



propeller turns counterclockwise. The direction of rotation is determined by observing the angle of the blades (**Figure 24**). Right-handed propeller blades slant from the upper left to the lower right; left-handed propeller blades are opposite.

### Cavitation and Ventilation

Cavitation and ventilation are *not* interchangeable terms; they refer to two distinct problems encountered during propeller operation.

To help understand cavitation, consider the relationship between pressure and the boiling point of water. At sea level, water boils at 212° F (100° C). As pressure increases, the boiling point of the water increases. It boils at a temperature higher than 212° F (100° C). The opposite is also true. As pressure decreases, water boils at a temperature lower than 212° F (100° C). If the pressure drops low enough, water will boil at room temperature.

During normal propeller operation, low pressure forms on the blade back. Normally, the pressure does not drop low enough for boiling to occur. However, poor propeller design, damaged blades or using the wrong propeller can cause unusually low pressure on the blade back (**Figure 25**). If the pressure drops low enough, boiling occurs, and bubbles form on the blade surfaces. As the boiling water moves to a higher-pressure area of the blade, the boiling ceases, and the bubbles collapse. The collapsing bubbles release energy that erodes the surface of the propeller blade.

This entire process of pressure drop, boiling and bubble collapse is called *cavitation*. The ensuing damage is called *cavitation burn*. Cavitation is caused by a decrease in pressure, not an increase in temperature.

Corroded surfaces, physical damage or even marine growth combined with high-speed operation can cause cavitation on the propeller shaft support strut and other exposed drive system surfaces. In such cases, low pres-

sure forms as water flows over a protrusion or rough surface. The boiling water forms bubbles that collapse as they move to the higher-pressure area toward the rear of the surface imperfection.

Ventilation is not as complex a process as cavitation. Ventilation refers to air entering the blade area from above the water surface. On inboard engines, ventilation is commonly caused by operation in rough water where the bottom of the boat momentarily leaves the water surface. As the blades meet the air, the propeller momentarily loses contact with the water and subsequently loses most of its thrust. During ventilation, cavitation can occur as the engine overrevs and creates very low pressure on the back of the propeller blade.