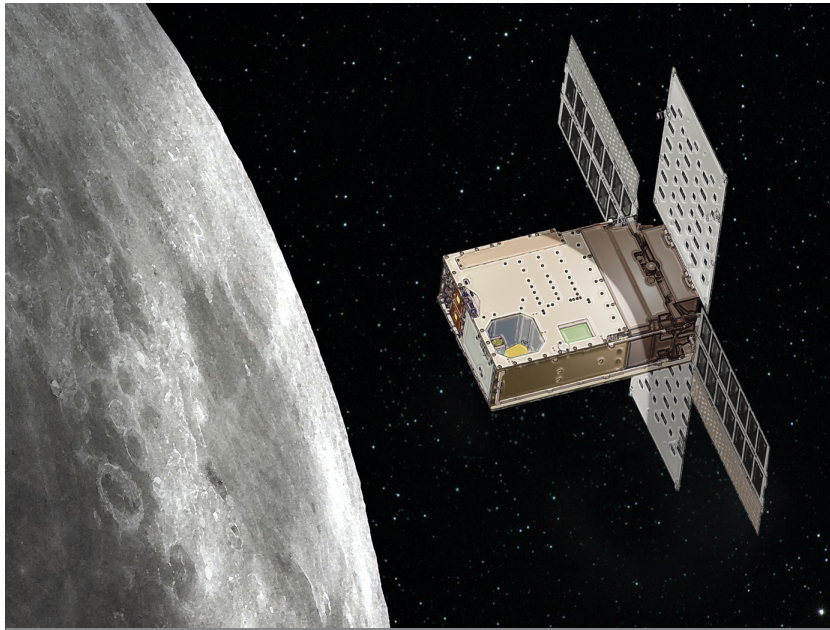




TECHNOLOGY SOLUTION

Mechanical and Fluid Systems



Miniature Separable Fill & Drain Valve

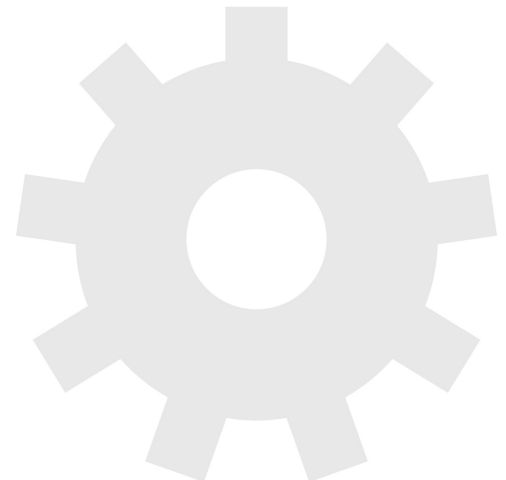
A Manually Operated, Two-Part Valve Design

Innovators at the NASA Marshall Space Flight Center have developed the Miniature Separable Fill & Drain Valve, a manually operated, two-part valve design for CubeSat propulsion applications. Miniature propulsion systems have been an area of significant investment over recent years as rising CubeSat and SmallSat adoption has precipitated the desire to increase the utility of such spacecraft. However, miniature propulsion systems require components that are much smaller than commonly available in industry.

Due to specialized requirements for sensitivity to mass and volume as well as compatibility with the fluids used in CubeSat propulsion systems, the Miniature Separable Fill & Drain Valve was developed. This new valve design allows loading and draining of fluid while minimizing the flown component size and weight, having applications in CubeSat and miniature spacecraft propulsion systems. The valve design is also scalable, and thus may be suitable for terrestrial applications including industrial processing.

BENEFITS

- Offers miniaturization for CubeSat applications: this new valve design allows loading and draining of fluid while minimizing the flown component size and weight.
- Eliminates concerns about leakage: includes the installation of redundant seals around the valve, including a previously-patented valve seal the simplifies the seat installation process.
- Provides a scalable design for alternative applications: although the design has been optimized for CubeSat applications, the valve could also be used terrestrially in applications where the removal of the actuation device would be desired.

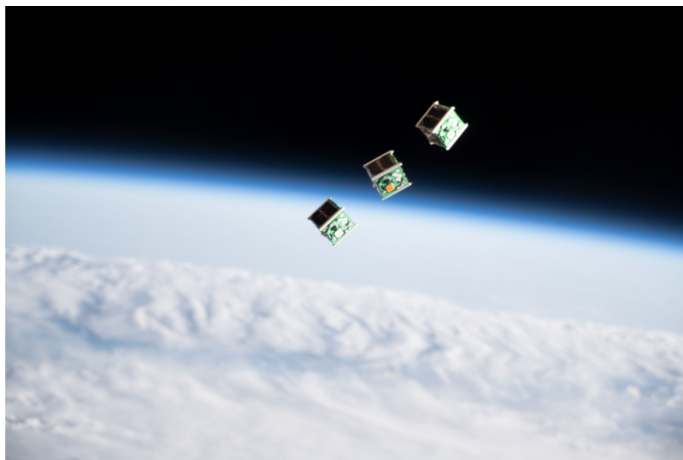


THE TECHNOLOGY

The Miniature Separable Fill & Drain Valve consists of two halves (ground and flight). The flight half is attached to the vehicle (i.e., CubeSat), and the ground half can be inserted into the vehicle in the same port as the flight half, connecting the two halves together. In normal state, the flight half seals the flow path. When the ground half is connected, the flow path is opened, allowing connected ground support equipment to supply fluid through the valve. The valve is manually operated.

There are redundant seals to eliminate leakage around the valve, including NASA's previously-patented Low-Cost, Long Lasting Valve Seal design (Patent No. 10,197,165; see MFS-TOPS-71 in the Links section of this flyer for more information) on the flight half. This eliminates the need for a swaged assembly process and the additional hardware and equipment that are typically required in conventional, elastomeric valve seat installations. The design also includes a cap for the flight half to ensure there is no leakage in flight configuration.

The Miniature Separable Fill & Drain Valve has been prototyped and provides valuable benefits for CubeSat applications. The valve could also have applications in the industrial processing industry where low flow devices are commonly used. The design is also scalable to larger applications where the removal of the actuation device would be desired.



NASA's Miniature Separable Fill & Drain Valve was designed to minimize valve mass and volume while maintaining compatibility with fluids used in CubeSat propulsion systems.

APPLICATIONS

The technology has several potential applications:

- Aerospace: fluid fill and drain valve for CubeSat/other miniaturized spacecraft
- Industrial machinery: low flow devices used in industrial processing
- Valves: two-part valves for space-based system as well as terrestrial systems

PUBLICATIONS

Patent No: 10,197,165

Patent Pending