Must replace figure above with new updated figure by Daniel Strong (has USDrive logo)

The CRF has been working closely with U.S. engine manufacturers for more than 30 years to increase scientific understanding of internal combustion engine processes affecting efficiency and emissions. Today, most of our engine research is directed toward building the science base on advanced combustion strategies that is required by industry to develop a new generation of high-efficiency, clean engines. The strategies include: ultra-low-emission, low-temperature combustion; stratified-charge, spark-ignition combustion; and advanced diesel combustion approaches. The effects of future fuels on these strategies are also being explored. Target vehicles include passenger cars, light-duty trucks, SUVs, and heavy-duty transport vehicles.

CRF researchers use advanced, laser-based diagnostics in conjunction with experimental hardware that simulates or closely mimics realistic engine conditions. Research hardware includes several optically accessible, single-cylinder engines with production or prototypical engine heads and an optically accessible combustion vessel capable of simulating an extremely wide range of potential engine conditions. Optical access in the engines is provided by quartz piston heads, quartz cylinder liners, windowed spacers, and/or periscopes in exhaust valves. CRF engine researchers are also developing sensitive, high-energy, laser-based diagnostics for measuring real-time particulate matter in engine exhaust streams.

Sandia's engine combustion research program is sponsored by the Department of Energy Office of Vehicle Technologies, as well as several industry partners. The work is conducted in close cooperation with the U.S. automotive and heavy-duty diesel engine industries, energy

companies, and other national laboratories through the Advanced Engine Combustion Memorandum of Understanding led by Sandia. Leading engine research universities also participate closely in this collaboration.

Engine Combustion Network

The purpose of the Engine Combustion Network website is to provide an open forum for international collaboration among experimental and computational researchers in engine combustion.

FUELS:

Fuels composition at the pump is changing as crude oil sources change and as fuels bio-feedstocks and other non-petroleum derived fuels are increasingly blended with gasoline and diesel. These trends will continue in the future as we push to reduce petroleum consumption. CRF researchers are focused on investigating how fuel properties effect various advanced combustion strategies and fuel sprays for these various strategies.

Automotive:

In the automotive scale engine area, CRF researchers are focused on investigating Low-Temperature Combustion (LTC) strategies appropriate for diesel fuel, advanced diesel combustion strategies, Direct-Injection Spark-Ignition (DISI) combustion, Homogenous-Charge Compression-Ignition (HCCI) and Stratified-Charge, Compression-Ignition (SCCI) combustion strategies, and the fundamentals of fuel sprays for these applications. HCCI research is investigating both the fundamental mechanisms controlling HCCI generic to all engine applications and a specific application to an automotive-scale engine using fuel injection during Negative-Valve-Overlap (NVO).

Heavy Duty:

In the heavy-duty engine area, CRF researchers are focused on providing fundamental understanding of various Low-Temperature Combustion (LTC) strategies appropriate for diesel fuel, HCCI/SCCI fundamentals generic to all engine sizes, advanced diesel combustion strategies (e.g., use of high levels of Exhaust-Gas-Recirculation (EGR), variable fuel injection timing, multiple injection pulses per cycle, and/or high-pressure injection), and the fundamentals of fuel sprays for these applications.