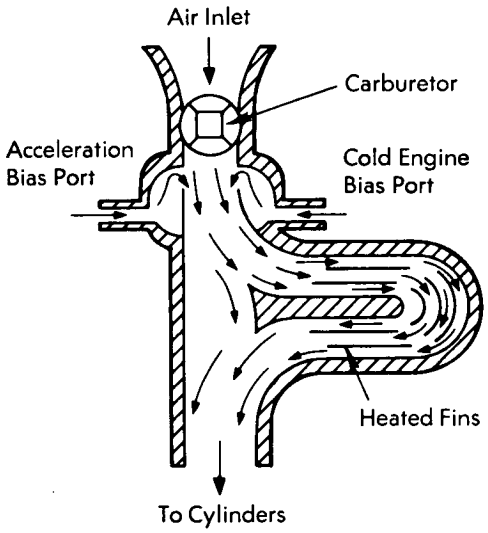
NASA TECH BRIEF

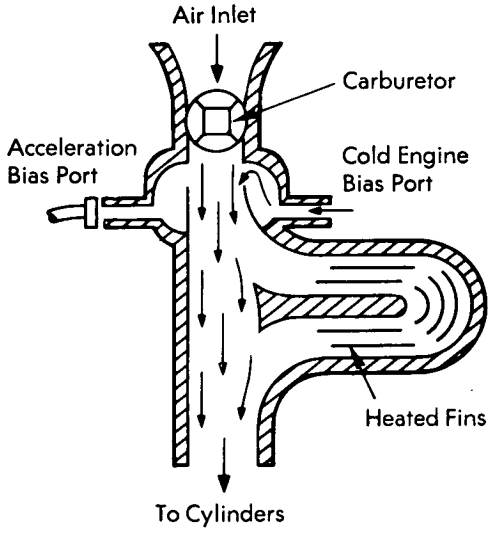
Ames Research Center

Fluidic Systems May Improve Combustion in Automotive Engines

The results of a study of the application of fluidic devices to control flow of propellants suggest that the devices might also be useful for reducing generation of noxious exhausts by internal combustion automobile engines. Noxious exhausts are the results of incomplete combustion, and only modest decreases in exhaust emissions are afforded by conventional emission-control system which operate on the products of incomplete combustion. More satisfactory corrective techniques operate at the input to the engine and usually involve preheating and homogenization of air and fuel mixtures to induce more complete combustion. A recently proposed system relies on moving parts to accomplish mixing and preheating; in contrast, a mixing and preheating system based on fluidic principles requires no moving parts.



Low Engine Output



High Acceleration

The fluidic system would bypass the fuel-air mixture into a heated loop during the times when combustion usually is incomplete (e.g., cold engine). Bypass control would be accomplished by allowing air from a bias port to entrain on the fuel-air stream and divert it into the heated loop. When the engine is hot enough to support more complete combustion, one of the bias ports would be closed, thereby establishing a

(continued overleaf)

direct route from carburetor to cylinder. The fluidic diverter or air induction system could be mounted in thermal contact with the engine block or be cast as an integral part of the block itself. Should the engine be idling or at low speed, combustion normally would not be complete; in this instance, as shown in the diagram, both bias ports would be open and the fluid-gas mixture would adhere to the walls and be diverted into the heated bypass loop. By the time the mixture got to the cylinders, it would be hot and homogeneous. Under cold conditions, as in initial startup, the cold engine bias port would be closed and about 50 percent of the flow would be diverted through the mixing and heating chamber. At moderate speeds, there is less need to stimulate complete combustion and most of the mixture would flow directly into the cylinders at minimum pressure drop. At high speeds, the acceleration bias port would be closed or blocked; little or none of the mixture would be diverted through the heated loop, and it would flow directly to the cylinder through the low impedance path (carburetor directly to cylinders).

The main feature of this concept is the absence of moving parts which require maintenance and consume power. Also, the use of available engine heat to preheat the air-gas mixture leads to improved combustion efficiency by permitting a leaner carburetor adjustment.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California
Reference: B72-10250

Patent status:

No patent action is contemplated by the NASA.

Source: Charles Mangion of
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