Electrospray systems have been developed and used previously for a variety of applications, such as paint spraying, crop spraying, production of fine powders, preparation of polymer coatings on electrodes and the production of semiconducting devices. The Combustion team at the University of Utah became interested in this technology for two reasons.

First, to develop a methodology to feed liquid fuels without "distilling" the components of the fuels, e.g., evaporating the light compounds while the heavier compounds stay in liquid form.

Second, to investigate the use of the electrospray to generate fine particles which could then be utilized in health effects studies. Numerous researchers have shown that there is an epidemiological link between the concentration of fine particles, specifically those below 2.5 microns, and increased adverse health effects. Some focus has been generated toward aerosols as small as 20 nanometers. It is hoped that the electrospray can be developed to provide this small particulate and investigate how these particles combine and grow. In addition, a recent proposal has been submitted to use the electrospray with an animal study conducted at the University of Arizona.

Electrostatic Atomization, or electrospraying, is an atomization technique in which a liquid-filled, sharpened capillary tip is brought to a high voltage. Fine liquid droplets are then "sprayed" from this tip when the electrical pressure causes the surface of the droplet to become unstable. In an ideal spray the liquid drops are so small they are not visible to the naked eye. The typical range of electrical potential required to reach this "threshold voltage" is from 0 to 15 kV for a given liquid. Many factors determine the size of liquid droplet produced by a spray, including surface tension, applied voltage, electrode size and configuration, liquid flow rate, and electrical properties of the liquid.

For liquid feeding, the small size of the droplets provides for more surface area and thus more efficient burning of the liquid fuel, in addition to a droplet with limited distillation. This liquid spray of JP-8 jet fuel will be fed into a flame to be used in a series of burners. A study of the role of oxidation in fragmentation and the effect of oxidation on soot size will be performed.

There are also future plans to use this electrosprayer to investigate the coagulation of nanoparticles and the effect of charge on coagulation rate with respect to the association of these small particles on human health, as previously stated.