



**Figure 16-71.** The temperature control system of a Boeing 777 combines the use of zone and duct temperature sensors with trim air modulating valves for each zone. Redundant digital left and right cabin temperature controllers process temperature input signals from the sensors and temperature selectors on the cockpit panel and throughout the aircraft to modulate the valves.

Adding heat to a substance does not always raise its temperature. When a substance changes state, such as when a liquid changes into a vapor, heat energy is absorbed. This is called latent heat. When a vapor condenses into a liquid, this heat energy is given off. The temperature of a substance remains constant during its change of state. All energy absorbed or given off, the latent heat, is used for the change process. Once the change of state is complete, heat added to a substance raises the temperature of the substance. After a substance changes state into a vapor, the rise in temperature of the vapor caused by the addition of still more heat is called superheat.

The temperature at which a substance changes from a liquid into a vapor when heat is added is known as its boiling point. This is the same temperature at which a vapor condenses

into a liquid when heat is removed. The boiling point of any substance varies directly with pressure. When pressure on a liquid is increased, its boiling point increases, and when pressure on a liquid is decreased, its boiling point also decreases. For example, water boils at 212 °F at normal atmospheric pressure (14.7 psi). When pressure on liquid water is increased to 20 psi, it does not boil at 212 °F. More energy is required to overcome the increase in pressure. It boils at approximately 226.4 °F. The converse is also true. Water can also boil at a much lower temperature simply by reducing the pressure upon it. With only 10 psi of pressure upon liquid water, it boils at 194 °F. [Figure 16-73]

Vapor pressure is the pressure of the vapor that exists above a liquid that is in an enclosed container at any given temperature. The vapor pressure developed by various