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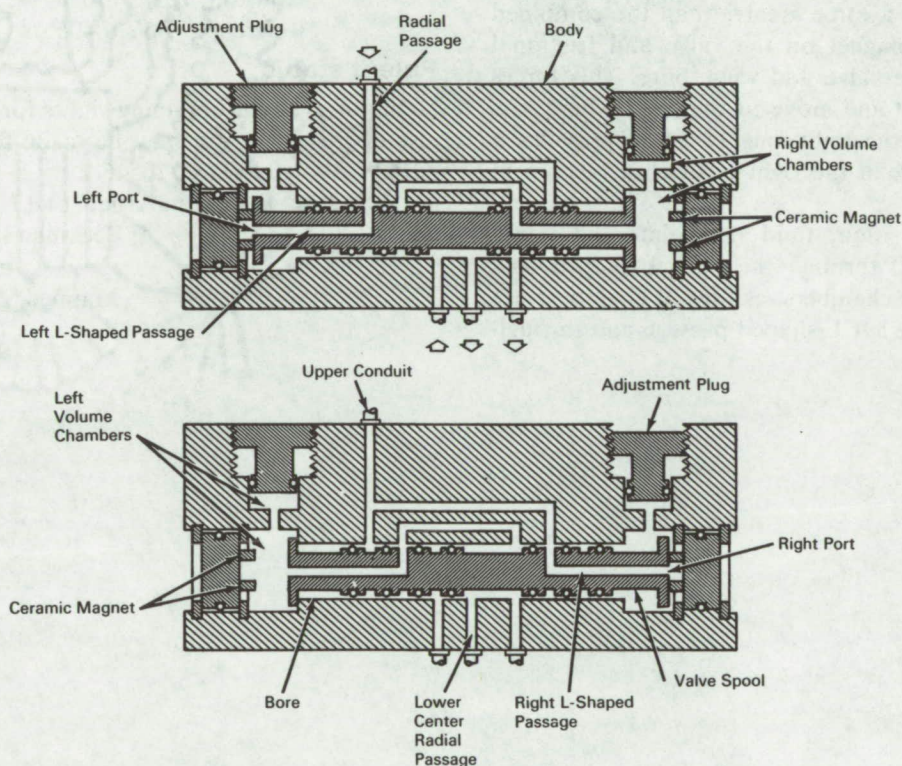
Brief 66-10495

# NASA TECH BRIEF



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## Spool Valve Cycles at Controlled Frequency



### The problem:

To accurately control the cycle of a pneumatically-actuated system over long periods. To stimulate vascular activity in bed-confined patients or in astronauts in the weightless condition during extended space flight, it is desirable to impose and remove, in a cyclic fashion, pneumatic pressure to simulate the pressure exerted on the body's blood vessels in normal terrestrial activity.

### The solution:

A spool valve that is designed to set its own cycle of applying and releasing preselected pneumatic pressure to and from inflatable sleeves covering the subject's limbs.

### How it's done:

The spool valve, made from magnetic material, is operated from any available source of sufficient continuous pneumatic pressure, and employs a series of

(continued overleaf)

ports and passages that register and lose registry in a switching manner to sequentially inflate and relieve the inflatable sleeves at a preselected cyclic rate.

In operation, with the spool valve in the position shown in the upper figure, metered fluid enters the upper conduit and passes into the upper radial passage, through the left L-shaped passage and into the left chambers. At this time the right chambers are vented through the right L-shaped passage and out the lower right radial passage. The left adjusting plug is not threaded into the valve body as far as the right adjusting plug, so that a volumetric difference exists between the right and left chambers. This difference is adjustable to allow the spool valve to remain for a longer period in either the left or right position. Fluid continues to flow into the left chambers until pressure builds to a force greater than the combined force of the left magnet on the valve and frictional forces between the valve and valve bore. This forces the valve to unseat and move to the right where it is now attracted by the right magnet which provides a snap action closure in the right position as shown in the lower figure.

In the right position, fluid flows into the upper radial passage and through the right L-shaped passage into the right chambers, as the left chambers are vented through the left L-shaped passage and through

the lower center radial passage. Pressure now builds in the right chambers to a point that unseats the valve and causes the above described action to take place in the reverse (or left) direction.

**Notes:**

1. Regulation of pressure from the external source, positioning of the adjusting plugs, and magnet selection, together afford wide variation in cyclic timing and speed of closure in either direction.
2. This device would lend itself to the precise control of pressure actuated industrial systems.
3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Manned Spacecraft Center  
Houston, Texas 77058  
Reference: B66-10495

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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Manned Spacecraft Center  
(MSC-143)