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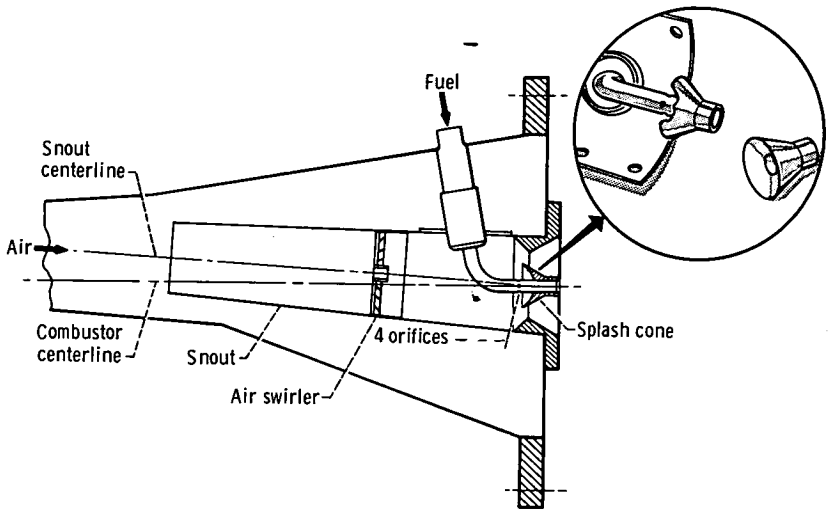
NASA TECH BRIEF

Lewis Research Center

Air-Atomizing Splash-Cone Fuel Nozzle Reduces Pollutant Emissions from Turbojet Engines



An air-atomizing fuel nozzle has been developed which utilizes the momentum of the inlet-air to atomize and distribute the fuel to improve burning characteristics and reduce pollutant emissions of turbojet engines. Tests have shown that emissions of nitric-oxide, carbon monoxide, and unburned hydrocarbons were significantly reduced with the splash-cone fuel nozzle when compared with those produced with conventional pressure-atomizing fuel nozzles.

The splash-cone fuel nozzle has these further advantages over the conventional pressure-atomizing fuel nozzles: simplicity of construction, the ability to distribute the fuel-air mixture uniformly across the full height of the combustor without using an auxiliary air supply, reliability when using contaminated fuels, and durability of the nozzle at high operating temperatures.

The splash-cone fuel nozzle assembly is shown in the figure. It contains a diffuser snout which captures a portion of the air from the compressor and directs it through an air swirler and around the splash cone. The air swirler assists in evenly distributing the fuel droplets and stabilizing the flame. Low-pressure fuel is injected onto the inner surface of the splash cone through four orifices in the fuel supply-splash cone support. The fuel splashes over the splash cone lip and is atomized by the swirling airstream. At the point where the air stream first contacts the fuel, the diffuser passage converges to accelerate the flow of the resultant fuel-air mixture. The nozzle assembly can be used either singly or in combination to provide the required distribution for can combustors, can-annular combustors, or annular combustors.

The reduction of pollutant emissions with the splash cone nozzle over those with the pressure atomizing fuel nozzles was greatest at high air pressures. At an inlet-air pressure of 20 atmospheres and temperature of 589 K (600°F), the nitric acid emission was reduced 35 percent, the carbon monoxide was reduced 85 percent, and unburned hydrocarbons were reduced 75 percent.

(continued overleaf)

Notes:

1. Further information is available in the following report:

   NASA TN-D-7154 (N73-16929), High-Pressure Combustor Exhaust Emissions with Improved Air-Atomizing and Conventional Pressure-Atomizing Fuel Nozzles

   Copies may be obtained at cost from:

   Aerospace Research Applications Center
   Indiana University
   400 East Seventh Street
   Bloomington, Indiana 47401
   Telephone: 812-337-7833
   Reference: B73-10200

2. Specific technical questions may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B73-10200

Patent Status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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