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The Art and Science of Compass Adjustment

Part I: Alignment, Magnetic Influences, and Pivot Wear

The single most important piece of navigation equipment on any boat is the compass. For racing, the compass is used to take bearings on opponents and on marks, to determine the wind direction, and to determine the direction of wind shifts. For the cruiser and the daysailor, the compass is used as the primary tool of navigation: to determine the course to be steered when out of sight of land or other reference marks.

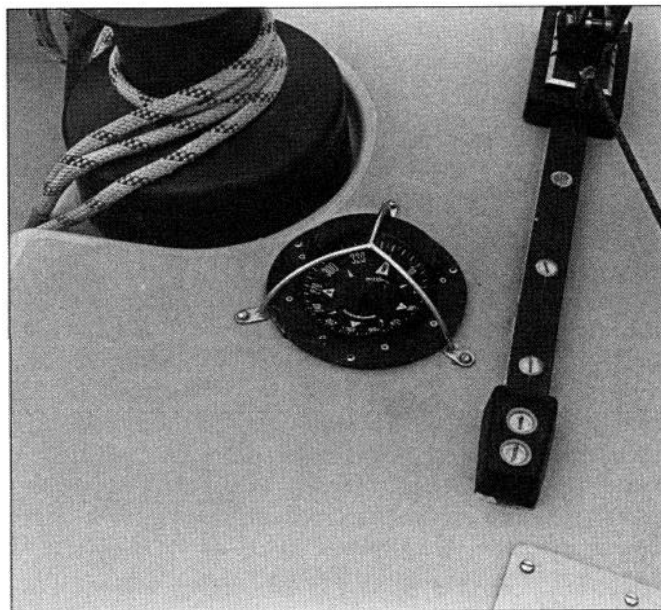
It is as easy to be out of sight of land on a 20-acre lake as it is 1000 miles offshore. Fog or heavy rain can reduce visibility to nothing. In such conditions, the mariner without an accurate compass is completely blind. To know neither the location of the boat nor the proper course to safety is the worst form of bad seamanship. If you have an improperly adjusted compass, you've got one strike against you.

Compass adjustment is both an art and a science. It is a science in that the principles are simple and exact, and the process perfectly repeatable. It is an art in that there are many ways to accomplish the same goal. That goal, of course, is to eliminate as much deviation (compass error) as possible, and to know the exact magnitude and direction of any error that cannot be removed.

Surprisingly few compasses installed aboard boats are properly adjusted, either by the owner or by a professional. The argument usually heard is that courses have been run, and the compass error duly recorded in a deviation table. Since you know how far off the compass is, why go to the trouble to adjust it? Why not just use the deviation table, changing the course steered as necessary to compensate for the compass error?

The arguments in favor of adjustment are simple and powerful. A properly adjusted compass will behave itself under almost all conditions. The bearings shown will be little affected by heeling angle or latitude. Steering and taking bearings will be far easier if you don't have to figure out whether to add or subtract the compass error. The possibility of simple errors of addition and subtraction of deviation will be eliminated. And best of all, your compass will perform as the simple precision instrument it was designed to be.

The literature supplied with your compass may contain instructions for adjusting the compass. This is by no means the only way to do the job, but may be the simplest procedure for the owner with no specialized tools or training. If even these procedures smack of black magic,



A compasses mounted in a bulkhead or through the deck should be kept at three feet away from magnetic materials.

you still owe it to yourself and your crew to have a properly adjusted compass. The answer is to seek out a professional compass adjuster.

Professional compass adjustment is one of the great bargains of boat ownership. The \$75 or so you will spend will repay you in peace of mind the first time you try to find your way home in pea-soup fog. Even the best compass adjuster cannot make up for a poor compass or a poor compass installation, however. So before calling in a professional, check out your compass and its installation. Here's what to look for:

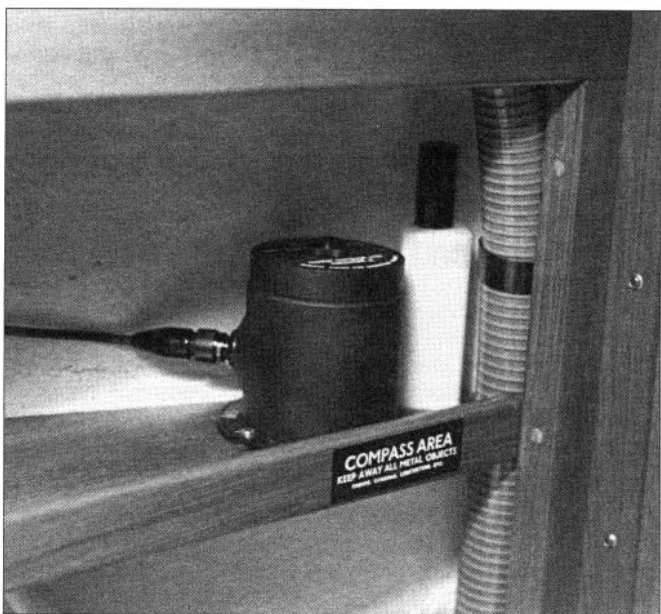
Accurate Alignment

For all compass error to be eliminated, the lubber line of the compass must be accurately aligned with the center of the boat. This doesn't mean that the compass must be mounted on centerline, only that it must be properly oriented fore and aft. The professional adjuster will check this by neutralizing the internal adjusters, if they exist, and checking reciprocal bearings. If the reciprocals are off in the same direction (for example, the compass reads 092°, 183°, 271°, and 001° instead of 090°, 180°, etc.) it indicates that the compass is not properly aligned. In this case it would be off by not quite two degrees.

Magnetic Influences

Any ferrous metal on your boat, or any charged electrical conductor, has the potential for affecting the boat's compass. One advantage of a steering compass mounted atop a pedestal steerer-or on a pedestal binnacle in the case of a boat steered with a tiller-is that the compass is usually far enough away from large ferrous masses (such as the engine) to reduce or eliminate their effects.

But if you clutter up the pedestal with electronics or steel beverage cans, or mount a sheath knife on the front of the pedestal, you may be undoing all your work.



If you mount a remote compass in a locker belowdecks, be sure that magnetic materials are not stowed close to it.

Another mistake frequently seen is lashing a valise life raft to the pedestal on boats without other permanent raft stowage. It may make the raft easy to get to, but the raft contains a steel CO₂ cylinder, and may also contain steel water cans or tools that can affect the compass.

Compasses mounted in the bridgedeck, side decks, or cabin bulkhead also require care in installation and use. It won't do you any good to mount the compass in the bridgedeck if the ship's tool drawer or the cook's cast iron skillet are directly below it. A bulkhead-mounted compass is also suspect if the vessel's electrical panel is mounted on the inside of the bulkhead right next to it. Don't laugh, this is a common installation!

Likewise, care must be chosen in mounting the sending unit of a remote-reading compass such as the B&G Halcyon. Don't install it in a locker full of steel coat hangers or cans of tuna.

Pay particular attention to the location of electronics. Anything with a speaker contains a magnet which can affect the compass. In the navigation station, be sure to keep the repeater compass away from the radios, and don't mount your handbearing compass within three feet of them, either.

Reroute any wiring so that it is at least three feet away

from the compass. Any wiring in the compass area should have the positive and negative leads twisted around each other to reduce magnetic influence. Better yet, if you're building a new boat or rewiring, use pre-twisted wire throughout the boat.

Don't forget the gear that accumulates in cockpit lockers. Anchors and chain which get moved from one locker to another can raise havoc with the compass if stored within a few feet of it.

Pivot Wear

During its life, your compass card will pivot on its jewel thousands of times. Sooner or later, the pivot will become worn, and the compass card may fail to respond properly due to increased friction. You can check for a worn or defective pivot by bringing a steel object such as a screwdriver close enough to the compass to deflect it about five degrees. Quickly move the steel object several feet away from the compass, and watch for the card to resettle. It should return exactly to the previous bearing. Repeat this procedure several times, deflecting the card in opposite directions by changing the location of the steel object relative to the compass. Don't bring the object close enough to deflect the compass 90 degrees. Just a little deflection is enough.

If the compass doesn't return to exactly the same bearing, the pivot is either worn or defective, and the compass is due for an overhaul or for replacement. An overhaul can return a compass to new condition, so don't discard an expensive piece of equipment without first getting a professional evaluation.

Just because you rarely use your boat doesn't mean that the pivot can't wear. A boat kept on a mooring is constantly changing direction 24 hours a day, wearing away at the pivot jewel.

Next month, in Part II, we'll discuss the solutions to the problem of bubbles in the compass bowl, the use of corrector magnets, and the use of the pelorus for making compass corrections. ■



Some compasses use hollow tubes on the outside of the compass base to hold round bar magnets of varying lengths.