact or close proximity to the airframe.

DO use a magnetic field indicator to locate areas of the airframe that need demagnetizing. The Magnaflux Corporation Model No. 2480 Field Strength Meter is suggested.

DO use only the proper tools and techniques in demagnetizing the airframe. Instructions for demagnetizing are found in other sections of this service instruction.

DO check carefully the effects on the compass of recent optional equipment installations; recent wire routing changes; relocation, modification, or removal of any equipment using electricity; or the relocation, modification, installation, or removal of any large ferrous metal parts.

#### SWINGING THE COMPASS:

The procedure for swinging the compass is as follows:

1. Set the engine speed at 1800 to 2000 RPM. Turn on rotating beacon and all radio equipment.
2. Position aircraft on compass rose and adjust N-S compensator screw on aircraft compass for 0° indication on north heading (use non-ferrous tools).

3. Taxi aircraft to east heading and adjust compass E-W compensator screw for  $90^{\circ}$  indication.
4. With aircraft on south heading, adjust compensator to reduce indicated error by 50% (if compass reads  $184^{\circ}$ , adjust so it reads  $182^{\circ}$ ).
5. With aircraft on west heading, adjust compensator to reduce indicated error by 50%.
6. Return aircraft to north heading, reset directional gyro and, using DG, check and record on "Compass Deviation Card" the compass error every  $30^{\circ}$ .

NOTE: During a compass swing, if any error greater than  $\pm 30^{\circ}$  (with compensator screws centered or compensators removed) persists, the cockpit area should be demagnetized.

#### DEMAGNETIZING THE COCKPIT:

Demagnetizing or degaussing can be done by either of the two methods described in this service instruction. The procedures used and the amounts of demagnetizing needed vary from aircraft to aircraft, depending on the location and the concentration of the magnetism. For this reason, all degaussing should be done by a repair station thoroughly experienced in performing such work.

This method employs an armature tester or "growler". Light duty equipment, such as tape recorder head demagnetizers, are ineffective because of the weak magnetic field they produce.

CAUTION: Improper use of the growler can induce more magnetism and cause extensive demagnetizing requirements.

NOTE: Remove compass from aircraft before trying to demagnetize cockpit.

1. Position aircraft at heading of either  $90^{\circ}$  or  $270^{\circ}$ .
2. Make sure growler is turned off. Place growler in cockpit, position seats aft, and support power cord so that it does not touch or pass within six inches of any structural member.

3. Hold growler inside cockpit in a low position. Turn growler on and slowly move it close to landing gear handle, up toward and along windshield center post, and along overhead structure. Move growler in a circular motion down from behind shoulders to waist or mid-chest height before turning off.
4. Hold compass in place to see if headings now match. If too much heading error (more than  $\pm 15^\circ$ ) still exists, remove compass from aircraft and proceed with steps 5 and 6.
5. Turn on growler and move it along center cross structure from one side of cockpit, overhead, and down the other side.
6. Again hold compass in place and compare headings. If heading error has not been reduced sufficiently (to less than  $\pm 15^\circ$ ), repeat steps 3, 4, 5 and 6 until heading error is less than  $\pm 15^\circ$ .
7. When heading error has been reduced to less than  $\pm 15^\circ$ , install compass, swing on compass rose using procedure described in this service instruction, and compensate N-S, E-W (NOTE: It is recommended that adjustment begin with compensator screws in centered position or compensators removed, depending on type compass installed).
8. If compass will not compensate to within  $\pm 10^\circ$  on any heading, it should be replaced.

NOTE: Effective with M20C, M20E, and M20F, serial numbers 670001 and later, the windshield center post is fabricated of non-magnetic stainless steel. This post will require no demagnetizing so efforts should be concentrated on other sections of the airframe.

#### METHOD B

This method consists of passing amounts of direct current through portions of the cabin structure. The compass need not be removed for, in fact, it serves as a convenient indicator for the effectiveness of the degaussing. Current is passed through each of three sections of the tubular structure until sufficiently low heading errors are obtained. These sections are:

1. The left half of the windshield bow from the top center intersection of the center windshield post to the lower intersection of the bow with the instrument panel bottom support tube.
2. The right half of the windshield bow with intersections corresponding to those of the left half.
3. The instrument panel bottom support tube.

The procedure for this second method of degaussing is as follows:

1. Position aircraft at heading of either 90° or 270°.
2. Thoroughly clean protective finish from small area of tubular structure at upper junction of windshield center post and windshield bow and at both ends of instrument panel bottom support tube using thinner and/or steel wool.
3. Prepare two #6 AWG or larger wires by crimping an AMP 321598 or similar terminal onto each end of each wire.
4. Using large (3" or 4") "C" clamp, firmly clamp one terminal of one prepared wire to cleaned area of tube at one end of instrument panel bottom support tube. Terminal must be clamped tight enough that it won't move when wire is wiggled vigorously.

**CAUTION:** An imperfect contact (dirty surfaces or loose clamp) between tubing and wire terminal will cause arcing and burning and will result in severe damage to aircraft structure.

5. Fasten other end of first wire to one terminal of well charged storage battery.
6. Using large "C" clamp, firmly clamp one terminal of second prepared wire to cleaned area at top center of windshield bow or other end of instrument panel bottom support tube. Terminal again must be clamped tight enough that it won't move when wire is wiggled vigorously.

7. Tap other end of second wire to other battery terminal; then, observe results on compass (NOTE: If error is aggravated, reverse battery polarity).
8. If compass heading error is not reduced sufficiently (to less than  $\pm 15^\circ$ ) by passing current through this section of frame, repeat process on the other sections.

CAUTION: Clamp wires firmly to prevent arcing.

9. When heading error has been reduced to less than  $\pm 15^\circ$ , swing compass on compass rose using procedure described in this service instruction and compensate N-S, E-W. (NOTE: It is recommended that adjustment begin with compensator screws in centered position or compensators removed, depending on type compass installed).
10. If compass will not compensate to within  $\pm 10^\circ$  on any heading, it should be replaced.
11. Refinish cleaned areas of structure with zinc chromate.