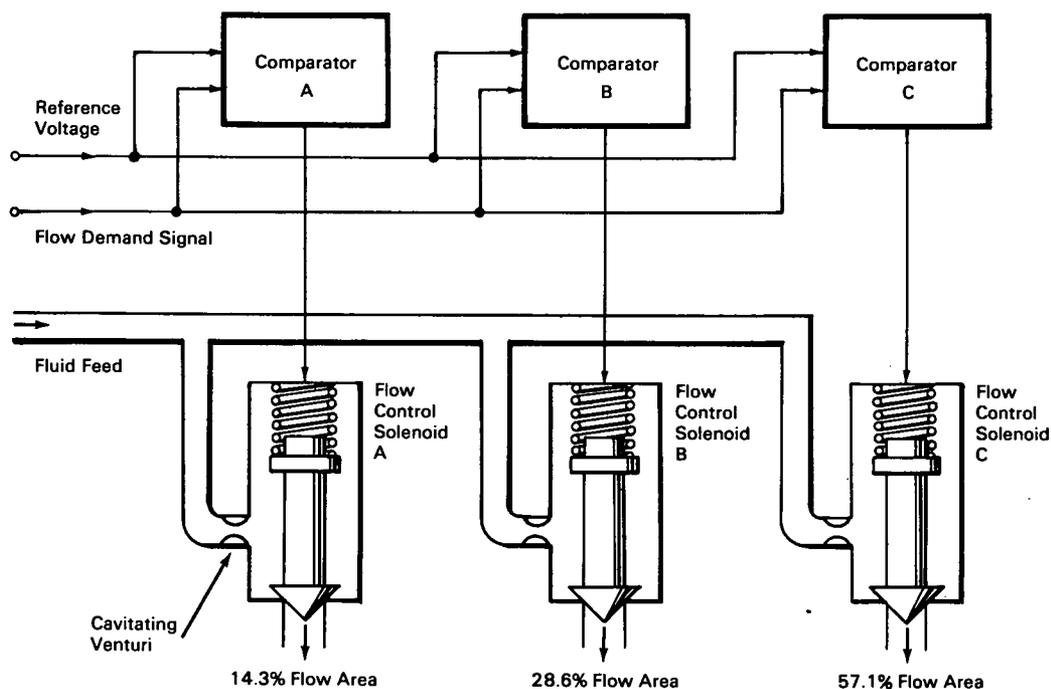


# NASA TECH BRIEF



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## System Proportions Fluid-Flow in Response to Demand Signals



### The problem:

To design a control system that will provide proportioned fluid-flow rates in response to demand signals.

### The solution:

A system that compares a digital signal representing a flow demand, with a reference signal to yield a control voltage to one or more solenoid valves connected to orifices of predetermined size.

### How it's done:

A digital flow-demand signal is compared with a reference voltage in the flip-flop comparator circuits. The voltage levels that trigger comparators A, B, and C, respectively, are in the ratio 1:2:4. The solenoid valves A, B, and C, actuated by the respective comparators are connected to separate orifices having flow areas that are also in the ratio 1:2:4. Thus, the flow rates from the fluid feed line can be

(continued overleaf)

proportioned to correspond to the area of any one of the three orifices or to any combination of these areas. The flow, expressed as a percentage of the fluid feed, from all possible combinations of the opened orifices is as follows: A, 14.3; B, 28.6; C, 57.1; A+B, 42.9; A+C, 71.4; B+C, 85.7; A+B+C, 100.0. In the general case of  $n$  branches ( $n$  solenoids and associated units) in the system, the number of attainable proportioned flow rates is  $2^n - 1$ .

**Patent status:**

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act [42 U.S.C. 2457 (f)], to the Curtiss-Wright Corporation, 304 Valley Boulevard, Wood-Ridge, New Jersey, 07075.

Source: Curtiss-Wright Corporation  
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