NASA TECH BRIEF

Marshall Space Flight Center

Combination Throttle and Shutoff Valve

The combination of a translating sleeve throttle valve and conventional poppet valve provides the capability of shutting off flow completely by the poppet and sleeve control of the rate of flow. The valve was designed for a space engine system to control the flow of oxidizer to the preburners. In the staged-combustion concept, the preburners are used to produce fuel rich gases to drive the main pumps. By controlling the amount of oxidizer flow to the preburners, the pressures of the pump drive gases can be varied and engine thrust controlled within a desired range. In addition to throttling oxidizer flow during preburner operation, the preburner oxidizer valves are able to shut off flow while providing a minimum volume between the shutoff seal and the preburner injector face.

Immediately downstream of a conventional shutoff poppet are two concentric sleeves. Flow past the shutoff seal is directed through contoured ports in the outer sleeve to the preburner injector. The inner sleeve is a part of the main valve poppet and contains ports which move with respect to the outer sleeve as the valve is operated. Flow through the valve is regulated by the relative position of the two sleeves.

The union of a translating sleeve throttle valve with a conventional poppet valve is a combination of well proven design concepts and requires a minimum of valve development. The operating characteristics of the poppet valve are basic knowledge and considerable experience in the use of sleeve valves for rocket engine controls has been gained in recent years. The integration of the two concepts can be accomplished without difficulty and in a manner that requires a minimum of development. This approach allows the design of the valves as an integral part of the engine preburners which results in a compact, lightweight design. It also provides the small volume between the shutoff seal and preburner injector face that is necessary for proper combustion control during engine shutdown.

Notes:

1. Information concerning this innovation may be of interest to the fluid power industry.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Code A&TS-TU
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B72-10287

Patent status:

No patent action is contemplated by NASA.

Source: J. W. Carriker of
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