

the use of potential leak-inducing valve body penetrations.

One implementation of this technology is a high-pressure, high-flow-rate rupture valve that is self-rupturing, which is advantageous for high-pressure applications such as gas isolation valves. Once initiated, this technology is self-energizing and requires low force compared to current pyrotechnic-based burst disk hermetic valves.

This is a novel design for producing a single-use, self-rupturing, hermetically sealed valve for isolation of pressurized gas and/or liquids. This design can also be applied for single-use disposable valves for chemical instruments. A welded foil diaphragm is fully supported by two mated surfaces that are machined to micron accuracies using EDM. To open the valve, one of the surfaces is moved relative to the other to

(a) remove the support creating an unsupported diaphragm that ruptures due to over pressure, and/or (b) produce tension in the diaphragm and rupture it.

This work was done by Curtis E. Tucker Jr. and Stewart Sherrit of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO-47497

⚙️ Explosive Bolt Dual-Initiated From One Side

Lyndon B. Johnson Space Center, Houston, Texas

An explosive bolt has been developed that has a one-sided dual initiation train all the way down to the pyro charge for high reliability, while still allowing the other side of the bolt to remain in place after actuation to act as a thermal seal in

an extremely high-temperature environment. This lightweight separation device separates at a single fracture plane, and has as much redundancy/reliability as possible. The initiation train comes into the explosive bolt from one side.

This work was done by Eric Snow of Lockheed Martin for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. MSC-24843-1

⚙️ Two-Stage Winch for Kites and Tethered Balloons or Blimps

Goddard Space Flight Center, Greenbelt, Maryland

A winch system provides a method for launch and recovery capabilities for kites and tethered blimps or balloons. Low power consumption is a key objective, as well as low weight for portability. This is accomplished by decoupling the tether-line storage and winding/unwinding functions, and providing tailored and efficient mechanisms for each. The components of this system include rotational power input devices

such as electric motors or other apparatus, line winding/unwinding reel(s), line storage reel(s), and independent drive trains.

Power is applied to the wind/unwind reels to transport the tether line. Power is also applied to a line storage reel, from either the wind/unwind power source, the wind/unwind reel itself, or separate power source. The speeds of the two reels are synchronized, but not

dependent on each other. This is accomplished via clutch mechanisms, variable transmissions, or independent motor controls. The speed of the storage reel is modulated as the effective diameter of the reel changes with line accumulation.

This work was done by Ted Miles and Geoff Bland of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-16014-1

⚙️ Dampers for Stationary Labyrinth Seals

Spring and/or shot dampers are incorporated as integral parts of seals.

Marshall Space Flight Center, Alabama

Vibration dampers have been invented that are incorporated as components within the stationary labyrinth seal assembly. These dampers are intended to supplement other vibration-suppressing features of labyrinth seals in order to reduce the incidence of high-cycle-fatigue failures, which have been known to occur in the severe vibratory environments of jet engines and turbopumps in which labyrinth seals are typically used. A vibration damper of this type includes

several leaf springs and/or a number of metallic particles (shot) all held in an annular seal cavity by a retaining ring. The leaf springs are made of a spring steel alloy chosen, in conjunction with design parameters, to maintain sufficient preload to ensure effectiveness of damping at desired operating temperatures. The cavity is vented via a small radial gap between the retaining ring and seal housing. The damping mechanism is complex. In the case of leaf springs,

the mechanism is mainly friction in the slippage between the seal housing and individual dampers. In the case of a damper that contains shot, the damping mechanism includes contributions from friction between individual particles, friction between particles and cavity walls, and dissipation of kinetic energy of impact.

The basic concept of particle/shot vibration dampers has been published previously; what is new here is the use of