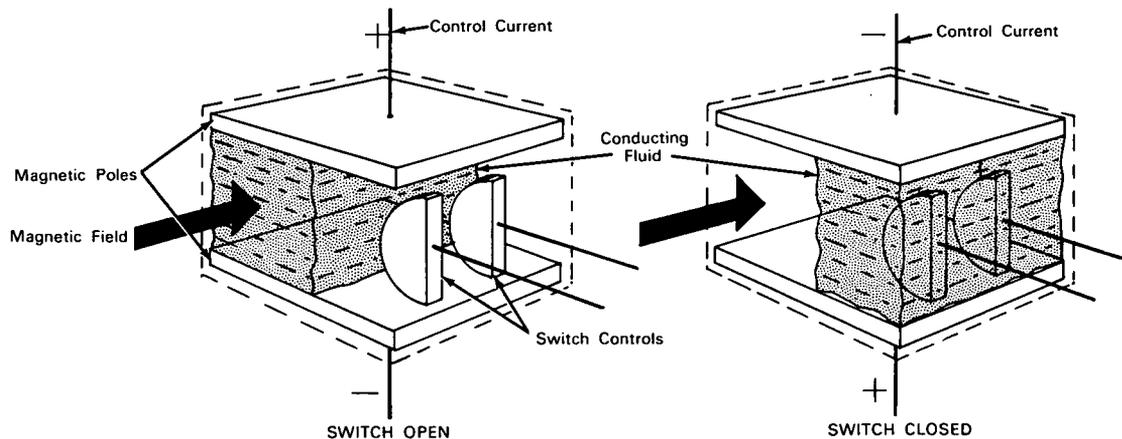


# NASA TECH BRIEF



This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

## Liquid Switch Is Remotely Operated by Low DC Voltage



**The problem:** Reliable switches that can be remotely operated by an electric current are needed for difficult environments, such as those encountered by spacecraft. Ideally, such a switch must operate at low DC voltage levels and be capable of high operational reliability. Mechanical or electronic switches presently available do not satisfactorily meet all of these requirements.

**The solution:** A liquid switch containing no moving parts that operates on the "left-hand rule" principle of electromagnetic force.

**How it's done:** A small, closed chamber is partly filled with a conducting liquid, such as mercury. Permanent magnetic poles are placed in opposite sides of the chamber. When a direct current through the liquid perpendicular to the applied magnetic field is alternated, the resultant electromagnetic force will cause the fluid to move toward or away from the electrical contacts mounted at one end of the chamber. Current flowing in one direction will cause the

liquid to bridge the contacts and close the switch. Reversing the current flow opens the switch.

Operation of this switch does not depend on any mechanical, gravitational, or inertial actuation of the mercury, the chamber, or the other parts of the unit. The switch is operated from an "On" to "Off" condition and vice versa by an electric current.

### Notes:

1. With suitable contact arrangements and chamber geometry, a switch of this type may be made to operate at high cyclic rates. It will then function in a manner compatible with either an AC or DC converter, and is suitable for other low voltage applications.
2. As a significant development in actuating switches, this invention may be of interest to industry. A normal amount of development work should cover applications where it would be an improvement over some of the mechanical switches that are currently used for remote control purposes.

(continued overleaf)

**Patent status:** NASA encourages the immediate commercial use of this invention. It is owned by NASA and inquiries about obtaining royalty-free rights for its commercial use may be made to NASA Headquarters, Washington, D.C. 20546.

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