NASA TECH BRIEF
Ames Research Center

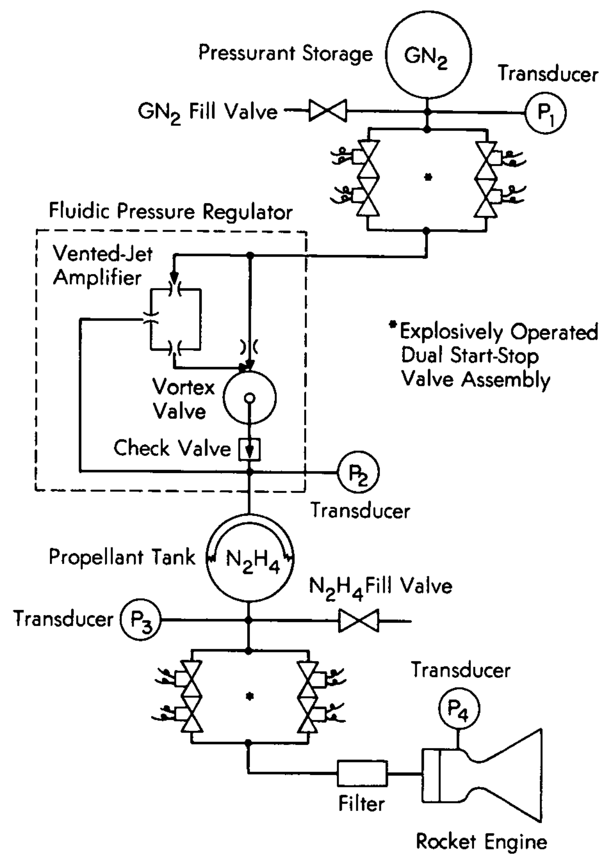
Fluidic Pressure Regulators

Rocket engine propellant pressurization systems currently employ conventional forms of gas pressure regulators to control the flow of propellants. Thus, a high pressure supply of an inert gas such as nitrogen at 34 kN/m^2 (5000 psi) is used at considerably lower pressure to force a liquid propellant such as hydrazine into a rocket engine.

A study was made to determine whether fluidic pressure regulators could be used in a typical spacecraft propulsion system and whether significant advantages could be realized. Three basic areas for possible application of fluidic control to rocket engine subsystems were identified: 1) Regulation of gas pressure in a positive-expulsion hydrazine storage tank (either by stored inert gas or by the gaseous decomposition products of hydrazine). 2) Regulation of the flow rate of hydrazine to the engine by the pressure of the hydrazine itself for control. 3) Regulation of the flow rate of hydrazine to the engine by a gas (in this case, both stored inert gas and decomposed hydrazine). Six subsystem configurations were analyzed; the simplest one is illustrated in the diagram, where the components of a typical fluidic pressure regulator are indicated.

As is customary in rocket engine studies, estimates were made of the weights, space, and cost of development of each of the six subsystems and an analysis was made of dynamic performance. The results of these studies provide an indication of the tradeoffs involved between conventional regulators and fluidic regulators and should be of interest to control and applications engineers who need to make similar analyses.

Fluidic pressure regulators could be incorporated into commercial devices; of interest is the fact that the fluidic systems studied use part of the mainstream of propellant for control. Thus, for example, in commercial applications requiring the supply of large



volumes of compressed air at closely regulated pressures, fluidic pressure regulators could be utilized advantageously because the mainstream of compressed air supplies the power needed to control flow.

(continued overleaf)

Note:

Requests for additional information may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
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No patent action is contemplated by NASA.

Source: Charles Mangion and
William Miller of
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