For all its good points, the lead acid battery still has many limitations and the nickel cadmium battery (NiCd) is finding its way into more and more aircraft.

THE NICD BATTERY

The nickel cadmium (NiCd) battery, referred to as "nicad" (pronounced "nye-kad"), works under the same principle as its lead-acid counterpart. Both are electrochemical systems that store and supply electrical energy as needed.

Designed for a long life under extremely adverse conditions, the NiCd has a very low freezing temperature, minimal gas emission during operation, and, unlike the lead acid battery, suffers no deterioration if left in a discharged state. Unfortunately, its high initial cost has hindered its growth into light aircraft.

The main components of the NiCd battery are positive and negative plates, separators, the electrolyte, the cell container, and the cell vent. The individual cells—typically 19 or 20, depending on application and manufacturer—contain thin, porous, sintered nickel plates. Polarity is achieved by impregnating the plates with nickel-hydroxide for positive polarity and cadmium-hydroxide for negative. Opposing plates are separated from one another by a continuous strip of porous plastic that serves as a reservoir for the electrolyte and a sheet of cellophane, which acts as an insulator. This sandwich structure is fitted into a case, which typically is made of a plasticlike substance called *plyamide*. The negative plates are then connected to a negative cell terminal and the positive to the positive cell terminal. The two terminal openings are sealed to the case with an external O-ring to prevent electrolyte from leaking out of the case. The electrolyte is a 30 percent solution (by weight) of potassium hydroxide (KOH) in distilled water.

Each cell has a removable vent cap, which is used to service the electrolyte, as depicted in Figure 8-9. The cap serves as a one-way valve to vent gas resulting from accidental overcharging, yet prevents air from entering the cell. Individual cells are connected in series along highly conductive bars, often made of nickel-plated copper. The current can flow in only one direction.

Because each cell averages 1.2 volts, a 20-cell battery would equal 24 volts. The entire assembly, as shown in Figure 8-10 and Table 8-5, is put into a battery case, which typically is made of stainless steel, plastic-coated sheet steel, or painted sheet steel. The case is attached carefully to a ventilation system to prevent gas buildup as a result of inadvertent overcharging and to permit forced-air cooling during operation. The two end cells are connected, usually by nickel-plated copper links, to the positive and negative battery terminals.

During the discharge process, some electrolyte is drawn into the plate sets, causing the fluid level to decrease. Recharging the battery forces the electrolyte back out of the plates, causing the fluid level to rise to its normal level. The pilot should NOT add electrolyte to an NiCd battery just because the fluid level appears low. Recharging during subsequent operation could force the highly caustic electrolyte to overflow and damage the battery and surrounding area. And if the vent cap happens to be blocked when that occurs, the result could be a cell explosion.