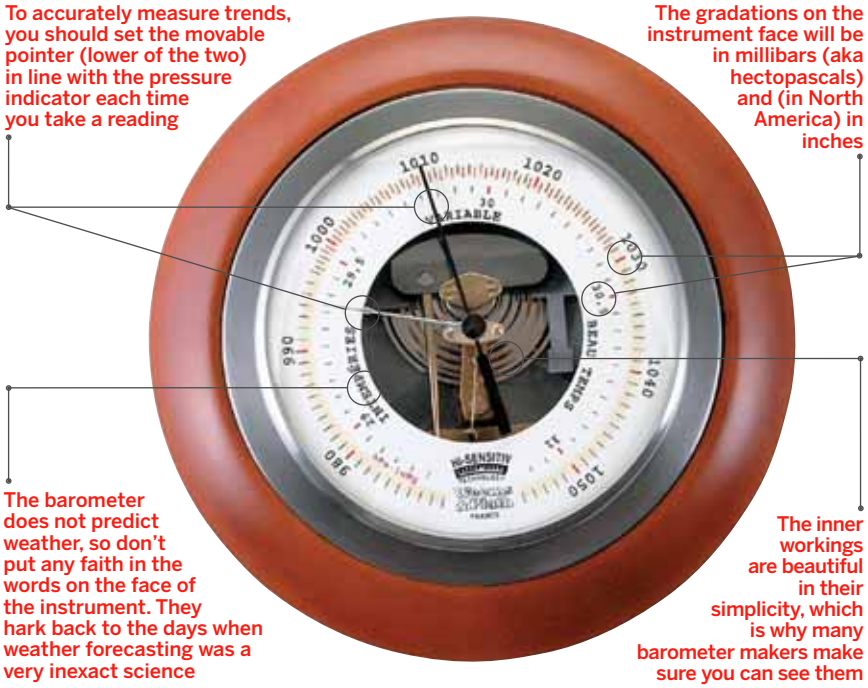

Barometer 101

The venerable barometer still has a place on board

BY PETER NIELSEN

FOR CENTURIES, THE BAROMETER was the sailor's most important weather-forecasting tool. Not these days, though. Weather information has become so readily available via radio, VHF, the Internet, even your cell phone, that on many boats the poor old barometer has been relegated to purely decorative duty. This is a shame, because the barometer is no less useful to the voyager today than it was 300 years ago. When its measurements of atmospheric pressure are used in tandem with your observations of wind direction and strength, it can be a reliable (though not infallible) short-term weather forecaster, and it doesn't depend on a power source.

Back in 1643, a contemporary and compatriot of Galileo Galilei, Evangelista Torricelli, invented the barometer when trying to measure the weight of the atmosphere. He filled a glass vial about a yard long with mercury and placed it open-end-down into a reservoir of mercury. As some of the mercury dropped into the reservoir, a vacuum was formed at the top of the tube. Torricelli observed that rising atmospheric pressure forced more mercury up from the reservoir into the tube, while declining pressure allowed the mercury level to drop. He and other physicists soon worked out that these fluctuations could be linked to changes in weather conditions.

Not many of us have room in our saloons for a 30-inch glass tube packed with a toxic element, so it's just as well that the aneroid barometer was invented in 1843. An aneroid (Greek for "without liquid") is a flexible metal canister enclosing a partial vacuum. Lower atmospheric pressure lets the canister expand; higher pressure makes it contract. Springs or levers attached to the aneroid drive the pointer on the face of the barometer that indicates changing pressure.

Here in the U.S., the National Weather Service ignores metrics and still supplies ground-level pressure readings in inches of mercury, but is in step with the rest of the world in reporting air pressure aloft only in millibars (also known as hectopascals) to avoid confusing airline pilots. All weather-service barometer readings are corrected to sea level. There's a good reason for sailors to give inches the heave-ho and think in terms of millibars; that's the unit used on the weather contours in weather maps. It is unambiguous, and it avoids the use of decimal points, which can be lost in a weatherfax transmission or on a computer screen.

It doesn't really matter, though, whether the gradations on the face of your barometer are in inches or millibars or both; what

GAME OF INCHES

Sea-level air pressure is about 14.7 pounds per square inch, which is equivalent to a column of mercury 29.92 inches high. For each 1,000 feet above sea level, the pressure drops by about 1 inch of mercury, but this is academic for us sailors (unless you're on a lake in the Rockies). Over the course of a year, your barometer readings will range over about 1.5 inches, from a low of circa 29 inches (983 millibars) to a high that could be as much as 30.5 inches (1035 mbar); however, pressure plunges to as low as 27 inches have been recorded during extreme weather events. Average sea-level pressure is 1013 mbar.

BAROMETER LORE

"Quick rise after low
Portends a stronger blow"

"When the wind backs and the weather glass falls
Prepare yourself for gales and squalls"

"Long foretold, long last
Quick notice, soon past"

PHOTOS COURTESY OF WEEMS AND PLATH

A	B	C			
BAROMETER READING (INCHES)	BAROMETER ACTION	WIND DIRECTION			
		NW QUADRANT	SW QUADRANT	SE QUADRANT	NE QUADRANT
30.20 OR HIGHER	RISING	CONT'D FAIR FOR 24 HOURS Lower temperatures	CONT'D FAIR FOR 12 HOURS	FAIR WEATHER	CLEAR AND COOL
	STEADY	CONT'D FAIR FOR 48 HOURS No decided change in temperature	CONT'D FAIR FOR 12 HOURS No decided change in temperature	RAIN WITHIN 24 TO 48 HOURS	CONTINUED FAIR Lower temperatures
	FALLING	CONT'D FAIR FOR 24 HOURS Slowly rising temperatures	FAIR FOR 6 TO 12 HOURS Rising temperatures	RAIN WITHIN 12 HOURS Wind increasing force...rising temp	RAIN WITHIN 24 TO 48 HOURS
30.20 to 29.80	RISING	FAIR FOR 48 HOURS Lower temperatures	FAIR FOR 48 HOURS Lower temperatures	FAIR	CLEAR WITH COLDER WEATHER
	STEADY	CONTINUED FAIR WEATHER	FAIR FOR 12 HOURS No decided change in temperature	RAIN WITHIN 12 TO 24 HOURS	NO CHANGE
	FALLING	FAIR FOR 12 TO 24 HOURS No decided change in temperature	RAIN IMMINENT	RAIN WITHIN 6 TO 12 HOURS Wind increasing force...rising temp	RAIN WITHIN 12 HOURS
29.80 OR LOWER	RISING	CLEARING WITHIN A FEW HOURS Lower temperatures	CLEARING WITHIN 6 HOURS	CLEARING WEATHER	CLEARING AND COOLER
	STEADY	CONT'D THREATENING WEATHER Lower temperatures	CONT'D STORMY WEATHER	CONT'D RAIN OR NO CHANGE	RAINY WEATHER Clearing in 12 to 24 hours
	FALLING	CHANGING WEATHER	INCREASING RAIN Clearing within 12 hours	SEVERE STORM IMMINENT Clearing within 24 hours	HEAVY RAIN Severe northeast gale, colder

WEATHER CHART

This chart came with an old barometer I bought. It assumes an average wind velocity of 10mph and is only for use in North American waters. I compared it to actual weather forecasts last winter and found it was surprisingly accurate. Note that diurnal variations of up to 3mbar are common; before you use this table you should observe your barometer's actions over a 24-hour period of stable weather to account for them. This table would look good laminated and posted at the nav station: go to sailmagazine.com to download a PDF.

The barograph (above) records readings, allowing you to keep an eye on trends; the electronic barometer (left) does the same thing

does matter is how fast and in which direction the pointer moves. The lower the air pressure, the worse the weather in store for you will be, and vice versa; the faster the pressure change, the more severe the weather change will be. In the 17th and 18th centuries, as mariners began to carry first "storm glass" water barometers and then mercury barometers on board their ships, they shared their scrupulous recordings of pressure variations and wind strength and direction, and a cause-and-effect consensus gradually evolved that enabled sailors to predict short-range weather changes with considerable accuracy. The table reproduced on this page is a typical example.

You can safely ignore the words on the barometer face that indicate "fair," "change," or "rain." They merely note typical conditions attendant to that particular pressure range. In order to get an idea of the coming weather, you need to keep an eye on the trend—rising or falling pressure. Passagemakers should log the pressure reading hourly, for the rate of change is a good indicator of the severity—or otherwise—of the weather to come. I once owned a boat that had a barograph, which recorded the pressure variations on a sheet of paper over the course of a week. Now it is increasingly common to see electronic barometers on board boats, and many of these can store trend information. They use detection cells—a type of capacitor whose resistance is affected by changes in air pressure. They are also considerably cheaper than barographs, which cost from several hundred dollars to north of a thousand. I wish I'd kept mine.

If you sail mainly around the coast, where weather information is both readily available and accurate, your barometer probably resides forgotten. Offshore and bluewater sailors still have a healthy respect for the instrument; at sea, there is always a place for the old ways.