

NASA TECH BRIEF



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Single-Element Coaxial Injector for Rocket Fuel

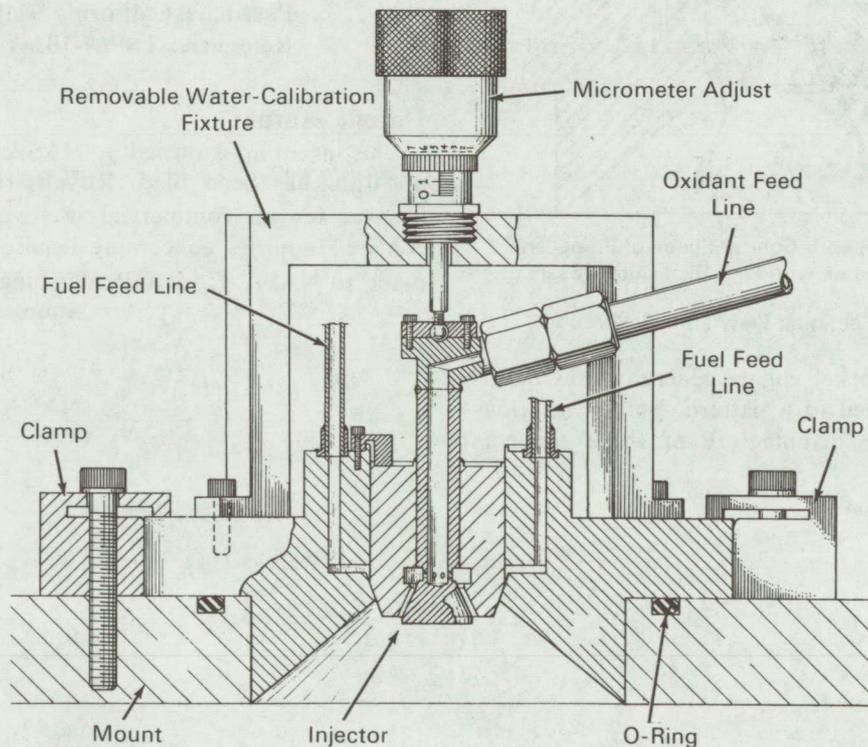


Fig. 1. Sectional View of Initial Assembly before Calibration

The problem:

Design of an improved injector, for oxygen difluoride and diborane, having better mixing characteristics and able to project fuel onto the wall of the combustion chamber for better cooling.

The solution:

A single-element coaxial injector has been developed that produces an essentially conical, diverging, continuous sheet of propellant mixture formed by similarly

shaped and continuously impinging sheets of fuel and oxidant.

How it's done:

After assembly of the injector (fig. 1) the annulus gaps of the orifices are adjusted during calibration with water; thus the ratio of fuel to oxidant is controlled and fixed before the injector is welded solid. The diverging conical spray is of an essentially homogeneous mixture of propellant having a fuel-rich outer

(continued overleaf)

layer. This spray pattern is directed toward the wall of the combustion chamber so that the wall is cooled by unburned fuel (fig. 2). Increase in the ratio of fuel to oxidant effects still-better cooling.

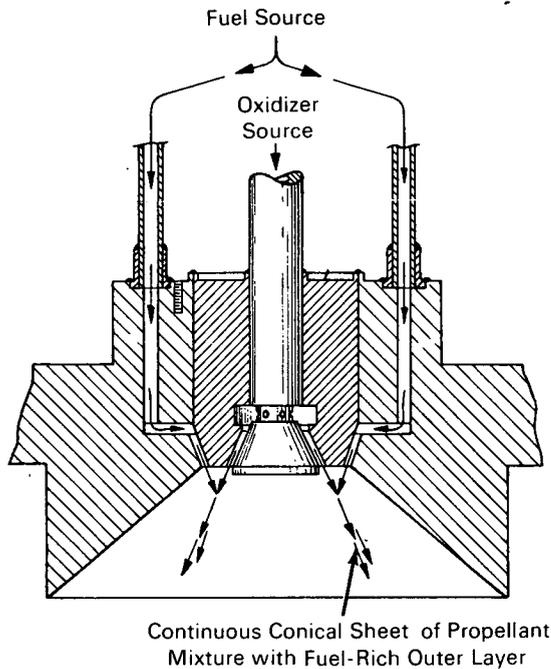


Fig. 2. Partial Sectional View after Calibration

A liquid-fueled rocket engine generally uses multiple elements arranged in a pattern. Small variations in tolerance during manufacture of these elements

can result in uneven combustion. Accordingly extra elements are machined, and only those that match closely are used, the others being discarded. Since this invention uses only one element, and rejects are virtually eliminated, the cost of machining is greatly reduced.

Notes:

1. The invention may interest designers of injection systems for industrial engines, or of spray systems for chemical fertilizers, insecticides, or paints.
2. Requests for further information may be directed to:

Technology Utilization Officer
 NASA Pasadena Office
 4800 Oak Grove Drive
 Pasadena, California 91103
 Reference: TSP69-10547

Patent status:

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