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### ATOMIZATION

POSITION

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What does the image show?

Fuel injectors in engines use an 'atomizer' to turn a stream of petrol into a fine mist, like the spray for a perfume or deodorant. The mist of petrol burns more efficiently, so by perfecting the atomizer you make your car more powerful, cheaper to run and better for the environment. The image shows the spray from a jet of fuel produced by a gasoline fuel injector. The atomizer – the nozzle assembly which creates the fuel jet spray – can be seen at the top of the image. Capturing the picture required the development of a digital imaging system capable of high-speed spray jet characterization. The droplets in the spray are moving incredibly fast, to see them we have to apply techniques that allow us to take pictures with exposure times of less than 0.0000001 seconds! The droplets can also be very small; with the equipment we have developed we can take photographs of droplets down to one hundredth of a millimetre. To achieve such high-speed microscopic imaging we use high-power lasers and high-resolution CCD cameras. Taking such photographs helps us to understand how the size and speed of the droplets depends on the atomizer used.

How is the work you are doing relevant to everyday life?

Although alternative energy sources will be an important part of making a 'greener' future, the internal combustion engines used in the vast majority of cars today are likely to be around for a while longer. It is important that we optimise their efficiency and reduce the pollutants that they produce. These two factors are linked; incomplete combustion produces various air pollutants such as carbon monoxide, nitrogen oxide, and nitrogen dioxide. Fuel injectors are important in achieving complete combustion; they control the size of the droplets in the injected fuel spray. The droplet size depends on the design and quality of the atomiser – the more effective it is, the smaller droplets it produces. Smaller droplets increase the surface area of the fuel and its evaporation rate, leading to increased burning ranges, higher released power rates and lower exhausted pollutant emissions. In short, perfecting the atomizer makes your car more powerful, cheaper to run and better for the environment.