

The Tesla Roadster: sporty *and* electric

A MODERN ELECTRIC SPORTS CAR PRESENTS A UNIQUE DESIGN CHALLENGE.

The enabling technology for the Tesla Roadster is the lithium-ion battery. The RC-modeling community years ago discovered that lithium-chemistry batteries created fast, light, quiet, and quickly rechargeable planes, so you can see why the technology first found use in model aircraft. Automotive design has all the challenges of aircraft design, along with the more brutal constraint of lower cost. Tesla (www.teslamotors.com) wisely chose to design a \$120,000 sports car rather than a family sedan or economy box. This choice gave it the freedom to use the latest technology to make a viable vehicle.

Although the air-conditioning unit cools the passenger compartment, its primary task is to cool the battery pack, so the Environmental Protection Agency's rules requiring air conditioning to run during mileage tests don't impact the car.

The Roadster initially used 6800 lithium-ion, 18×65-mm laptop-computer batteries. Cell-balancing and safety concerns may require the use of ferric-anode-lithium chemistry from A123 (a123systems.com). This technique would use larger cells to reduce the cell-count and ferric chemistry to prevent thermal runaway.

The car's charger port charges in approximately 3.5 hours and gives a range of 220 miles. If Tesla switches to ferric-anode lithium-ion batteries, charging may be more aggressive, but the vehicle's range may suffer due to lower energy density of ferric-anode chemistry.

Tesla made extensive use of carbon fiber and fiberglass in the vehicle's body to get the car's curb weight down to 2700 lbs. Low weight is critical to making a viable electric vehicle. About 20% of the car's parts come from Lotus.

The vehicle uses a flux-vector inverter, and multiple DSPs create the three-phase sine waves and provide regeneration current to recharge the battery while a driver is braking.

The car has four-wheel disk brakes with an antilock-braking system and forged-alloy wheels. An electric vacuum pump provides power assistance.

